APPENDIX A

WESTERN RESEARCH INSTITUTE DATA

Final Report

Microbiological Study of Biodegradation of Petroleum Hydrocarbons and Pentachlorophenol in Groundwater

Jointly Sponsored Research Proposal
Task 70 Final Report under DE-FC26-98FT40323

Prepared for

Montana Department of Environmental Quality
Helena, Montana
Attention: Ms. Moriah Bucy

Prepared by

Western Research Institute
365 North 9th Street
Laramie, Wyoming 82072-3380

October 10, 2006

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EXECUTIVE SUMMARY

Assessments of microbiology and related parameters have been conducted at three sites in Kalispell, Montana. Groundwater samples were collected from selected monitoring wells and analyzed in the laboratory. Microcosms were also established to offer preliminary information for potential enhancement of in-situ biodegradation. Results demonstrate a diversity of anaerobic bacteria were present in the groundwater onsite. These microbial populations include denitrifying, iron-reducing, sulfate-reducing, fermenting, methanogenic and dechlorinating bacteria. Denitrifying bacteria appear to be the dominant species that is present in high populations in groundwater. *Dehalococcoides* sp. was detected in high numbers in groundwater collected from wells on the PCP-contaminated sites, indicating active dechlorination of PCP.

The enhancements to date applied to microcosms resulted in the increased growth of bacteria populations. Data suggest that denitrifying bacteria may be the most active population and responsible for a substantial amount of diesel biodegradation. This study suggests that *in situ* enhancement of denitrifying bacteria may increase the rate of diesel (and possibly other hydrocarbons) biodegradation at the Reliance Refinery Company site. However, further studies are warranted to obtain conclusive information in enhanced biodegradation and maximize denitrifying bacteria activity and the rates of hydrocarbon biodegradation.

INTRODUCTION

Petroleum hydrocarbon contamination in groundwater systems is a major environmental concern. Petroleum hydrocarbons include gasoline range organics, diesel range organics, other longer-chained aliphatic compounds, and polycyclic aromatic hydrocarbons (PAH). Enhanced biodegradation of petroleum hydrocarbons in groundwater is a cost-effective and environmentally friendly remediation technique. Both aerobic and anaerobic biodegradation of hydrocarbon compounds have been demonstrated during the last 10 to 15 years, and are gaining in interest due to the in-situ nature of the technique. Particularly, anaerobic biodegradation is appealing for treating contaminants in oxygen-depleted environments such as subsurface soil and groundwater.

Such anaerobic hydrocarbon-degrading microorganisms include denitrifying bacteria (Ball et al., 1996; Durant et al., 1995; Evans et al., 1991; Lei et al., 2005; Rabus and Widdel, 1995; Rueter et al., 1994), iron-reducing bacteria (Jahn et al., 2005; Lovley et al., 1995b, 1996; Lovley and Lonergan, 1990), sulfate-reducing bacteria (Aeckersberg et al., 1991, 1998; Caldwell et al., 1998; Cravo-Laureau et al., 2005; Lovley et al., 1995a; So and Young, 1999; Townsend et al., 2003), and methanogenic consortia (Anderson and Lovley, 2000; Kleikemper et al., 2005; Zengler et al., 1999). With adequate populations of these types of microorganisms and adequate nutrients, complete biodegradation of petroleum hydrocarbons in groundwater systems can occur.

Pentachlorophenol (PCP) and other phenolic compounds are another major group of organic contaminants found in groundwater systems. Phenolic compounds are often associated with petroleum refining, coking, coal conversion, and pulp-and-paper plants. PCP is commonly used in wood preservatives, pesticides, herbicides, and defoliants. Removal of PCP and other phenolic compounds can be achieved by either chemical or biological means and, where environmentally safe, bioremediation technologies are beginning to replace conventional methods.

In some studies, white rot fungi were used to oxidize PCP (Pointing, 2001; Walter et al., 2005a, 2005b), while other technologies utilize *Sphingomonas* species to degrade PCP (Cassidy et al., 1999; Crawford and Ederer, 1999). However, these processes are aerobic and would not proceed in anaerobic subsurface conditions.

Chemical oxidation is another process capable of degrading PCP (Tai and Jiang, 2005) and depending on the site condition, chemical oxidation may be used as an effective tool to eliminate high concentrations of these contaminants, leaving residual oxygen in the groundwater that may facilitate aerobic biodegradation (Johnston and Jin, 2005).

Anaerobic PCP biodegradation has also been observed under both sulfate-reducing and methanogenic conditions (Beudet et al., 1998; Chen et al., 2006; Guthrie et al., 1984; Jin and Bhattacharya, 1996; Kamashwaran and Crawford, 2001; Leven and Schnurer, 2005). Microbial reductive dechlorination is the predominant PCP-degradation process that occurs under anaerobic conditions and different microbial pathways can be utilized

in groundwater bioremediation if adequate microbial populations and optimal conditions are present.

Successful co-metabolic degradation of petroleum hydrocarbons and chlorinated organic compounds under anaerobic conditions has been demonstrated in previous studies by Western Research Institute (Jin et al., 2006). Based on this theory, it is possible to co-degrade petroleum hydrocarbons and PCP in groundwater because the by-products of petroleum hydrocarbon degradation provide substrate necessary to enhance biodegradation of PCP.

This project focuses on three sites located near Kalispell, MT, near local residences and the Stillwater River. Site 1 (Kalispell Pole and Timber) experienced spillage of PCP associated with diesel fuel, PAH, and dioxins/furans, all of which have contaminated the groundwater Site 2 (Reliance Refinery Company) experienced oil spillage during operations, resulting in petroleum hydrocarbon and some metal contamination of the underlying groundwater. PCP and PAHs have also been detected in the groundwater at this site, possibly from Site 1. The MDEQ-CECRA program has ranked this site as high priority. The groundwater at Site 3 (Yale Oil Corporation) has also been impacted by petroleum hydrocarbons, PAHs, and PCP. The MDEQ-CECRA program has ranked this site as medium priority.

No microbial data exists for these three sites, therefore, microbial enumeration and identification is necessary to determine if adequate populations exist to biodegrade the contaminants of concern.

OBJECTIVE

The objective of this study was to characterize (identify and enumerate) the microbial populations in the groundwater from representative locations and evaluate the feasibility of enhanced biodegradation of contaminants.

METHODS

Groundwater and Soil Sample Collection

Groundwater was collected from one up-gradient well and wells containing substantial contaminant levels based on the monitoring record provided by MTDEQ. The wells selected included GWY-3, GWY-10, GWY-13, GWRR-3, GWRR-4, GWRR-8, KPT-1, KPT-5, KPT-7, and KPT-16 (see location map in Appendix A). Groundwater was sampled by following a low-flow purging and sampling method. A water-interface probe was used to determine the depth of water table and the middle point of the screened interval from which groundwater was drawn with a peristaltic pump at 400 ml/min. Temperature, conductivity, and pH were measured at 3-min intervals until the readings stabilized and the values were within ±10% of each other, at which point water samples were collected. Anion and cation samples were collected from all monitoring wells into plastic bottles with minimal headspace and stored at 4°C. Dissolved metals samples were

collected from all monitoring wells, and filtered (0.45 μm filter) into plastic bottles preserved with HNO_3 (pH~2) and stored at 4°C. For organic constituents (including petroleum hydrocarbons), PCP, dioxins, and microorganisms, monitoring wells containing high elevated concentrations were selected from the Yale and Reliance site (GWY-10 and GWRR-3). All wells on the Kalispell Pole and Timber sites were sampled. These samples were collected into 5-gal plastic containers with minimal headspace. Determination of the corresponding parameters were to be representative of the conditions of microcosm preparation (i.e., containers will be opened in order to setup microcosms). Soil samples were also collected adjacent to the monitoring well locations GWY-10, GWRR-3, KPT-1, KPT-2, and KPT-16 at ~15 cm below ground surface.

Chemical Analysis

Microbial activities in groundwater are dominantly chemical reactions catalyzed by bacteria. Chemical parameters, including anionic and cationic constituents are closely associated with microbial pathways. Bacteria use elements such as nitrate, sulfate, and metals as electron acceptors to transfer electrons extracted from organic substrates, gaining energy and maintaining metabolic activities. Parameters such as nitrate, ammonium, phosphorus, sulfate, and others are important nutrients to bacteria. Organic carbon serves as the substrate for microbial metabolism. Soil parameters were also analyzed, since microcosms all contain soil to simulate sediment onsite. Laboratory analysis in this study included all these parameters.

The conductivity of water samples was measured in the field with an Orion® Thermo model 150 conductivity meter (ThermoElectron, Beverly, MA) calibrated with a 1417-μS/cm Traceable One-Shot™ conductivity standard. The pH of water samples was measured in the field with an Orion® Thermo model 720A+ pH meter equipped with an Orion® Ag/AgCl combination electrode calibrated with Orion® pH 4 and 7 buffers. The dissolved oxygen (DO) of water samples was measured in the laboratory using an YSI model 95 DO meter calibrated in the air. The total organic carbon (TOC) was analyzed on a Shimazdu TOC-5000A total organic carbon analyzer. Extractable petroleum hydrocarbons (EPH) and volatile petroleum hydrocarbons (VPH) were determined by following the January 1998 Massachusetts method (modified by the Montana Department of Environmental Quality). Pentachlorophenol (PCP) was analyzed by EPA Method 625/SW 8270C. Dioxin screening was conducted by PACE Laboratory by following EPA Method 1613B. Ammonium was determined colorimetrically by a Shimadzu UV Mini 1240 UV-vis spectrophotometer (Keeney and Nelson, 1982). Sulfide was determined colorimetrically by light spectroscopy according to EPA Method 376.2. Anions [chloride (Cl^-), fluoride (F^-), bromide (Br^-), nitrate (NO_3^-), phosphate (PO_4^{3-}), and sulfate (SO_4^{2-})] were analyzed on a DIONEX DX-100 ion chromatograph (IC) equipped with a 4-mm AS-14 anion exchange column (Dionex, Sunnyvale, CA). Cations (calcium (Ca), magnesium (Mg), potassium (K), and sodium (Na)) were analyzed on a flame atomic absorption spectrophotometer. Metalloids and metals (arsenic (As), selenium (Se), aluminum (Al), copper (Cu), manganese (Mn), nickel (Ni), and lead (Pb)) were analyzed by inductively coupled plasma-mass spectrometry (ICP-MS).

Soil samples were extracted with 1:1 mixture of soil and deionized water. The mixture was shaken for 24 h, centrifuged, and analyzed for Br^-, Cl^-, F^-, NO_3^-, PO_4^{3-}, and SO_4^{2-} by IC. Soil samples were also analyzed for bulk density (g/cm^3), water content, and total porosity. Finally, soil texture was determined with a standard soil chart and soil particle size was measured according to the method described by Gee and Bauder (1986).

Microbiological Analysis

Total bacteria enumeration was conducted by using acridine orange staining and a fluorescent microscope equipped with an oil lens and a micrometer eye-piece. Aerobic bacteria were enumerated according to the most probable number (MPN) method (APHA, 1998a; Cochran, 1950) using only the presumptive phase to determine all aerobes, because using other phases narrows the analysis to coliforms only. Denitrifying bacteria were enumerated by using the MPN method and the medium described by Tiedje (1982), iron-reducing bacteria (IRB) were enumerated by using the MPN method and the medium described by Gould et al. (2005), sulfate-reducing bacteria (SRB) were enumerated using the MPN method and the medium described by the American Public Health Association (APHA, 1998b).

Water samples (100 ml) were vacuum-filtered through 0.2-μm membrane filters (Fisher Scientific) and DNA was extracted from the biological material on the filters with an AquaPure Genomic DNA extraction kit (Bio-Rad, Hercules, CA) to isolate and enumerate *Dehalococcoides* sp. and methanogens. Real-time polymerase chain reaction (RT-PCR) analysis was used to identify and quantify *Dehalococcoides* sp. and methanogens. Specific DNA sequences (primers) were used to identify individual bacterial species, since these sequences have been identified specific and conservative to corresponding species. Universal small subunit (SSU) rDNA was used as a positive control for all bacteria and archaea in the groundwater. Based on literature reports, the nucleotide sequence that is universal to bacteria was used. The forward primer (U1F) was 5'TGACTGACTGAGTGCCAGCMGCCGCGG3', and the sequence for the reverse primer (U1R) was 5'TGACTGACTGAGGYTACCTTGTTACGACTT3' (Borneman et al., 1996; Lane, 1991). The nucleotide sequence used for the *Dehalococcoides* sp. forward primer (DHC1 forward) was 5'AAGGCGGTTTTCTAGGTTGTCAC3', and the reverse primer (DHC1 reverse) sequence was 5'CGTTTCGCGGGGCAGTCT3' (Loffler et al., 2000). The nucleotide sequence used for the methanogen forward primer (ME1 Forward) was 5' TAYGAYCARATHTGGYT3 and the sequence for the reverse primer (ME2 Reverse) was 5'ACRTTCATNGCRTARTT3' (Erkel et al., 2005; Springer et al., 1995).

Laboratory Microcosm Study

Microcosms study was initiated to determine the feasibility of enhanced biodegradation and which metabolic pathway(s) would dominate. Anaerobic microcosms were established in triplicate in 125-ml serum bottles using various nutrient and inhibitory amendments with groundwater from wells GWY-10 (Yale Oil Corporation), GWRR-3 (Reliance Refinery Company), KPT-1 and KPT-7 (Kalispell Pole and Timber;

Table 1). Groundwater sample collected from each monitoring well was decanted into each corresponding microcosm serum bottle containing no headspace. All microcosms were prepared in an anaerobic chamber (glove box) with N_2 atmosphere (O_2-free), under sterile conditions, at room temperature (~20°C), and stored in the dark. All nutrient amendment ratios and inhibitor amendment amounts remained constant for microcosms within corresponding groups. Amended microcosms were established to identify the feasibility of enhanced biodegradation; however, this study was not intended to determine the optimal microbial pathways or dosages of amendments. Ammonium chloride (Fisher Scientific, Fair Lawn, NJ) and potassium phosphate dibasic (Fisher Scientific) were used as sources of nitrogen and phosphorus. The nutrients were added based on a molar C:N:P ratio of 100:30:3. This ratio is commonly accepted in anaerobic bioremediation studies, and verified by other biodegradation studies at WRI. Carbon (C) concentration was based on the TOC concentration determined through baseline chemical characterizations (Table 2). Potassium nitrate (J.T. Baker, Phillipsburg, NJ) was also added to corresponding treatments based on the molar C:N ratio of 100:30. Sodium molybdate dihydrate (Mallinckrodt, Phillipsburg, NJ), which is an inhibitor of sulfate reduction (Oremland and Capone, 1988), was added to corresponding treatments at a molybdate concentration of 2.0 mM. 2-Bromoethanesulfonic acid sodium salt (2-BESA; Sigma-Aldrich, St. Louis, MO) was added to corresponding treatments at a concentration of 0.8 mM to inhibit methanogenesis (Oremland and Capone, 1988). Calcium carbide was added (CaC_2; Sigma-Aldrich) to corresponding treatments at a concentration of 2.0 mM to form acetylene (produced when CaC_2 reacts with water), which inhibits denitrification, sulfate reduction, and methanogenesis (Oremland and Capone, 1988). Microcosm serum bottles were sealed with a rubber septum and aluminum cap to ensure anaerobic conditions.

Microcosms, selected based on chemical characterization data, were spiked with #2 diesel fuel or PCP to determine the ability of the indigenous microbes in degrading hydrocarbons or PCP. The GWRR-3 microcosms were spiked with #2 diesel fuel to a concentration of 40.0 mg/l. The GWY-10 and KPT-7 microcosms were spiked with PCP to a concentration of 1.0 and 100.0 μg/l, respectively. Standard errors were calculated for microcosm triplicates.

RESULTS AND DISCUSSION

Baseline Chemical Analyses of Groundwater

Results from the groundwater baseline characterization are listed in Table 2. Per discussion with MTDEQ, one well sample from each zone was selected for the analyses. The selected wells were GWY-10, GWRR-3, KPT-1, KPT-5, KPT-7, and KPT-16. Samples from wells GWY-3, GWY-13, GWRR-4, GWRR-8 were not analyzed for EPH, VPH, PCP, dioxins, and aerobic, denitrifying, iron reducing, sulfate reducing, and fermenting bacteria. Dissolved oxygen in the groundwater was measured at <0.4 mg/L, showing the reduced condition. The pH of the groundwater samples ranged from 6.8 to 7.5, which is the favorable range that supports normal microbial activities. The electrical conductivity (EC) of the groundwater samples (EC < 2.6 dS/m) indicates the groundwater

in the region has relatively low salt concentrations, as in typical groundwater, which was also confirmed by low concentrations of Na, Ca, and Mg (< 53, <137, and <57 mg/L, respectively; Table 2). Nitrate concentrations were low (<1.5 mg/L) in groundwater samples except for GWY-3, which was 84.2 mg/L (Table 2). Depletion of nitrate suggests denitrification might have been the dominant microbial pathway at these locations; however, the current low concentration of nitrate may prevent denitrification to continue due to the lack of electron acceptor.

Total organic carbon and concentrations of EPH were the highest in groundwater collected from well GWRR-3 (89 and 3.5 mg/L, respectively, Table 2), indicating the location was the most contaminated area among the sites sampled. Concentrations of PCP, VPH, PO_4^{3-}, Br^-, and F^- were below instrument detection limits (IDLs; 10 and 20 μg/L and 0.1, 0.1, and 0.1 mg/L, respectively) in all samples analyzed. Dioxins were below IDL (0.2 μg/L) in all analyzed samples except KPT-1, which was 0.39 ng/L as the concentration detected and reported by PACE Analytical. It was pointed by MTDEQ that a BNSF ozonation system was in operation in the area, and KPT-1 is the most upgradient well sampled, the non-detection of dioxin in other samples might be attributed to ozone oxidation.

Although concentrations of PCP and PAH were below IDLs for most of the samples analyzed, these values do not necessarily reflect the actual concentrations of these contaminants in the field because we used sampling and handling techniques designed for analyses of non-volatile anions, cations, metals, and microbial consortia. The microcosms were spiked with PCP and benzene to simulate existing conditions in groundwater on site since the post-collection chemical characterization of our water samples had changed (i.e., volatilization of PCP and PAHs).

Baseline Microbial Analyses of Groundwater

Population densities of denitrifying bacteria in the analyzed samples were higher than the densities of iron and sulfate reducing bacteria and fermenting bacteria combined (Table 4), which indicates that denitrification was the dominant metabolic pathway in these wells. Furthermore, this suggests that denitrification may be the best pathway for biodegradation of petroleum hydrocarbons onsite if sufficient nitrate is supplied.

RT-PCR analyses of the selected groundwater samples indicated that methanogens were absent in all of the wells. However, populations of *Dehalococcoides* sp. were detected in groundwater samples collected from wells GWY-10, KPT-1, and KPT-7 (1358, 462, and 29 cells/ml, respectively). These wells are located in areas affected by chlorinated compounds such as PCP and dioxins. This result suggests that these chlorinated compounds may support *Dehalococcoides* sp. respiration and can be dechlorinated or other chlorinated compounds such as polychlorinated ethenes may have been present in the past. The detection was inconclusive for KPT-5 due to difficulties in DNA purification from the water in samples collected from this well. The absence of these species GWRR-3 may be due to the lack of chlorinated compounds affecting or have affected this area.

Based on WRI previous studies on petroleum impacted sites, an average total population reading in such impacted samples is usually in the 10x E5 cell/ml range. The population densities of bacteria in samples collected from the site under study appear to be relatively low. This may be attributed to the low water temperature during the time of sampling (early December), which ranged from 4 to 6°C. Although, these microorganisms may be adapted to low temperatures (even psychrophilic), most of the microbial growth still occurs under slightly warmer temperatures so microbial densities are probably higher during warmer seasons. In addition, the tendency of microbes to attach for growth may also contributed to the low readings of microbial populations in the water column.

Baseline Chemical and Physical Analyses of Soil

Soil textures ranged from sandy loams to loams with high porosities (Table 3). Porous, low clay soils tend to be more susceptible to leaching, which is important in considering transport of contaminants into groundwater. Nitrate and sulfate concentrations were significantly higher in the soil nearby the location of monitoring well KPT-16 (100.771 and 106.263 mg/kg, respectively) than in other soil samples and the groundwater.

Microbial Analyses of Enhancements

Total bacterial enumeration of each treatment for each selected well after 125 days is represented in Figure 1, where

BL = baseline number at zero days
C1 = no nutrient or inhibitor amendments
C2 = sterile groundwater amended with ammonium and phosphate
E1 = amended with ammonium and phosphate
E2 = amended with molybdate
E3 = amended with ammonium, phosphate, and molybdate
E4 = amended with ammonium, phosphate, molybdate, and 2-BESA
E5 = amended with nitrate
E6 = amended with nitrate and phosphate
E7 = amended with nitrate and acetylene
E8 = amended with nitrate, phosphate, and acetylene

The total bacteria numbers in all C2 treatments for each well were below their respective BL. Similarly the numbers in C1 for GWY-10 (Figure 1a) and GWRR-3 (Figure 1b) were lower than their respective BL; however, the numbers in C1 for KPT-1 (Figure 1c) and KPT-7 (Figure 1d) were higher than their respective BL. This may indicate that the bacteria in KPT-1 and KPT-7 may prefer the higher temperature (~20°C) during the incubation in the laboratory. Total bacteria numbers for E7 and E8 were either

below BL or C1 for each well, this being due to acetylene inhibiting most bacterial growth.

In the GWY-10 treatments, the addition of ammonium and phosphate (E1) had the largest effect on increasing growth rate of bacteria. No marked improvement was observed for the other treatments. Since treatments that were applied to enhance denitrifying activity had no effect on growth despite GWY-10 having the largest baseline population of denitrifying bacteria among the wells and addition of nutrients without molybdate enhanced bacterial growth, it is likely that SRB are contributing to the bacterial population growth based on the adequate sulfate in the groundwater and the reducing condition onsite. Another possibility would be growth of *Dehalococcoides* sp. since PCP may possibly being used as an electron acceptor in this groundwater. Microbial species identification will verify our hypothesis; however, such study is beyond the main goal of this study. The funding availability prevented the microbial assay in these enhancement microcosms.

The E4 treatment had the most substantial effect in increasing bacterial populations in microcosms containing GWRR-3 groundwater. Also substantially high were microcosms containing E3 and E6 treatments. Both E4 and E3 treatments inhibited sulfate-reduction, suggesting denitrifying bacteria as the dominant growth which is shown in Figure 2. This is further supported by the growth observed from the treatment that had added nitrate and phosphate (E6) which had the highest increase in denitrifying bacteria population. Denitrification is known to be the dominant metabolic pathway in biodegrading hydrocarbons which are found in diesel for certain groundwater locations.

The addition of molybdate alone (E2) resulted in the highest increase in bacterial populations for the microcosms containing the KPT-1 groundwater, while treatment E4 resulted in the only other treatment to result in a marked increase in bacterial population. The bacterial group types cannot be determined indirectly from this information since SRB cannot grow in the presence of molybdate and no SRB was observed in the baseline analysis, and no marked increase was observed from treatments that promote denitrifying bacteria activity. Also no IRB, fermenters, and methanogens were present in the baseline analyses. The only possibility based on the baseline analysis would be *Dehalococcoides* sp., possibly due to chlorinated compounds that were present below detection limit in the groundwater in these microcosms. Denitrifying activity was high based on the results of treatments E4 and E6 for KPT-7 groundwater microcosms. The trend in bacteria density in groundwater collected from KPT-7 was similar to the trend in GWRR-3 samples. It is possible that similar compositions (not population density) of bacteria are found at both locations since both locations are situated in petroleum hydrocarbon-contaminated area. The population of bacteria may be less due to the ozone treatment in KPT-7 area, which releases radicals that are toxic/inhibitory to microorganisms. This also indicates that PCP may have little effect on microbial populations in the areas of petroleum hydrocarbon contamination.

DRO Analysis of Enhancements

Diesel range organics (DRO) concentrations in the GWRR-3 microcosms were monitored in the enhancement microcosms. Results show biodegradation of diesel occurred during 152 days of incubation (Figure 3; see section above to decipher treatment identifications). Treatments E3, E4, E5, and E6 all yielded significant decline in DRO concentrations (10.10 – 11.75 mg/l), showing the enhanced DRO degradation at rates ranging 0.07 – 0.08 mg/l/day. These enhancement microcosms also contained the highest total and denitrifying bacteria populations, which indicate the successful enhancement of diesel biodegradation through the stimulation of denitrification pathway.

CONCLUSIONS

Analysis of the baseline microbiology of groundwater collected from all of the monitoring wells demonstrates the existence of a diversity of anaerobic bacteria, including denitrifying, iron-reducing, sulfate-reducing, fermenting, methanogenic and dechlorinating bacteria. Denitrifying bacteria appear to be the dominant species that is present in high populations in groundwater collected for analysis. *Dehalococcoides* sp. was detected in groundwater collected from wells on the PCP-contaminated sites (GWY-10 and KPT-1), indicating possible active dechlorination of PCP. The goal of profiling microbial populations in the groundwater onsite has been achieved.

In addition, the feasibility study of enhanced biodegradation offered some insightful information that may be helpful for future remediation. The enhancements applied to microcosms resulted in the increased growth of bacteria populations. The GWRR-3 enhancement treatments indicate that denitrifying bacteria may be the most active population and responsible for a substantial amount of diesel biodegradation. This study suggests that *in situ* enhancement of denitrifying bacteria may increase the rate of diesel (and possibly other hydrocarbons) biodegradation at the Reliance Refinery Company site. In samples collected, nitrate was below detection limit (0.100 mg/l), showing a possible depletion of electron acceptor for denitrifying bacteria. This was confirmed by the resumed and enhanced denitrifying activities and the consequent degradation of diesel in the enhancement microcosms. Again, this study was designed to determine microbial profiles in the indigenous groundwater and in-depth study on enhancement feasibility was not performed due to funding limitations. Further studies are warranted to optimize the enhancement and maximize denitrifying bacteria activity and the rates of hydrocarbon biodegradation. Based on the data gathered to date, it appears that denitrification is a preferred microbial pathway to be enhanced to degrade the constituents of concerns onsite.

Determining how oxidation by ozone would affect the microorganisms in the water was not investigated in this study. At the Kalispell Pole and Timber site, ozone was injected into the groundwater. Ozone can destroy bacterial cell walls which would decrease microbial populations. Ozone generates radicals that are toxic to microbes. In addition, residual oxygen from the ozone application is also inhibitory to anaerobic microorganisms. Ozone injection may be useful for areas impacted with high concentrations of contaminants but it may have detrimental effects on the ubiquitously existing anaerobic microorganism populations, which are expected to play a key role in

the long term natural attenuation. Caution should be taken in the dosage and operational period of ozone injection in the oxygen-depleted, anaerobic groundwater.

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Table 1. Amendments and inhibitory chemicals added to each treatment in the microcosm experiment using groundwater collected from wells in areas contaminated with various petroleum hydrocarbons near Kalispell, Montana.

Treatment	Amendments[a]	Inhibitors[b]
Control 1	---[c]	---
Control 2[d]	N, P	---
1	N, P	---
2	---	Molybdate
3	N, P	Molybdate
4	N, P	Molybdate, 2-BESA
5	NO_3	---
6	NO_3, P	---
7	NO_3	Acetylene
8	NO_3, P	Acetylene

[a] N from ammonium chloride, P from potassium phosphate dibasic, and NO_3 from potassium nitrate.
[b] Molybdate inhibits sulfate reduction, 2-BESA inhibits methanogenesis, and acetylene inhibits denitrification, sulfate reduction, and methanogenesis.
[c] --- No addition.
[d] Sterile control.

Table 2. Various baseline water quality parameters in groundwater samples collected from monitoring wells at contaminated sites near Kalispell, Montana, December, 2005. GWY:Yale Oil Corporation, GWRR: Reliance Refinery Company, KPT: Kalispell Pole and Timber.

	Monitoring Wells									
Parameter	GWY-3	GWY-10	GWY-13	GWRR-3	GWRR-4	GWRR-8	KPT-1	KPT-5	KPT-7	KPT-16
pH	7.51	7.17	7.15	6.79	7.22	7.28	7.26	7.04	7.02	7.12
Temp. (^{o}C)	7.2	5.6	6.0	6.1	5.8	6.2	6.0	5.5	5.5	5.5
EC (dS/m)	2.09	0.95	1.02	2.58	1.90	0.97	0.80	0.92	0.98	0.95
					mg/L					
DO	0.25	0.31	0.25	0.32	0.27	0.26	0.34	0.35	0.35	0.37
TOC	16.3	2.1	4.9	89.1	4.7	0.9	0.3	1.8	0.5	1.0
NO_3^-	84.2	BDL[a]	BDL	BDL	1.0	1.0	1.4	BDL	BDL	0.7
S^{2-}	0.05	0.02	0.03	0.11	0.02	0.02	0.04	0.07	0.03	0.02
SO_4^{2-}	25.2	6.1	2.0	104.1	58.0	2.8	2.4	2.3	5.1	2.8
Cl^-	11.0	304	4.4	6.0	23.3	1.7	1.4	1.3	1.3	1.4
NH_4^+	0.34	0.26	0.50	2.36	0.28	0.20	0.23	0.25	0.26	0.20
Ca	90.6	64.1	74.8	136.8	104.3	73.1	56.3	67.5	71.0	73.8
Fe	0.4	0.9	1.7	12.8	0.6	0.4	0.4	0.5	0.3	0.7

Table 2 (continued)

Parameter	Monitoring Wells									
	GWY-3	GWY-10	GWY-13	GWRR-3	GWRR-4	GWRR-8	KPT-1	KPT-5	KPT-7	KPT-16
	mg/L									
K	38.9	1.4	2.0	1.8	1.9	1.9	1.2	1.0	1.2	1.1
Mg	48.4	13.3	11.6	56.7	46.4	12.7	11.0	12.4	13.4	13.0
Na	18.6	5.6	5.8	52.7	19.6	3.8	4.2	3.6	3.8	3.7
	µg/L									
As	0.3	2.7	9.2	35.8	BDL	BDL	BDL	0.5	BDL	0.4
Se	1.9	BDL	0.2	BDL	0.3	BDL	BDL	0.3	BDL	BDL
Al	10.7	66.6	16.0	38.5	44.5	32.8	79.6	76.9	13.5	279.1
Cu	6.3	12.0	4.5	3.6	1.3	1.0	3.7	2.6	1.1	3.3
Mn	1.2	505.2	1645.4	726.4	4.0	1.6	12.3	407.4	1749.9	34.8
Ni	3.7	4.3	3.5	4.6	3.5	2.7	3.3	2.9	2.6	3.6
Pb	2.3	3.8	2.5	1.3	2.2	1.5	22.4	20.7	1.5	16.9
EPH[b]	---[c]	BDL	---	3,500	---	---	BDL	730	BDL	BDL

[a]Below detection limit, [b]Extractable petroleum hydrocarbons, [c]---not analyzed.

Table 3. Various baseline soil characterization parameters of samples collected near monitoring wells at contaminated sites near Kalispell, Montana, December 2005. GWY:Yale Oil Corporation, GWRR: Reliance Refinery Company, KPT: Kalispell Pole and Timber.

	Monitoring Wells					
Parameter	GWY-10	GWRR-3	KPT-1	KPT-5	KPT-7	KPT-16
Bulk density (g/cm^3)	1.02	1.79	1.20	1.21	1.23	1.22
Water content (v/v)	---[a]	0.0093	0.0086	0.0064	0.0050	0.0079
Total Porosity	0.616	0.324	0.546	0.545	0.537	0.540
Texture	---	silt loam	silt loam/ loam	loam	silt loam	loam
			%			
Sand	---	32	40	50	30	45
Silt	---	61	50	40	60	43
Clay	---	7	10	10	10	10
			mg/kg			
Cl^-	1.25	2.15	2.82	2.00	3.58	18.12
F^-	0.78	0.70	0.37	0.18	0.30	0.24
NO_3^-	0.70	1.37	3.23	2.92	5.79	100.78
SO_4^{2-}	15.12	3.17	10.42	5.10	0.92	106.26

[a]--- not analyzed.

Table 4. Microbial populations in groundwater samples collected from monitoring wells at contaminated sites near Kalispell, Montana, December 2005. GWY:Yale Oil Corporation, GWRR: Reliance Refinery Company, KPT: Kalispell Pole and Timber.

	Monitoring Wells									
Parameter	GWY-3	GWY-10	GWY-13	GWRR-3	GWRR-4	GWRR-8	KPT-1	KPT-5	KPT-7	KPT-16
				cells/ml						
Total bacteria	109,322	19,935	26,366	54,661	7,074	10,289	1,929	1,286	28,938	7,074
Aerobes	---[a]	0	---	5	---	---	0	0	0	0
Denitrifiers	---	1,100	---	350	---	---	18	1,300	222	333
Iron reducing	---	9	---	35	---	---	0	1	7	28
Sulfate reducing	---	3	---	11	---	---	0	13	0	5
Fermentors	---	0	---	3	---	---	0	1	2	8
Methanogens	---	0	---	0	---	---	0	0	0	0
Dehalococcoides sp.	---	1,358	---	0	---	---	462	INC	29	0

[a]--- not analyzed
INC = inconclusive (possible interference in DNA analysis)

Figure 1. Total Bacteria Enumeration of Microcosms after 125 days (except baseline—BL), Groundwater Collected from Monitoring Well (a) GWY-10, (b) GWRR-3, (c) KPT-1, and (d) KPT-7.

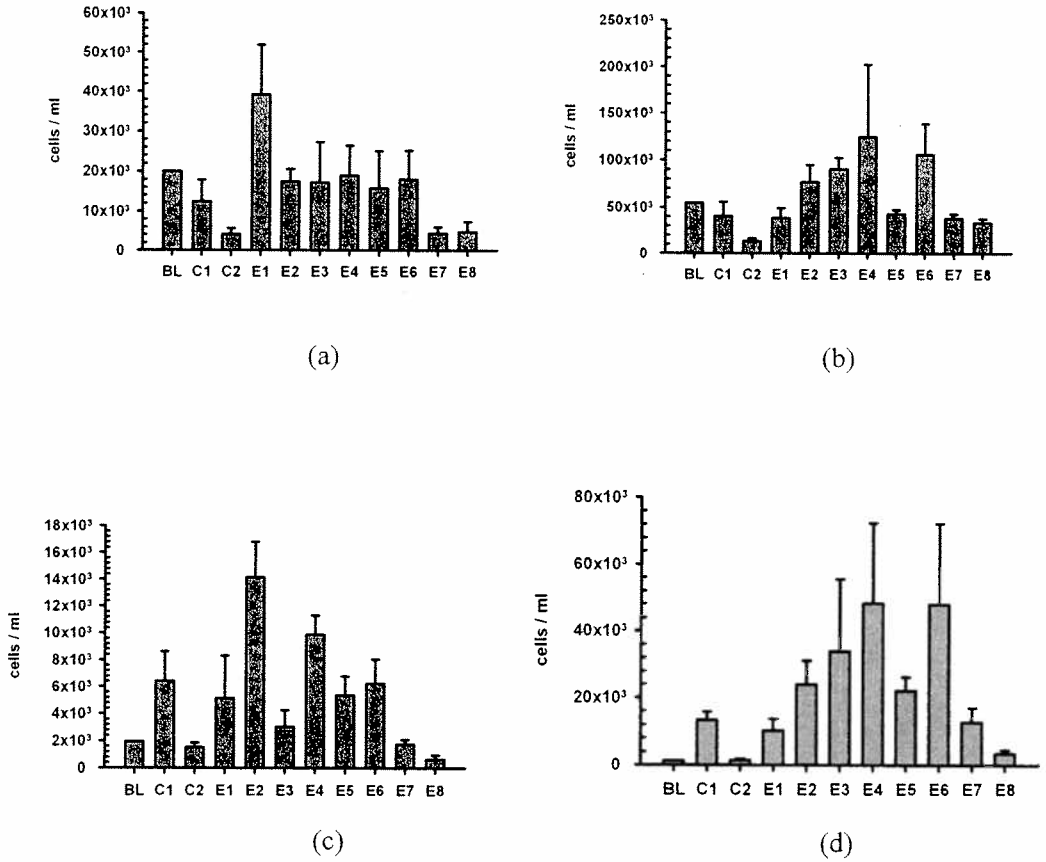


Figure 2. Denitrifying Bacteria MPN in Microcosms Containing Groundwater Collected from Monitoring Well GWRR-3 (152-d incubation)

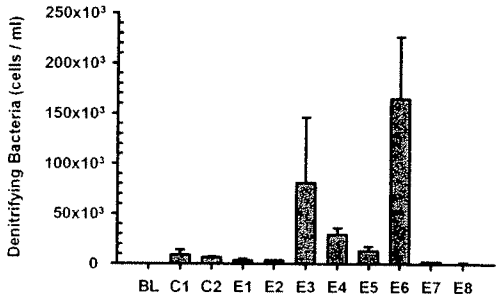
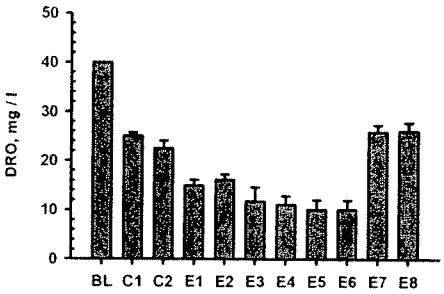


Figure 3. DRO Concentrations in Microcosms Containing Groundwater Collected from Monitoring Well GWRR-3 (152-d incubation)



APPENDIX A
Site Maps (Provided by MT DEQ)

APPENDIX B
Field Measurements

Co-Sponsor: Montana Department of Environmental Quality
Location: Kalispell, MT
Sites: Kalispell Pole and Timber, Reliance, and Yale Oil
Media: Ground Water
Contaminants: Petroleum Hydrocarbons, Pentachlorophenol (PCP), and Dioxins

GW = Groundwater
Y = Yale Oil Well
R = Reliance Well
KPT = Kalispell Pole and Timber Well

Date	Time	Well	Depth to Water, ft	Total Depth, ft	Water Flow, m/min	Temperature, °C	EC, µS	pH
12/8/2005	9:10 AM	GWY-3	16.75	28.60	400	6.2	1080	6.86
						7.7	1076	6.84
						7.6	1079	6.88
12/8/2005	10:00 AM	GWY-13	18.35	29.64	400	5.3	444	6.35
						6.7	518	6.63
						6.1	525	6.61
12/8/2005		**GWY-10**	**19.60**	**30.40**	**400**	**4.5**	**480**	
						6.1	**475**	**7.10**
						6.3	**465**	**7.10**
12/8/2005	11:30 AM	GWRR-4	14.00	16.92	400	4.7	416	7.08
						5.2	961	6.96
						6.4	986	6.96
						6.7	968	6.97
12/8/2005	**12:20 PM**	**GWRR-3**	**11.80**	**20.25**	**400**	**5.3**	**1492**	
						6.5	**1464**	**6.88**
						6.4	**1476**	**6.91**
12/8/2005	1:09 PM	GWRR-8	23.73	34.14	350	6.2	493	7.18
						6.2	488	7.11
12/8/2005	**2:15 PM**	**KPT-5**	**21.54**	**25.90**	**400**	**4.3**	**467**	**7.18**
						5.5	**392**	**7.12**
						5.9	**461**	**7.14**
						6.2	**462**	**7.13**
12/8/2005	**3:15 PM**	**KPT-7**	**18.90**	**29.04**	**400**	**5.1**	**516**	**7.22**
						5.8	**512**	**7.14**
						5.5	**509**	**7.12**
12/8/2005	**4:10 PM**	**KPT-1**	**20.46**	**31.22**	**400**	**5.1**	**410**	**7.33**
						5.6	**340**	**7.27**
						6.8	**407**	**7.25**
						6.6	**405**	**7.25**
12/8/2005	**5:00 PM**	**KPT-16**	**215.15**	**29.5**	**400**	**4.5**	**481**	**7.23**
						5.7	**487**	**7.14**
						6.2	**484**	**7.13**

APPENDIX C
Analytical Results (our own data and Energy, PACE data)

Total Bacteria Enumeration (cells/ml) for Each Microcosm Treatment of Each Groundwater

(Note: Correction factor for the micrometer eye-piece is 6430.72)

GWY-10

											MEAN
E1-1	3	1	2	0	1	2	3	1	0	0	1
E1-2	9	7	8	7	5	12	15	7	6	4	8
E1-3	10	8	7	8	7	16	10	7	8	9	9
E2-1	3	2	1	4	2	3	1	4	0	2	2
E2-2	3	0	2	1	0	5	3	2	1	3	2
E2-3	5	4	8	4	5	2	3	3	2	3	4
E3-1	2	1	0	0	0	1	2	3	0	1	1
E3-2	0	0	0	0	1	2	0	1	0	1	1
E3-3	9	3	6	1	6	7	9	7	8	9	7
E4-1	4	0	2	0	0	0	0	1	0	0	1
E4-2	2	2	2	3	4	2	1	4	3	2	3
E4-3	3	7	3	13	9	7	6	2	4	2	6
E5-1	5	5	3	4	10	8	3	10	7	5	6
E5-2	4	0	2	0	0	0	0	1	0	0	1
E5-3	0	0	0	2	0	1	0	2	1	0	1
E6-1	3	2	4	5	2	1	3	4	6	4	3
E6-2	3	5	4	6	10	2	1	6	5	6	5
E6-3	0	0	0	1	0	0	1	0	0	0	0
E7-1	2	0	1	0	0	0	0	0	3	1	1
E7-2	0	6	1	0	0	1	2	0	2	0	1
E7-3	0	0	0	0	1	0	0	0	0	0	0
E8-1	0	0	0	0	0	0	0	0	0	0	0
E8-2	0	1	0	0	0	0	3	0	1	0	1
E8-3	0	4	6	0	1	3	0	1	2	0	2
C1-1	2	0	1	0	1	0	2	1	3	1	1
C1-2	1	3	5	8	2	4	5	0	3	7	4
C1-3	1	0	1	0	1	2	0	0	0	0	1
C2-1	0	0	1	0	0	0	1	0	0	0	0
C2-2	0	0	0	0	0	0	0	5	0	0	1
C2-3	2	0	2	1	2	1	0	2	0	2	1

GWRR-3

											MEAN
E1-1	25	0	7	13	8	12	9	5	5	15	10
E1-2	8	3	2	5	6	4	3	5	0	10	5
E1-3	4	3	5	3	2	1	1	4	5	6	3
E2-1	24	11	16	18	23	30	17	12	19	16	19
E2-2	4	5	4	6	8	5	10	10	12	8	7
E2-3	13	12	12	8	7	12	12	8	9	8	10
E3-1	20	20	18	23	9	12	18	24	22	17	18
E3-2	10	11	13	10	15	5	7	10	11	11	10
E3-3	10	7	5	13	8	18	19	17	26	12	14
E4-1	2	0	1	3	4	5	0	2	2	1	2
E4-2	43	60	55	49	45	62	50	51	33	39	49
E4-3	6	7	10	6	8	6	7	8	6	11	8
E5-1	7	6	8	6	7	8	2	0	4	3	5
E5-2	14	12	8	6	5	6	8	9	7	7	8
E5-3	6	7	5	7	2	3	10	12	8	6	7
E6-1	20	28	41	17	22	13	24	12	28	22	23
E6-2	20	28	41	17	22	13	24	12	28	22	23
E6-3	8	1	3	5	4	1	2	8	6	1	4
E7-1	3	10	7	4	5	4	1	5	9	1	5
E7-2	6	7	5	10	6	3	4	7	3	3	5
E7-3	6	9	8	12	6	8	3	7	11	6	8
E8-1	1	6	7	6	1	5	2	3	1	4	4
E8-2	7	2	0	11	12	9	10	2	1	4	6
E8-3	9	8	3	7	5	7	8	7	4	5	6
C1-1	6	8	7	5	7	21	12	10	7	8	9
C1-2	0	1	1	0	0	0	0	1	1	0	0
C1-3	18	5	6	12	12	8	5	13	10	4	9
C2-1	2	3	2	1	9	3	3	2	2	4	3
C2-2	1	1	1	1	0	2	2	1	2	2	1
C2-3	4	0	1	1	1	2	2	3	3	1	2

KPT-1

											MEAN
E1-1	1	0	0	0	0	0	0	0	0	1	0
E1-2	1	0	0	0	0	0	1	0	0	0	0
E1-3	1	0	2	4	1	0	0	8	1	3	2
E2-1	4	2	1	0	2	0	2	5	1	1	2
E2-2	4	0	1	4	3	5	6	2	4	3	3
E2-3	2	1	0	1	1	0	6	0	3	2	2
E3-1	0	0	2	1	3	0	1	0	1	1	1
E3-2	0	0	0	0	0	1	0	0	0	0	0
E3-3	0	0	0	1	0	0	1	2	0	0	0
E4-1	5	0	2	3	2	0	1	2	2	0	2
E4-2	3	0	1	2	1	2	4	2	3	1	2
E4-3	2	1	0	1	2	2	0	0	0	2	1
E5-1	0	1	2	3	0	2	0	2	0	1	1
E5-2	0	1	1	0	0	0	1	0	0	0	0
E5-3	2	1	0	1	0	1	3	1	2	0	1
E6-1	0	2	0	0	0	0	0	1	0	1	0
E6-2	1	2	2	4	0	1	1	1	3	1	2
E6-3	2	0	0	0	0	3	2	0	0	2	1
E7-1	1	0	0	0	0	0	0	1	0	0	0
E7-2	1	0	0	0	1	0	0	0	0	0	0
E7-3	2	1	0	0	0	0	1	0	0	0	0
E8-1	0	0	0	0	0	1	0	0	0	0	0
E8-2	0	0	0	0	0	0	0	0	0	0	0
E8-3	0	0	1	0	0	0	0	1	0	0	0
C1-1	2	0	1	0	1	1	0	0	5	2	1
C1-2	0	0	1	2	1	2	0	0	0	10	2
C1-3	0	0	0	0	1	0	0	0	1	0	0
C2-1	0	0	0	0	1	0	0	2	0	0	0
C2-2	0	0	1	0	1	1	0	0	0	0	0
C2-3	0	0	0	0	0	1	0	0	0	0	0

KPT-7

											MEAN
E1-1	0	1	0	1	0	2	0	2	1	1	1
E1-2	2	1	3	4	5	2	4	5	1	2	3
E1-3	5	0	2	0	0	1	2	1	0	0	1
E2-1	4	5	4	6	3	6	5	7	7	9	6
E2-2	0	1	1	0	6	2	0	0	0	1	1
E2-3	5	3	4	2	5	7	4	3	8	4	5
E3-1	0	1	0	2	1	0	0	0	0	0	0
E3-2	11	14	16	11	17	20	13	13	14	6	14
E3-3	6	3	2	1	0	0	2	1	3	1	2
E4-1	8	4	5	7	4	2	4	5	8	3	5
E4-2	21	16	14	15	21	10	12	15	23	17	16
E4-3	2	1	0	3	2	1	2	0	1	0	1
E5-1	7	5	3	2	1	4	5	4	3	2	4
E5-2	4	6	2	4	2	4	3	5	7	10	5
E5-3	3	1	2	0	2	1	2	2	5	2	2
E6-1	1	0	2	1	3	0	1	0	1	2	1
E6-2	21	16	14	15	21	10	12	15	23	17	16
E6-3	10	7	4	2	1	6	6	8	3	2	5
E7-1	0	0	1	0	0	2	0	0	1	0	0
E7-2	14	0	2	8	0	0	0	0	0	0	2
E7-3	24	2	1	0	1	0	1	0	1	1	3
E8-1	0	1	0	0	0	0	1	0	0	0	0
E8-2	1	0	2	1	0	1	2	1	0	1	1
E8-3	3	0	0	0	0	0	0	1	0	1	1
C1-1	1	0	1	1	2	9	2	3	2	1	2
C1-2	4	8	5	2	1	0	2	3	2	1	3
C1-3	0	0	1	0	2	3	2	1	1	2	1
C2-1	1	0	0	1	0	0	0	3	0	0	1
C2-2	1	0	0	0	0	1	0	1	0	0	0
C2-3	1	0	0	1	0	0	0	0	1	0	0

Most Probable Number Analysis (MPN) of Denitrifying Bacteria in GWRR-3 Microcosms

Treatment	MPN (cells/ml)
E1-1	2300
E1-2	910
E1-3	7500
E2-1	3500
E2-2	3500
E2-3	3500
E3-1	2300
E3-2	240000
E3-3	1100
E4-1	21000
E4-2	46000
E4-3	21000
E5-1	15000
E5-2	21000
E5-3	3500
E6-1	240000
E6-2	240000
E6-3	15000
E7-1	2300
E7-2	1500
E7-3	2300
E8-1	360
E8-2	360
E8-3	2300
C1-1	2300
C1-2	3500
C1-3	21000
C2-1	4300
C2-2	7500
C2-3	7500

Diesel Range Organics Analysis of GWRR-3 Microcosms

Treatment	DRO (mg/l)
E1-1	16.40
E1-2	16.40
E1-3	12.00
E2-1	16.20
E2-2	18.40
E2-3	13.80
E3-1	15.70
E3-2	19.70
E3-3	7.80
E4-1	6.80
E4-2	13.20
E4-3	13.20
E5-1	13.40
E5-2	5.60
E5-3	11.40
E6-1	10.90
E6-2	5.70
E6-3	13.70
E7-1	22.60
E7-2	26.90
E7-3	28.20
E8-1	25.70
E8-2	22.60
E8-3	29.90
C1-1	26.00
C1-2	23.40
C1-3	25.70
C2-1	20.00
C2-2	21.20
C2-3	26.20

APPENDIX D

Example Sample Calculations

Molar C:N:P = 100:30:3
Well: GWRR-3
TOC = 89.1 mg/l
NH_4 = 2.36 mg/l
Nitrate is below detection, so assume zero when doing this calculation
No P detected
125-ml serum bottles with actual capacity of 150 ml (use 150 ml in calculation)

(89.1 mg C / L)(1 mmol C / 12 mg C)(30 mmol N / 100 mmol C) = 2.2275 mmol N / L required

(2.36 mg NH_4 / L)(1 mmol / 18.042 mg NH_4)(1 mmol N / mmol NH_4) = 0.1308 mmol N / L present

Need to add: 2.2275 – 0.1308 = 2.0967 mmol N/L to each serum bottle

Add: (2.0967 mmol N / L)(1 mmol NH_4Cl / mmol N)(53.492 mg NH_4Cl / mmol NH_4Cl)
×(0.150 L)
= 16.83 mg NH_4Cl to each serum bottle

Add:
(89.1 mg C / L)(1 mmol C / 12 mg C)(3 mmol P / 100 mmol C)(1 mmol KH_2PO_4 / 1 mmol P)
×(136.086 mg KH_2PO_4 / 1 mmol KH_2PO_4)(0.150 L) = 4.55 mg KH_2PO_4 to each serum bottle

These amounts are very small for accurate measurements, so add 1 ml of a concentrated solution. To get correct concentration use formula: $C_1V_1 = C_2V_2$

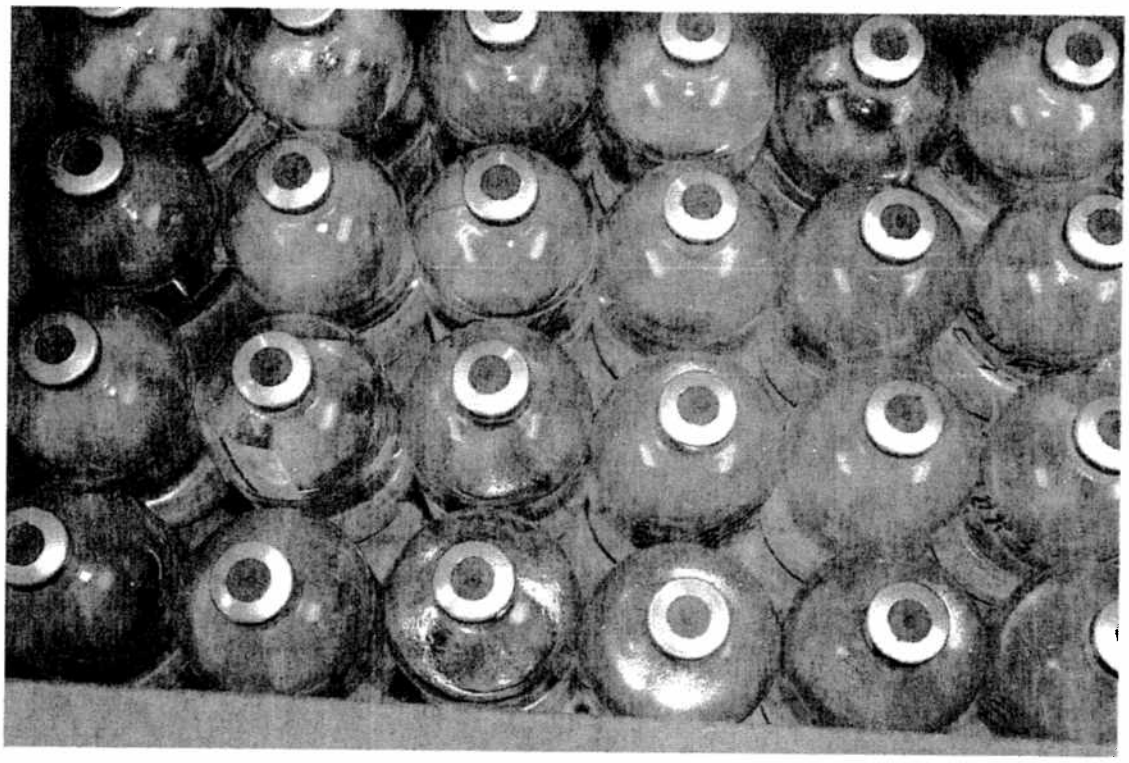
C_1(0.001 L) = (16.83 mg NH_4Cl / 0.150 L)(0.150 L)

C_1 = 16.83/0.001 = 16,830 mg NH_4Cl / L

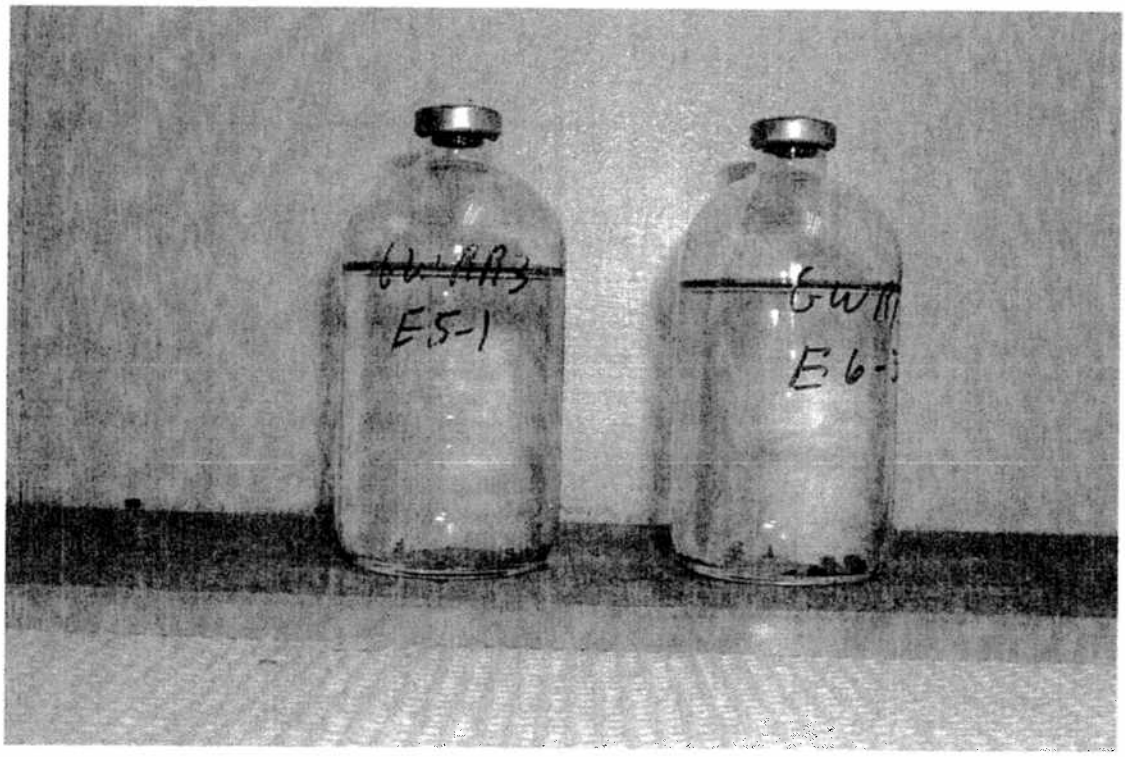
APPENDIX E

Photographs

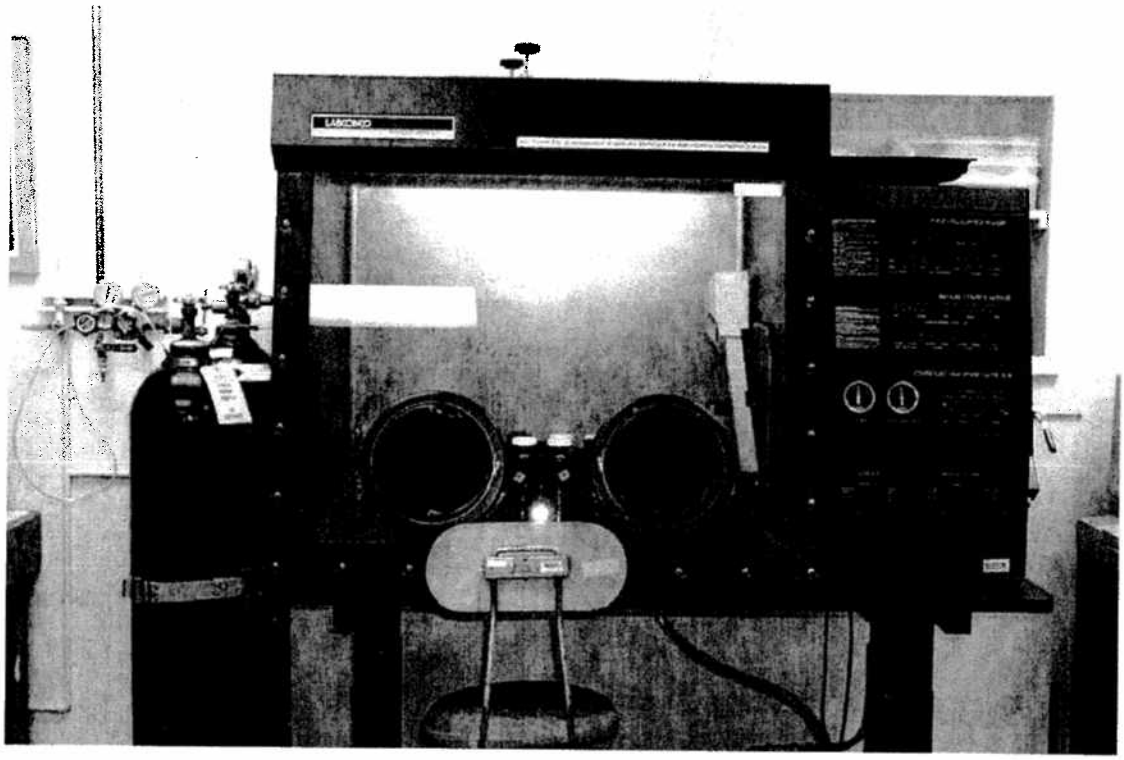
Photograph 1. Top view of some of the microcosms



Photograph 2. Side view of two microcosms



Photograph 3. Anaerobic glove box



APPENDIX B

FIELD LOGS

April 18, 2006 →

FIELD Coordinator

"Rite in the Rain"®
ALL-WEATHER
FIELD
No. 350

KRY-LOGBOOK 1

Kalispell Pole + Timber,
Reliance, + Yale Oil
facilities
Kalispell, MT
FIELD ACTIVITIES

(60)

~~4/18/06~~ 4/17/06

Randy L. & Dave D.

left Helena about 12:30. Picked up remaining coolers at Energy Labs.

Arrived in KRY site at 3:30. unload equipment & organize trailer & equipment.

HSA rig arrived ~ 12:00 & unloaded equipment

Sonic rig arrived ~ 9 pm & unloaded next day.

TetraTech personnel

Randy, Jessica, Joe Geoff Dave
Laskowski Allewalt Faubion Nimsfeldt Dorothy

- meet at 8 PM in room to talk over logistics

4/18/06

TetraTech: D. Donohue J. Faubion G. Nimsfeldt
J. Allsmalt R. Laskowski

4/18/06 Mostly clear; ~ 20°F

7:00 A Meet drillers in Breakfast Room
Discuss logistics for site & drilling times.
They will be onsite @ 6:30 AM & start drilling by 7:00 AM
Drill from 7 AM to 7 PM

8:00 A Drillers & TetraTech on site & begin unloading, prep & setup.
Drillers run errands

~9 AM semi with 300 55 gal drums arrive - unload by hand

Continue to prepare equipment for drilling.

11 AM NW Energy personnel (Tim) arrives & looks over well locations along gas pipeline
Requested we wait until 9:30 Friday to drill MW 123 & SB 607 so they can be ~~on sight~~ onsite.

Joe & Geoff continue to work on site setup; Jessica worked on sample supply organization; Randy & I picked up monitoring, safety, & decon supplies.

Drillers setting up on locations to start
HSA on KRY 610
Jesse Cannon - Driller
Will McDonald
Kyle Pemberton

Sonic on KRY 114 - start at ~2:15 p
Nate Mooney ~~- Driller~~
Russ Gomez
Nathan Jackson - Driller

5:50 checked out new location for KRY 115 w/ Moriah. Looks ok - Joe says cleared

Brian Goodman (MDT) stopped by to say hi (on his way to ~~Kalispel~~ Libby for work.

6:10 PM Brian Goodman left site

6:30 pm HSA rig met refusal after Moving twice at loc. 610 & 611. Last try at 611 encountered metal debris & boulders at < 3' bgs.
- end for day & will move north of RR Tracks tomorrow

7:10 left site

D Donahue 4/14/06

4/19/06
on site @ 7 AM D. Donahue; R. Laskowski; J. Allewalt; J. Faubion; G. Ninefeldt
Sunny / crisp morning ~ 30° F

- hold tailgate H&S meeting & discuss any concerns & monitoring & today's plan.

Plan for Today
- Sonic rig - complete KRY-114 & then start at wells on gravel pit
- HSA move to Swank property to start SB since having difficulties on Reliance Property

RETEC personnel on-site completing gw sampling / monitoring (Nancy Gilland) [Do not know when left since did not stop at trailer]

Monitoring well supplies - all new PVC screen & risers, per spec, & factory sealed in plastic.

~~Met~~ DD Met Met Gary at McElroy & Wilkins & discussed access. He gave me a key

to access gate at eastern end of property. Move KRY121 inside ~~gated~~ OO fenced area. will install 3 wells at that location.

Sonic rig completed drilling & installed well ~ 4 pm.

Decon rig & tools at decon pad & then moved to KRY121 location ~ 5:30 pm

HSA making progress at Swank property, north of tracks. Install 1 piezometer (KRY 114) & soil borings KRY ~~612~~ TA, 616, 617, ~~618~~ OO

Crew went to get supplies.

- Collect Evergreen Source Water - KRY900QS00 1

Discussed getting sand delivered to use for constructing decon pad for drill rigs. I'll call tomorrow.

Sonic rig move to KRY121 Location. Set up rig & trucks - will start churning tomorrow.

Drillers of both rigs end about 6:30 pm. Randy, Jessica, & I collect source water blank (Evergreen water) for analysis.

All samples on ice. will put shipment together tomorrow.

Left site at 7:00 pm.

D. Donohue; J. Faubion; G. Ninefeldt; J. Allawalt; R. Laskowski

4/20/06

7 AM on site & open gates

Temp ~ 25°F; sunny. Temps expected to be in the 60's & 70's.

Order load of sand to build decon pad for drill rig. cost approx $300; drillers will spread sand.

7:15 Hold tailgate health & safety meeting summary: no concerns

Moriah went to ~~DE~~ OO DOT with car.

Sonic rig drilling 121. HSA drilling 114 & 117

9:20 Terrance Carineau, State of MT Electrical Inspector. Expected & tagged CTC work & left.

10:00 Sand delivered & dumped for decon pad

10:15 Flathead Elec.

253-3657 < Denny Gozney
751-4436

(Eng - Ashley K).

Danny (field pers.) arrived &

looked at setup. Said can't cross tracks without permit.
Called Ashley (eng): he said he didn't see tracks & will put transformer on pole for free.

Called Denny - [mail box full on phone] called & left msg on cell that we need transformer today

Denny called back. - will have transformer up tomorrow.

Chuck (CTC) arrived & said Flathead told him they were doing a new transformer (somebody messed up!)

Moriah & Jessica took coolers to ship samples to lab.

11^{30} - 12^{30} Drillers take lunch.

Discuss Walmart wells w/ Moriah. Decide to try to use NTL wells as shallow and pair it with our deep. Also need to put in well immediately in front of Walmart. Moriah will check into ownership

Drove to well locations near Highway. Need to bring driller's to look at them
- Talked w/ Howard Gipe about access to area on along rr tracks. (behind Pacific Recycling). He has gates through his corrals, & then need to remove a barb wire fence.
- Other option is to remove Posts through Pacific Steel to get to RR.
I will call Pacific Steel tomorrow to discuss.

HSA rig is working on rest of afternoon to unload semi trucks w/ drilling supplies. Will start drilling again tomorrow.

Sonic rig advanced into "clay aquitard?" at 130'. First hit unit about 127'? (see geologic log). Sealed hole with

hole plug & reentered about 4:15 pm.

Confining unit was silty clay matrix with up to 3" cobbles. Some mottling similar to clay in KRY 114.
Ended day about DD at depth of about 147', still in tight, mottled clay.

Trans. decon water to stock tanks. Set up trash pump.

6:30 HSA rig crew done & leave
7:00 Sonic rig crew " "

7:10 lock gates & leave site
(- locked McElroy & wilkins gate from inside & walk out over east berm)

DD
4/20/06 4/20/

D. Donohue; R. Laskowski; J. Faubion;
G. Ninefeldt; J. Allewalt

4/21/06 ~35° sunny; high clouds
7 AM on-site - unlock gates
7:10 AM Health & Safety meeting - tailgate.

Set up decon pad for HSA when move from Reliance to NW Energy substation (location 607)

HSA - complete SB 612;
Sonic - set up on KRY121C - still drilling in clay.

9:20 called Tim w/ NW Energy - expect him in 15 min (9:35 AM)

Tom - ELM loc. - discussed cleared areas & left me his map to transfer points from.
- He will clear Office Max lot this morning & be here Monday morning to meet with me for additional clearance

9:30 Flathead Elec. installing transformer

9:45 ~~10:45~~ NW energy on site & start drilling KRY 607

11:50 Sonic rig at ~180' still in clay. Lunch break
HSA - completed 607. Lunch

Flathead Elec. completed elec. hookup. I threw breakers & tripped our main. Called Chuck & he will come over

12:10 Chuck arrived & fixed breaker. Elec. up & running!

Talked with Moriah on logistics:
1) deep well depth.- objective is to drill through confining unit. If need to go more than 200', ok.
2) Notify her when need to go to residential sample locations.
3) Discussed next week - Sonic at McElroy & Wilkens; HSA finish up Reliance & move to OAA in Max area.

Checked on rigs; HSA moved to ~~NW~~ KRY 123 area; sonic slow but steady.

2:30 meet with Dale Augustu (Pacific Steel) to look over Borings & MW locations KRY 128 will move ~50-100' north along fence to allow access to gate & area for them. Need room with Sonic rig.
- Boring ok

3:00 Randy reports that bit sheared off in KRY 121C. Try to fish it out

3:30 Jessica, Randy, Geoff leave site & drive back to Helena.
Joe at HSA; Dave D. at Sonic.

4:00 Call NTL to ask about shallow wells recently installed at Walmart
257-6479 -
Rob Brown in GF - 453-~~4500~~ -5400

4:35p Contacted Rob Brown. - 2 wells are shallow w/ 10' of screen.
Installed on property that is not walmarts.
He will check with his client if ok to send us well logs & call me early next week.
He mentioned if we knew they had contamination (fuel) in them. I said we know.

4:45p Nate (sonic rig) shut down for day. New bit coming in this weekend that may help w/ fishing out sheared bit. I talked with him about completing this as the deep uncont. well & drilling the next well as the confined aquifer well. We will talk Monday.

15p Jesse down & unload tools
Done for day.

6pm Close gate for night

4/24/06
Sunny, cold ~ 25-30°F
7 AM Jessica Allwalt; Joe Faubion; Dave Donohue; Dan Shaffer; Shane Brossler & Cascade Driller subcontractors

7 10 Tailgate H&S meeting. Discuss work; Sonic rig try to fish out bit at 195'. HSA start on KRY 415.

Took Nate to look at proposed KRY130 location. He said he can get in there with drill rig.

10 30 Nate drilled into sheared bit & was able to pull it out of the hole. Continue drilling.

11 45 Sonic at about 220' & still in tight clay

12 30 Discussed drilling depth w/ Moriah. Proposed calling it at 250' if still in clay. She will talk with Denise & get back with me

4/24/06

- Moriah told us it is ok to collect Surface soil samples at Mr. Gripes - just call him.
- At Yale samples, Moriah requested quick turnaround on petroleum analysis.

Drillers take lunch

- 1:00 Jess & Shane begin SS sample collection

2:30 Sonic rig at 243'. Still in tight clay. Call hole & will complete as 4" deep unconfined well, with bottom of screen about 125'.

5:30 Sonic rig backfilled 4" hole in clay to 130'; need to clean out hole plug at 130' (when reduced down).

6:00 HSA - completing KRY 136 (lots of ~~fuel~~ OG petroleum contamination)

6:30 Collected SS equipment rinsate & Culligan water source blank KRY9Ø1QSØØ1

7 PM Put samples on ice & lock up

D. Donohue 4/24/01

4/25/06

7 AM on site I. Faubion; D. Donohue; S. Broeseder
J. Allewalt; D. Shaffer

Clear; sunny ~ 25°-30°F

Hold tailgate HS meeting.

Sonic will complete KRY 121B. It was orig. designated as KRY121C, but since completed as deep unconfined well ~~that~~ OG because it was not drilled through confining unit, the well will be renamed KRY 121B.

HSA plan: complete KRY 136; KRY 618; KRY 137.

Held meeting with crew to discuss sampling objectives & how to collect samples at locations where we have no recovery or refusal (Suggestion: Backhoe).

11:00 Sonic rig setting well; put in filter pack & bentonite chips
Lunch at 11:30

I called Gary at McElroy & Wilkins & asked him to check on new proposed location for KRY 116.

1145 HSA finishing drilling KRY 137 & took lunch.

I went back to motel to download e mail from Moriah & Brian - new contact list & SPLP sampling info.

1230 call from Gary - KRY116 not on McElroy & Wilkens Property, but on NW Truck Repair Property. Need to contact Bill Lupe(?) at ~~273~~ 253-0545.

- I called Moriah & left message regarding this.

1330 Talked w/ Moriah about KRY 116. She will send out letter tomorrow morning & call Bill Lupe(?) also.

- HSA set up on KRY138

1430 Sonic rig placed grout in KRY121B & worked on demob & decon of drill tools. Will drill KRY 115 next

~1500 Nate is sick w/ bad sinus; went back to motel. Russ & Nathan will decon sonic tools & get set up on KRY115. Nate will drill in morning.

1555 HSA drilling at KRY138.

- KRY 138 has ~ 3" of free product on water table, but no soil recovery since due to large gravel/cobbles in barrel.

1650 Talked with Office Max - will drill tomorrow

- complete KRY 138 & decon tools.
- move drums to Reliance

1900 - leave site

Dave Dunham 4/25/06

4/26/06 Wednesday 40°F partly cloudy

7AM onsite D. Donohue; D. Shaffer; J. Allewalt
S. Brooker; J. Fairbrin

Cascade Drilling crew

Hold tailgate H&S meeting.

- Sonic start KRY 115B; HSA decon rig then start borings at Office Max
- called Tom at EIM - All borings cleared at Office max & Rocky Mtn. Marine
- call Rocky Mtn Marine - left message that we would like to drill there today.

0900 Mark from Evergreen water showed up we drove to look at some locations

KRY 634 need to move due to water main

KRY 130 water & sewer main, along with overhead utilities, power poles & braces restrict access for Sonic rig. Should be able to drill shallow well, but limited area for deep well - I'll talk w/ drillers

KRY 125 - ok inside Rocky Mtn. Marine, but check on where water comes into building. I spoke with Wes and he helped me locate boring KRY 601 away from his water line. KRY 125 will be located north of water line

KRY-122 - tough location because tight spot & water & sewer are beneath road & parking area. I suggest we move to location outside trailer ~~at~~ court. will look for location.

1030 Sonic rig working on drill bit & equipment. Rig would not re start - working on starter motor.

HSA completing KRY 606 & moving to KRY 605.

1145 Sonic crew done for week. Need to get starter for sonic rig. will put starter on in morning & leave for weekend off. No more drilling planned until Monday afternoon.

HSA complete 605 & break for lunch.

1330 HSA set up on KRY 125.

Shane collecting SS samples on Reliance.

1415 received call back from Jeff Hammett

owner of Klingler Lumber. No problem to collect surface soil samples today on his property.

1500 Packing samples for shipment & planning for tomorrow.

1701 called Bob Brown at NTL to ask about Walmart wells. - left message

1720 Bob Brown Returned call. He is still checking with client, & will hopefully hear tomorrow.

1730 Looked at ~~location for~~ new location for KRY 122. Propose Western Building Center yard, back near roll-off bin. It will be out of the way & accessible for Sonic rig.

Walmart well - will bring Nate to look at access

1800 HSA - finishing up KRY 603

1830 - sample COC prep - discover insufficient volume for samples

from KRY 606 & 605 at 8-10'; will need to ~~redrill 15' at each tomorrow~~ discuss tomorrow.

1915 left site

4/26/06

4/27/06 cloudy to partly cloudy ; 48°F
D. Donohue ; J. Allewalt ; D. Shaffer ; J. Fourbron ;
Shane Broesder

Drove over to La Quinta with Jesse & looked at location for drilling HSA. He can get in to location. Will propose ~~or~~ a shallow well only at KRY130, unless Nate can get Sonic rig in there - will talk w/ him next week.

Discussed samples from KRY 606 & 605 with Brian. Decide to wait for results from quick turnaround before decide to drill an opportunistic boring at nearby location.

Discussed lithology of 601 & 603 with Brian. Intent of 603 is to be outside of excavation. However, we are still in it, as indicated by fill material. If out of fill in KRY601, then will drill an opportunistic boring between the two. I called Tom at Elm & he gave me the ok at that location. I marked the location - named KRY666.

Bob Brown from NTL called. He faxed data from WalMart wells. Also well construction logs & borehole logs. He accessed well locations via road by coffee shack. His client requested copies of analytical results.

- I called Jim Peterson at Kari Dodge. He wasn't in, but I spoke with Craig Draper (new car manager). He will have lot in front of La Quinta (grass-dirt area) clear.
- spoke with Brian about next week. We will wait for week of 5/8/06 to ~~complete~~ sample at KPT.

- called Gary at gravelpit to discuss well completion construction. Waiting to hear back.

11^{30} Talked w/ Moriah about KRY122. Faxed her copy of propose new location. She will send with letter to Western Building Center.

1215 HSA complete SB @ Rocky Mountain Marine. Break for lunch.

1330 HSA crew decon rig at decon pad. Drummed sediment from decon

trailer. HSA moved to KRY 130.

1410 Talked w/ Gary about wellcompletions at gravel pit. ok to complete wells with casing stickup. Joe & Jessica leave site - return to Helena. Drove to MoKKo & Parmenter(sp?) properties to look at SS sites. Will call Energy Labs about wood chips in soil samples.

1445 KRY130 at ~13' bgs - cobbles & gravel - dry

1450 Cleaned up SB at Office Max & Rocky Mtn Marine - look good

1500 Drove down to Wal Mart wells & looked at access again for Sonic. Will pair deep well w/ MW-4 if completion of MW 4 is acceptable

1600 Discuss completion of KRY 130. Lithology different than expected. Tight fat clay from 15 to 30'; sandy unit below clay. Drilled to 45'; screened from 25'-45'.

1640 Jon Hagen at Energy labs return call - discussed wood chips in SS samples from MoKKo area. suggest we try to minimize wood chips in samples, but knows it is impossible. It will only have potential effect on EPH analysis.

1730 HSA completing KRY130.

Pump decon water into storage troughs & organize & cleanup storage yard

1830 collect equipment rinsate of split spoon with Shane

1900 leave site

Dave Donohue 4/28/06

4/28/06 Cool clear day ~ 45°F
Dan Shaffer; Shane Broesder; Dave Donohue
0700 onsite & conduct HS tailgate meeting.
HSA crew here - will work on maintenance & decon pad since flying out early afternoon for break.

We worked on paperwork, sample COC to bring to Energy, & next week details

0830 Moriah called. Passed on following
1) Names of people working at Parmenter
Lavone Hill
Dave Wilkens
2) Jim from Evergreen - concerned our wells would impact water quanity in aquifer they are pumping from. She told him we are not pumping from ours.
3) Has locks for wells - will give to Brian

0910 Talked with John Roth & got him set up for next week
1000 Pumped remaining decon water into stock tanks.
1130 Drillers leave site
1224 Dan, Shane & I leave. return OA.

5-1-06 Monday
1300 hrs - Arrive on site w/ R. Laskowski, J. Allewalt, J. Faubion, + J. Ninefeldt, + J. Ruth. Unload equipment, review + update sampling maps, review field activities with J. Ruth, go over sonic rig operation, review logging + sampling methods.
1600 hrs - Todd Merchom of Cascade arrives with equip rig. Unloads equip.
1630 - Load equipment for surface sampling.

KRY 432 SS001	1705 hrs
KRY 433 SS001	1710 hrs
KRY 436 SS001	1720 hrs
KRY 437 SS001	1725 hrs
KRY 438 SS001	1735 hrs
KRY 439 SS001	1730 hrs
KRY 440 SS001	1740 hrs
KRY 440 SS002	1742 hrs
KRY 442 SS001	1755 hrs
KRY 443 SS001	1800 hrs
KRY 444 SS001	1753 hrs
KRY 445 SS001	1758 hrs.

5-1-06 continued

1810 hrs - Back at supply area.

J. Faubion working on water treatment system.

Rest of crew packing samples + building walkway to treatment shed.

1900 hrs - off Site

EOD
RL

5-2-06 Tuesday

0700 hrs - H+S Meeting.

J. Faubion, J. Allewelt + J. Roth will work on auger rig at KRY111A

R. Laskowski on Sonic at KRY115B

0730 hrs - Crews at rigs, warming up equipment, starting to drill.

Auger Rig - KRY111A to 35' and set well.

Soil boring 647 to 15'

Soil boring 650 to 20'

KRY107A to 35' and set well.

Sonic Rig - TD's KRY115B at 122.5'. Drive casing to TD depth + clear, Get well supplies. Will set well tomorrow. No samples collected on Sonic Rig.

Mariah Bucy on site with Colleen from DEQ. Observe drilling. Discuss waiting on drilling near rail lines until next week + need for BN flagger.

1800 hrs - at trailer packing samples. Doing chains of custody.

1830 hrs - Auger drillers off-site.

1840 hrs - TtEMI off site

EOD

5-3-06 Wednesday

P. Cloudy 32°F AM 65° PM
Objective - Set well KRY115B. Begin drilling KRY112B (with Sonic)
Personnel - TtEMI - R. Laskowski, G. Nindfeldt with Sonic Rig.
J. Ruth, J. Allewalt - Augur Rig
J. Faubion - working on water Treatment system.

Drillers - Cascade -
Sonic Rig - Todd M, Nate, Russ
Auger Rig - Jesse

0700 - Hrs Meeting, Then to rigs.
Sonic rig - setting KRY115B
Riser 0-107'
Screen 107-117'
Sump 117-122'
Sand 103-122.5'
Bentonite Seal 100-103'
Grout - rest of hole.
1200 hrs finish setting well, breaking down for noh

5-3-06 Continued.
1230 hrs - Locate boreholes 651 + 652. Go talk w/ Craig at western building center - discuss KRY122 well location.
1300 hrs - Have Mark from Evergreen water check locations of 651, 652 and KRY122. He OK's them all.

Augur Rig
KRY112A TD 35' - complete well
KRY104A - Meet refusal twice. Get through on 3rd attempt TD at 41' - set well.

1400 hrs - Sonic rig moves to KRY112B. Drill to 85' by end of day. Having problems with heaving sands.
1500 hrs - Talk to NW Truck Repair - May need to move 116.
Allewalt + Nindfeldt pack samples, deliver to UPS + pickup rental car in afternoon.
1830 hrs - Leave site

EOD R. Laskowski

5-4-06 Thursday
Sunny 35°F in am.
Objective - drilling, sampling + well installations in the gravel pit.

Sonic Rig - Cascade - Todd. M, Nate M, Nick C Russ G.
TEEMI - R. Laskowski
Auger Rig - Cascade - Jesse. C, Jason H., Kyle. P Tyler D,
TEEMI - John Ruth, Jessica Allewalt
J. Faulion working on water treatment system.
G. Ninefoldt checking locations along railroad track + then doing initial well development.
0700 - H+S Meeting then crews go to rigs + begin drilling.

Auger rig cannot find KRY 102A. Move to KRY115A and begin drilling.
J. Allewalt locates KRY102A with GPS.
Sonic Rig - Continues drilling at 112B
GPS Coordinates for new KYR116 Location.
N 48.20798°
W 114.29794°

5-4-06 continued
1100 hrs - Check with Pacific Steel again on location of KRY128. They OK locations and move skids of materials to make room for rigs.

1600 hrs - Sonic rig is setting KRY112B.

Drilled	0-125'	No Samples from borehole.
Sump	120-125'	
Screen	110-120'	
Sand	106-125'	
Bent Seal	102-106'	
Grout - rest of hole.		

Auger rig finished KRY115A + is drilling KRY121A.

KRY115A

Drilled	0-35'	Set well
Sump	32-32.5	
Screen	12-32	
Sand	10-32	
Bent. Seal	1-10	
~~Grout~~ Cement	0-1	

5-04-06 ~~Friday~~ RL continued

KRY121A

Drilled 0-35' set well

Sump

Screen

Sand

Bent. Seal

Auger rig finishes setting KRY121A and mobs to 102A. Drills 0-19' and stops for the day.

Bill Meyer w/ Cascade arrived with different sonic rig. They will change out rigs tomorrow morning, Nate M., Russ G. + Jason will be leaving tomorrow.

800 hrs - Drillers finish installing + decon at KRY 112B.

TD at 125'

sump 120-125'

Screen 110-120'

sand 106-125'

Seal 102-106

Grout 0-106

EOD R Laskowski

5-05-06 Friday

Sunny 70°F

Objective - drill, soil sample, monitor well installations

TtEmI -

R. Laskowski on sonic rig

J. Allewalt + John Ruth on auger rig

J. Faubion + G. Nineteldt working on water treatment system.

Cascade

Sonic - Todd M., Bill M,

Auger - Jesse C., Kyle, Tyler

Nate M, Russ G. + Jason loading equip. + mobbing out,

0700 H+S meeting then to rigs.

Auger rig continuing on KRY102A.

Sonic rig starting 107B

0830 - Meet with Tom from ELM Locate Service, Show him locations for 651, 652, KRY122 + KRY128. He OK's 651, 652 + 128, He will have to check 122. Said he will paint an OK on the ground if it checks out.

5-5-06 continued

Auger rig finishes KRY102A and mobs to KRY116A.

Drills 0 - 30' KRY102A

sump 27-29'

screen 7-27'

sand 5-29'

Bentonite 1-5'

1600 hrs

Auger has mobbed to KRY128A and is drilling.

Sonic rig is at 118' on KRY107B

1700 hrs sonic rig TD's in clay unit at 136'. Begin breaking down for week-end. will set well next week.

1800 hrs Finish KRY128A.

TD at 29'

sump 25-29

Screen 5-20'

Sand 3-27

Bent 1-3

5-5-06

Specs for KRY116A

TD - 30'

sump 27-29'

screen 7-27'

Sand 5-29'

chips 1-5'

EOD R Harkenrider

5/08/06 Monday
All notes kept in LogBooks 2, 3, 4 for Today

Donohue 5/9/06

5/9/06 weather: foggy, cold ~ 32°F
0700 on site & conduct tailgate meeting
Dave Donohue, Dan Shaffer, Jessica Allewalt
Joe Fambrion, John Ruth, Shane Brousden
Moriah Bucy (DEQ)
Nancy Gilland (ReTec)

0730 Discuss progress with Moriah
Joe & Shane working on water treatment.
- will construct sand filter

0815 Talk w/ Dan & Jessica at HSA
rig on KRY 653. No problems

0830 Talk w/ John. Go over some additional
procedures. sonic at ~~10~~ 00 KRY 107B
sand heaving

0915 return to trailer & do paperwork -
will call Don about 1) monuments 2) sonic
schedule; 3) footage completed

1000 discuss water treatment system
with Joe & Shane

Discuss residential soil sampling with Mariah: plan to sample residential yards on Thursday. She will make calls

1040 Marcille from DEQ onsite.

~~to~~ 1120 Marcille leaves

Don Larson from Cascade Drilling returns my call. He ~~is~~ is on the road & will call this afternoon when back in office.

1230 Look at western Building Center well locations. Talk with Mark from Evergreen. He is ok w/ location - just stay clear of ~~sewer~~ stormwater line

Check on HSA & Sonic

1330 Work in office trailer - paperwork & driller daily reviews.

1430 Check on Sonic - completing KRY111B

HSA - completing SB at KPT sign

1545 Received call from Don - called him back & will connect tomorrow

HSA & Sonic rigs deconing tools & rods; getting water, etc.

Shane labeled all monitoring wells & collected gps coordinates on SB & MW to date.

1840 Finish for Day. Drillers leave.

Shane drives back to Helena

1900 leave site & lock up

D Donohue

5/09/06

5/10/06 ~50°F clear, sunny - beautiful (although relative!) Moriah Bucy; Nancy Gilland
D. Donohue; J. Allswell; D. Shaffer; J. Fanbian; J. Roth; Cascade Drill.
0700 on-site - H&S tailgate meeting
HSA crew - complete some rig repair/maintenance & complete monuments on wells.
Sonic crew - mob at KRY-102B
Dan & Jess - collect SS samples at KPT area
Joe - work on water treatment
John at Sonic rig - waiting for rig to complete repair on crane.
~1000 sonic set up & drilling KRY 102B
HSA at KRY629. Need to re-work hammer hydraulics.
~1200 Sonic twist of corebarrel. Grout hole & move.
1230 lunch, then went to Office Max for printer cartridge & copies
13⁰⁰ Talk w/ Don (Cascade Drilling) about schedule.
HSA done possibly by 5/23 (± a few days)
Sonic " " " 6/6 (± " ")
I proposed working weekend of ~~of~~ 20 May 20. I'll talk w/ crew & drillers.

1450 Mark locations on ground for KRY 139 A&B & KRY122 A&B called UDIG - will need a new ticket & will have Shane set up tomorrow.
1500 - 1600
- in Field office working on spread sheet for well/soil completions & bore hole log review. ~~14~~ 80

1610 talk w/ John at Sonic.
Drill hole encountered productive gravel zone at ~40-60' at KRY 102B
Down through gravel & better recovery
HSA completing KRY 630.
- walk locations w/ Dan - I'll call ELM & Evergreen to look at relocate of KRY 634.

1700 Joe connected filter (1 um) to water treatment system & circulating decon water in poly tanks. Looking good.

1800 Sonic crew done for day at KRY 102B - TD 110' bgs

Took Todd to look at several well locations.
KRY 130B - is doable - need to get clearance again by ELM & Evergreen
KRY 131B - he can get rig down as long as no rain
KRY 139B - ok

1900 - Moriah asked that we move HSA rig to drill borings around ozone line so system can be turned on. will start there tomorrow

1930 off site

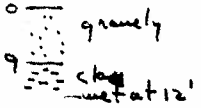
D. Donahue
5/10/06

5/11/06 49° high clouds; overcast cool.

0700 on site D. Donahue
J. Fauvion; J. Allewalt; J. Ruth; D. Shaffer
Moriah Bucy - DEQ; N. Gilland - ReTec
Cascade Drilling crew
Complete H&S Tailgate meeting. Get drilling schedule worked out with drillers through May.
Sonic - quit today at 5:00 pm for break. return Sun night or Monday morning - Todd will let me know tomorrow - call
HSA - work standard schedule - take Sat & Sun off.
Both crews Memorial Day schedule
- stop work noon Friday May 26
- start work noon Tues May 30
note: HSA may be done before memorial day.

Sonic rig completing KRY 102B
HSA " start at KRY 110A
Joe - water treatment
Moriah & Jessica will start residential soil samples collection at 0900 - 0930

0900 Dan called to discuss KRY 110 A lithology



appears similar lithology as KRY 130A. I suggest we drill through clay.

1000 Moriah & Jessica start sampling. Moriah informed me that her RR contact called her & they only have traffic control up to Flathead Dr. No active trains on Klinger - KPT. We are good to go.

1130 HSA completing KRY 110A - drilled to ~ 55' clay 9 - ~40'.
Sonic working at KRY 116B

1230 - 1300 lunch
Pu filters for water treatment

1400 - Sonic at ~ 90' in sands. - looking good for drilling. Expecting to TD hole before 5pm
HSA still completing well & deconing augers.

1500 work on water treatment
sonic at ~ 90'. Should TD hole today. HSA at

1630 Sonic rig TD KRY 116B. Move tender to yard & move water. Leave site for vacation at 1700.

1730 HSA drilling 625 - will finish that boring for the day.

1915 Close site & lock gate

Dave Donohue
5/11/06

5/12/06 partly cloudy; slightly cool - 50°F

0700 on-site

D. Donohue; J. Faubion; D. Shaffer; J. Allewalt; J. Ruth; Moriah Bucy - DEQ; N. Gilland - ReTec

HSA crew only; Sonic crew on vacation.

0705 Tailgate safety meeting - discuss today plans. HSA setup on 627 to start; Dan & Moriah leave by noon.

0800 Talk w/ Dan & John about drilling to see if clay is below sand/gravel on bench.

0900 Inspect loc. of KRY 632. Met w/ J. Hammet & discussed location. - will locate in aisle east of stack of lumber.

He left - looked at location for KRY 108 A,B will need to locate to get sonic rig in ~ 50' from where staked.

0941 called Jeff Hammet about moving location of KRY 108 & completing it as flush mount. - asked him to call me back.

1030 Moriah left site & heads back to Helena

I walked ozone system with Nancy & looked at soil boring locations. Nancy gave me a key to fenced area and BV wells.

1100 Dan & John leave site - head to Helena.

I go help Jessica log last soil boring KRY 628

1220 lunch

1310 return from lunch

afternoon, drillers work on rig & equipment maintenance. leave site around 1530.

Jessica & I complete paperwork, daily reports, sample packaging, & shipping.

1800 Joe & Jessica leave site.

1830 Leave site & go to flag locations KRY 632 & KRY 108.

D. Donohue

5/12/06

5-15-06 Monday.

Tt EMI - R. Laskowski, J. Faubion, J. Allewalt
Cascade - Jesse C., Kyle P, Tyler
0700 - H+S Meeting - Review work for the day. Only the auger crew is working today on KPT area. Drill crew loads equipment. Mob to KRY624.
R. Laskowski + J. Allewalt on rig.
J. Faubion working on water system.

1030 hrs - Tom from ELM on-site, Go over new sites that need clearance.
1200 hrs - Break for lunch
1255 hrs - Auger rig on KRY655
1730 hrs - Auger rig done for the day
1800 hrs - off site

EOD
R. Laskowski

5-16-06 Tuesday
Drilling, soil sampling, mw Installations
weather Sunny 80-90°F
0700 hrs - Hold H+S meeting. - Sonic crew back on site.
Crews load equipment and go to rigs.
Tt personel - R. Laskowski, J. Ruth, J. Allewalt, J. Faubion.
Auger crew - Cascade - Jesse, Kyle, Tyler
Sonic crew - " - Todd, Nick, Bill

Sonic crew is setting KRY1613 in the morning.
Auger crew is still on KPT doing borings.

0800 - Speak to Nancy from Retec - owner of Permenter property will be in tommorow we can discuss drill locations then.
In a.m. Laskowski, Ruth + Allewalt with auger rig, J. Faubion working on water trestment system.
0930 - J. Allewalt goes to do surface sampling on residential property north of the river.

5-16-06 continued.

1015 hrs - Sonic crew finish setting well + and start installing flushmounts in gravel pit.

1500 hrs - Meet w/ Mark of Evergreen water + check over location of KRY634 again. Needs to move either west of gas line or east of water line.

1700 hrs - Auger rig finishing up drilling for day and begin deconning and break down.

1730 hrs - field crew back at trailer packing samples, taking rinsate samples.

1800 hrs - off site

EOD
R Laskowski

5-17-06 Wednesday

0700 H+S Meeting
Tt: R. Laskowsk, J. Faubion, J. Allewalt, J. Ruth.

Cascade -
Auger Rig - Jesse, Nick, Bill
Sonic - Todd, Kyle, Tyler

Auger Rig back drilling on KPT. Allewalt + Ruth on auger rig. Faubion on water treatment.

Sonic rig is in the shop getting new compressor. Sonic crew had set up post digger on bobcat and are installing bollards.

1000 hrs - Talk with Chris Parmenter about drilling near the tracks. - He indicates we should talk to Wilken about whether the rail line will be used.

1100 hrs - O. Donohue arrives. Go check out locations of 632, 633, 634 + 108.

5-17-06 continued

1300 hrs - speak w/ J. Hammet on drilling 632, 633, 634 + 108. He indicated we should do 632 + 633 tonight after semi moves. We can position 634 to be out of the way even during the day. He would move material for us to drill 108 but he could not do it right away, - Friday at earliest.

1330 hrs - Switch log from R. Laskowski to D. Donohue. Laskowski stays with auger rig. R Laskowski

1400 D. Donohue
coordinate drilling crews. Sonic checking on rig repairs. Will be onsite at 7 AM tomorrow.
Complete paperwork & errands in afternoon.

1900 HSA completes KRY 633 & moves equipment off site from Klingler.
= check gates & leave site at
1915 - called Nancy & left msg. about flagged cable.

5/17/06 ~~[illegible]~~

5/18/06 sunny, hot ~ 60°F
0700 on site
0705 safety tailgate meeting
D. Donohue J. Ruth
J. Fanbin R. Laskowski
J. Allowalt
- Cascade Drilling HSA & Sonic crews
Discuss plan for today - HSA start at KRY 634 ; Sonic start at KRY 110 B.
0800
- Brought new loc. map to UDIG. Ran errands
- 0900 Met with Mark at Evergreen - KRY 660 & 113 A/B are not near any of his water lines
1000 went with Jessica & sampled residential soil location KRY 554.
1040 Back at office.
1200 Took John to get rental car
Lunch
1300 Afternoon spent locating a few borings. Looked for Gary at McElroy & Wilkens for loc. of KRY 113 A.
He is gone - will look for him tomorrow.
Put locks on wells in gravel pit area & labeled wells.
~ 5:30 Nancy G. leaves site.

1800 HSA crew left site. Completed KRY 634, 651, 652 & 114A.
J.A., J.F. & RL. leave site

1820 go check on sonic rig
- J. Ruth says they are done for day. Need to finish completion in morning.

1830 Back to office, clean up & lock gates.

off site at 1840.

D. Donohue 5/18/06

5-19-06 overcast - cloudy - rain showers ~ 58°F

0700 on site D. Donohue; R. Laskowski; J. Allewalt; J. Ruth; J. Faubion; N. Gilland - ReTec; Cascade Drilling Crew (6)
- hold tailgate safety meeting to discuss today plan.

0715 drove over to locate 100A & 101A for HSA.
Dave Wilkins (Glacier Stone Co.) came & worked with me on locations.
HSA will start at 100A, move to 108A, then to 101A. 101A is located just to north of RR tracks, north of overhead utilities, & in location that works better for Dave Wilkins.
- walked loc. 113 & 103 with Dave & Nancy Gilland. They are ok w/ locations.
- I met Mr. Parmenter & he said no problem to move piece of equipment in front of 103A. location.
0830 Tom from ELM locating - met me at Trailer office & we looked at loc. of 101A, B, 113A, B, & 660. He

cleared locations.

0900 - I checked on sonic rig - just got first 5' at 106 A. went back to trailer for paperwork & call Helena office. J. Fanbion & J. Allewalt leasesite.

1100 Talk w/ Brian. - agree that KRY 113A better location than KRY 101A for 4" completion. More central location & farther from river

1120 Looked at loc. for KRY 128B. Pacific Pillar Palleted bins in area. Dale is on vacation & I need to call him Monday. Looking at Sonic maybe drilling there next week or week after

1130 Stop at Rocky Mtn Marine. Talk w/ Linda about well dw. next week. Expect Sonic following week

1140 ~~Hani Dodge~~ Western Building Center call Roy on Monday to move materials on top of loc. for KRY 122. (Craig is off until next Thursday)

1150 Return to office. Check in on rigs.

1200 lunch

1230 check on Sonic - drilling going ok. Talk w/ Nancy regarding plan for weekend. Check in w/ Moriah & discuss what was done this week.

1345 Sonic TD KRY 106B at 88'. Drilled about 5' into clay. will set screen from 83' to 73'.

1400 Check in on HSA at KRY 101A. Randy will leave after TD 101A & head back to Helena.

- Sky clears & sunny ~ 75°F.

1430 Back at trailer.

1500 Run errands (gas/ phone card)

1530 Back at Trailer. Randy & I pump water from drums into tank.

~~1400~~ 1600 Randy leaves site. John still at Sonic. Setting well.

1630 HSA crew finishing monuments & cleaning up. off site at about 1830.

1700 Sonic crew working on support rig alternator

1750 Sonic rig alternator being replaced.

1810 Drove to look at completed well locations & make sure gates are locked.

~1830 called N. Gilland & told her about Sonic mechanical problems & we won't start until about 0800.

1915 Sonic crew has alternator in. Will meet tomorrow at 8 - early to get fuel.

1920 left site & locked gate

D. Donohue 5/19/06

5/20/06 overcast ~60°F cool / nice

0800 - on site

D. Donohue ; N. Gilland (Re Tec) ; J. Ruth

Cascade Drilling Inc. - Sonic Crew only

- Hold Tailgate safety meeting
- Sonic set up & ready to drill KRY101B
- I get Sonic started, Then return to trailer for planning & paperwork

1115 lunch

1215 set up schedule at motel through June.

~1300 Stop at Sonic. Show J. Ruth loc. for 113B & 103B. Discuss sampling at 103B through wood chips. Take samples of what is planned in SAP, & collect opportunistic soil sample at "original" ground surface.

Nick smashed finger w/ hammer - I drove him to Hospital.

1430 Pick up Nick from hospital. He broke finger & knuckle. Splinted it & is on antibiotics. He is ok to keep working.

1445 Sonic just getting into clay.
will TD hole (~105'?)
I returned to trailer.
1530 John back at trailer with me
to discuss plan for next week.
Also go look at KRY 118 A & B &
KRY 109A locations.
1650 I finish up paperwork &
leave site. John Ruth remains w/
Sonic rig to complete well. He
will work with them tomorrow.

D. Lowhm
5/20/06

5-30-06 Tuesday

Tt EMI - R. Laskowski, J. Allewalt take one
truck from Helena, J. Faubion takes
another truck.
0800 hrs - At office - review drilling plan
for the week.
0900 hrs - loading equip.
0930 hrs - drop J.F. off at Enterprise
RL, J.A. head to Kalispell.
1315 hrs - Arrive at site. RL + J.A.
delayed from traffic + hitting
deer on Sealy-Swan Hwy.
1320 hrs - J.F. on site.
Sonic Crew on site loading
equip, prepping to continue
KRY 122B. -
1330 hrs - Todd of Sonic crew goes to pick
up auger crew at airport.
RL + J.A. go to Enterprise to
rent another vehicle.
J.F. - working on water treatment.
1630 hrs - R.L. goes to RKy mtn Marine.
They will move boats by tomorrow
when Sonic rig is ready to move.

5-30-06 continued

1630 hrs - Sonic crew prepping to set KRY122B
Auger crew is setting bollards.

1745 hrs - Sonic crew had to leave western Building Center - they were closing their gates for the night. Drop equip at trailer + leave for day

1800 hrs - Auger rig bringing back their equip. from setting bollards.

EOD
R. Lukowski

5-31-06 Wednesday

Sonic Crew - Todd, Nick, Bill

Auger Crew - Jesse, Kyle, Tyler

TtEMI - Jessica w/ auger
Joe w/ water treatment + auger.
Randy w/ sonic/auger

0700 - H+S meeting.
Sonic crew will complete KRY122B
Auger crew will start at KRY127A
RL helps J.A. w/ sampling at 127A

0900 - Stop at Rocky Mtn Marine - let them know we may be there before noon. They will start moving boats. They also said that they will let us work late, we will just shut their gate and they will arrive early tomorrow to let us in.

1000 hrs - Go talk with Craig at Kari Dodge. He says he will have trucks moved by Friday.

1400 hrs - Stop at Town Pump + look over the construction blue prints. Boring 604 is clear of utilities.

1600 hrs - Mariah from DEQ has arrived.

1800 hrs - Drillers finishing up. Dan still developing.

1830 hrs - Back to lock up. Dan finished.

EOD RL

6-1-06 Thursday

0700 - H+S meeting.

Sonic crew working on KRY125B

Auger crew going to KRY118A

Cascade - Sonic - Todd, Nick, Bill

Auger - Jesse, Kyle, Tyler

TEME - Jessica w/ auger rig

Joe w/ auger rig + water treatment

Randy w/ sonic, + auger, clearing holes.

DEQ - Moriah Bucy.

0900 - Mark new boring locations - KRY667, 668 on KPT. Go to water district and get their location cleared.

Recheck town pump 604 location. Definitely not cleared. Call udig - get a new number to get it cleared.

1200 - Sonic decanning. Auger going to lunch. Moriah goes to lunch then leaves for Helena.

1300 - Talk w/ KPT personnel - he says boring locations for KRY667+668 are out of their way and OK.

6-1-06 continued.

1400 - Sonic mobs to KRY118B

Call U-Dig - tell the 604 has not been cleared

1500 - ELM contacted Jessica - said they would be out to locate 604. They had located the wrong location the first time.

1810 Sonic crew finish drilling to 98' - Breaking down for the day.

1900 - off site

EOD R Lukowski

6-2-06 Friday

0700 - H+S Meeting

- Sonic Rig going to finish drilling KRY118B
- Auger Rig - will be doing another boring on KPT
- Development

Auger rig - SB KRY604, KRY671; KRY672 field notes in Auger Rig note book & on bore hole logs. Complete soil borings

Sonic rig - complete KRY 118B notes in Sonic Rig notebook & on borehole logs

Development info kept in development log & on development sheets.

D. Donohue (6/29/06 - added some info)

6/3/06 through 6/11/06

Notes kept in well development & sonic rig books & on field sheets. No notes for this period kept in Field coordinator log book.

D. Donohue 6/12/06

6/12/06

Drive to Kalispell &
pick up gear. Organize groundwater
sampling plan.

Joe Faubion - drove up early to work
with development rig.

TEEMI onsite: D. Donohue; J. Faubion;
J. Ruth; R. Laskowski; Jessica Allewalt
Cascade Drilling; D. Lownie
ReTec: N. Gilland

D. Donohue

6/12/06

6/13/06 Tuesday cool ~50°
partly cloudy

0720 Tailgate meeting
Today: - continue MW development
- begin gw sampling
onsite:
TEEMI: J. Ruth; R. Laskowski; J. Allewalt;
D. Donohue; J. Faubion
Cascade Drilling: D. Lownie
ReTec: N. Gilland

GW sampling: Teams work together to
work out bugs

fieldnotes kept on gw sample sheets &
in gw sampling notebooks

~1900 offsite. D. Donohue drives
back to Helena

D. Donohue

6/13/06

6/14-16/06.

- All gw sampling notes kept on gw sampling sheets & log books
- Well Development continued

on site:

T&EMI: J. Ruth; J. Faubion; J. Allewalt
R. Laskowski.
Dan Shaffer - arrives at noon

Cascade: D. Lowrie

6/19/06

6/19/06

Leave Helena about 10 AM
Drive to Kalispell.
Arrive about 2 pm at field office

Joe Faubion - here early to work w/ well dev. - D. Lowrie

Jessica Allewalt, D. Donohue; J. Ruth
arrive ~ ~~10~~ 2 pm.
organize field equipment & pick up supplies.
off site ~ 1830.

6/15/06

6/20/06 Tuesday cool morning ~ 55°F
0700 on site Partly cloudy

0720 Tailgate meeting
well development & gw sampling

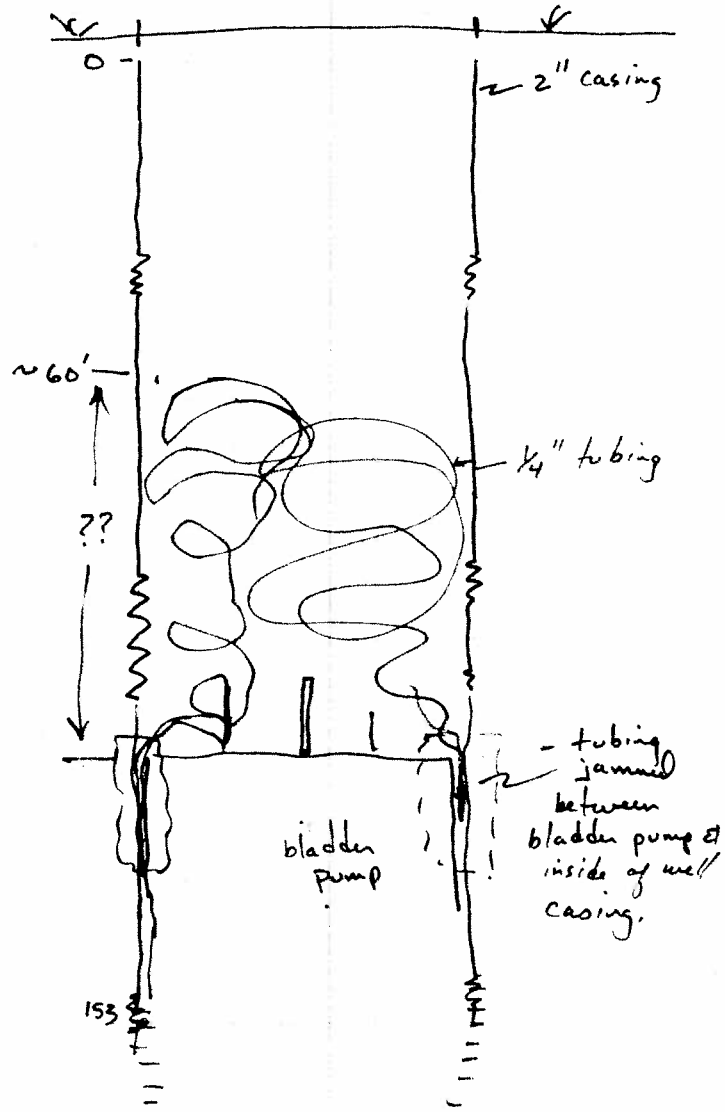
on site:
TtEMI: J. Ruth; J. Faubion; D. Donohue; J. Allewalt
Cascade: D. Lowrie

- All field notes for gw sampling kept in field logbook & on sampling forms.
- well Dev. info kept on daily logs.

~1600 - bladder pump stuck in KRY130 B. worked on getting it out until ~ ~~800~~ 2000 hour.
will try again in morning
Diagram of bladder pump situation on next page

D. Donohue
6/20/06

Hypothesis of stuck bladder pump situation at KRY 131B.



6/21/06 Wednesday cool morning
partly sunny

onsite 0700
TEEMI: J. Allewalt; J. Faubion; J. Ruth; D. Donohue
Cascade: D. Lawrie

0730 Tailgate Safety meeting

Plan: Complete well Dev.; GW sampling
Notes kept on gw sampling forms.

Work on trying to recover bladder pump from KRY130B. Pump will not move up when pulled or pushed down. Decide to leave in place, order a second one, & attend to it after gw sampling is complete.

Moriah Bucy arrives about noon.

GW sampling continues ~~onto~~ today.
Sampling at KRY129B had some problems & took long time
~ 2100 hr - offsite

D. Donohue
6/21/06

6/22/06 Thursday partly sunny
0700 on site Temp ~ 55-60°

TEEMI: J. Ruth; J. Allewalt; J. Faubion
D. Donohue; D. Shaffer
DEQ: Moriah Bucy
RETEC: N. Gilland

0720 Tailgate meeting

GW sampling: begin sampling KPT existing & newly installed wells w/ ~~No~~ RETEC oversight.
M. Bucy & J. Ruth locate residential wells
- Field notes kept in GW sampling sheets & logbooks.
Noted that Wells @ Western Building Supply have been covered w/ road mix.
Need a metal detector to locate
~ 1430 M. Bucy leaves site
0730 offsite

D. Donohue
6/22/06

6/23/06 Friday partly cloudy
0700 onsite

TEAMS: J. Faubion; Dan Shaffer; J. Allewalt;
~~N. Gillard~~ J. Ruth; D. Donohue
RETEC N. Gillard

GW Sampling - KPT location wells & residential / IW wells.

Field notes kept on field sampling sheets & log books.

J. Allewalt & R. Laskowski - leave site ~ 3^30 to drive samples to lab.
J. Ruth leave about 5 PM
J. Faubion, D. Shaffer, Dave Donohue leave about 5^30 pm

D. Donohue 6/23/06

6/26/06 Monday ~ 70°-75°F
Hot. Sunny

J. Allewalt; J. Faubion; Geoff Nineteldt; R. Laskowski drive to Kalispell. leave Helena ~ 8^20 - 9^00

J. Ruth on site about 0800 - wait for "gac" delivery & complete chore list & organize equipment

1300 Tailgate meeting ~~at~~
Sample wells off of KPT.
GW sampling - KPT located wells were not sampled since Nancy was not here.
D. Donohue left Helena ~ 530 - drive to Kalispell. Arrive ~ 900 pm.

1900 GW samplers off site

D. Donohue 6/26/06

6/27/06 Tuesday

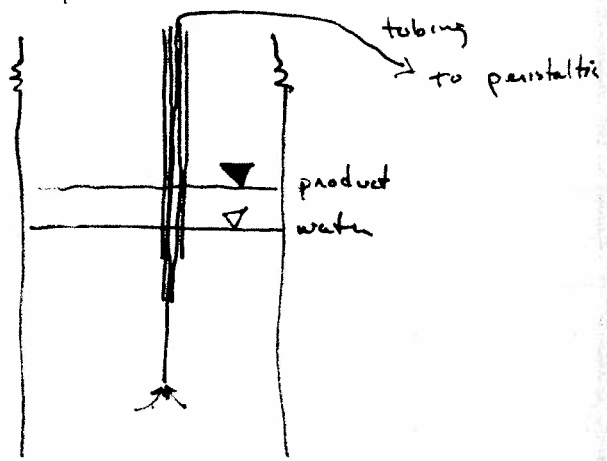
Hot, Sunny Today
~60°F

0700 onsite

TtEMI: G. Nimafldt; I. Faubion; I. Allewalt;
I. Ruth. R. Laskowski; D. Donohue
ReTec: N. Gilland

0720 Tailgate meeting

John & Geoff sample wells with product. - use peristaltic & poly pipe per DEQ permission



isolate peristaltic sampling tubing from contacting product. Peristaltic tubing in location of well screen

system worked well.

Bladder pumps on KPT wells. Find that gas compression needed for deep wells. Sampling at ~170' at Walmart well is difficult w/ bladder pump.

offsite ~ 1930

Dave Donohue
6/27/06

6/28/06 Wednesday Hot, sunny ~ 65°F

onsite 0700

T+EMI: R. Laskowski; D. Shaffer; J. Ruth; G. Ninefeldt; J. Faubion; J. Allewalt

0730 Tailgate meeting
Continue gw sampling. Information kept in log books & on sampling data sheets.

N. Gilland on site ~ noon.

0700

Resident well RW1 - Fraleigh new owner. Interested in results - has kids

- Sampled well at "Shed mans" - saw well casing at Cordell. - will investigate.

J. Ruth & G. Ninefeldt on site until ~ 2030 hours. Rest of us off site ~ 1930.

Dave Donohue
6/28/06

6/29/06 Overcast ~ 60°F

onsite 0700

D. Donohue; R. Laskowski; G. Ninefeldt; D. Shaffer; J. Allewalt; J. Faubion

0730 Tailgate meeting & plan for today

I called Todd Gardner - RW6 well. - ok to sample.

Contacted Mr. McGranor - RW10 well Sample next week. Call him to set up appointment.

J. Ruth & Geoff - sampling w/ peristaltic at wells w/ product

D. Shaffer & I sampled at Reliance wells - R. Laskowski & J. Allewalt - sample perimeter wells.

Joe F - left site ~ 230 & headed to Helena.

Rest of us cleaned up & finished sampling.

1700 left site & drove to Helena

D. Donohue
6/29/06

7-5-06 Wednesday

1130 hrs - On-site -
Tt R. Laskowski
T. Faubion
J. Ruth

Objective - GW sampling + water treatment.

1200 hrs - Review wells left to sample.
Talk w/ D. Donohue in Helena.

1230 hrs - R.L. + J.R. Go get another vehicle at Enterprise. Get supplies.
T.F. doing water treatment.

1330 hrs - loading trucks
J.R. Sampling wells with possible LNAPL using peristaltic
R.L. Sampling with bladder pump.
T.F. - water treatment.

1900 hrs - T.F. off site
R.L. - Sampled KRY118A + B and KRY114B - off site at 1930 hrs.
J.R. - Finishing up sampling. Sampled GWRR 5 + 2.

EOD
RL

7-6-06 Thursday

0630 - On site loading Equipment.
T.F. doing water treatment in the morning. Will sample later.
R.L. Bladder pump sampling around Office Max.
J.R. still sampling wells at Reliance with peristaltic.

1530 hrs - Break for thunder + lightening storm. Heavy rain and hail.

1700 hrs - Back sampling. T.F. working on Rky Mtn Marine wells.
J.R. Finishing up Reliance wells. R.L. working on office max wells.

1930 hrs - Finishing sampling, unloading equipt.

2000 hrs - off site

EOD
RL

7-7-06 Friday

0630 hrs - Loading equipment.
RL working on GWY12 and
J.R. doing PW-1 w/ peristaltic
set up.
J.F. doing water treatment.

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19-	KRY107B	5-4
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4-18-06

0800 - On site preping for drilling
Sunny - 45°F
Objective - drilling, soil sampling, monitoring well installations.
Drillers - Cascade Drilling
T+EMI Personnel - R. Laskowski, J. Allewalt
1400 hrs - Sonic rig set up on KRY114B.
1440 hrs - Begin drilling

	Samples	
1450 ~~1440~~ ~~Samples~~	KRY114B SS001	0-0.5'
1520	KRY114B SB001	22-23'

1850 - Stop drilling for day at 90'

1900 - Drillers off site

1910 hrs - Off Site

RL
End of Day

4-19-06

0700 hrs - Meet at site, H+S meeting
Sunny 40° F.
Objective - Continue drilling KRY114B and install monitoring well.
Activities - drilling, soil sampling, monitor well installation.
0730 hrs - Drillers at rig - begin drilling. Starting at 90'
T+EMI Personel - R. Laskowski, J. Allewalt.
1130 hrs - Finish boring down to 122'. Begin setting well KRY114B
1700 hrs - Finish deconning rig + equipment. Bring drums of cuttings into storage area and start moving to KRY121C
1830 hrs - Rig is set up and one sample barrel driven. Stop for the day.
1900 hrs - Finish unloading trucks. Leave site.

RL
End of Day

4-20-06

Objective - Drilling, soil sampling and well installation at KRY121C

Drillers - Cascade Drilling
Nate

TtEMI - R. Laskowski, J. Allewalt

Sunny 50°F

0700 - On site for HAS meeting, loading trucks.

0805 - Begin drilling KRY121C

Samples

KRY121CSS001	~~0-0.5'~~ 0-2" RL	~~0820~~ RL hrs
KRY121CSB001	12.5-15'	0830 hrs
	Collected for TOC	
KRY121CSB002	25-27'	0900 hrs
	Collected for standard suite + TOC	

1530 hrs - Have drilled down to 130' and hit silty clay + gravel layer. Drillers drill another foot to 131'

4-20-06 continued.

to set outer casing into the clay. Then put 5' of bentonite into outer casing to seal off upper aquifer from lower aquifer. Let bentonite set-up for 1/2 hour then set inner 6" casing down thru bentonite and into clay zone. Then begin drilling and pushing inner casing down thru clay to lower aquifer.

1730 hrs - Stabilizers on rig are sinking into the ground. Stop drilling. Driller leaves site to get timbers to put under stabilizers.

1830 - Drillers back. Fill in holes where stabilizers sank. Put down timbers. Re-set rig.

1900 hrs - Off site.

RL
End of Pag

4-21-06

Sunny 50°F in am.

Objective - continue drilling KRV121C. Got thru confining clay and set well in lower aquifer.

Drillers - Cascade Drilling - Nate

TtEMI - R. Laskowski

0700 hrs - Meet for H+S meeting.

0730 hrs - drillers warming up rig. Continue drilling from 140'. Still in confining clay layer.

1450 hrs - Bit shears of at 195'. Will attempt to get it out.

1600 hrs - R. Laskowski preps to leave site. D. Donohue continues to oversee drillers. R Laskowski

1550hrs. - D. Donohue - finish day on sonic. still trying to get a tap into sheared bit.

1645 ~~1650~~ - Nate done for day. New bit coming in this weekend will help clean out hole to then try to fish sheared bit.

Sheared bit at 195'

Rods down to 193' w/ 2' of ~~stuff~~ material between casing & bit.

Option to complete this as deep unconfined aquifer well and drill another confined aquifer well.

- will discuss on Monday if not successful fishing bit.

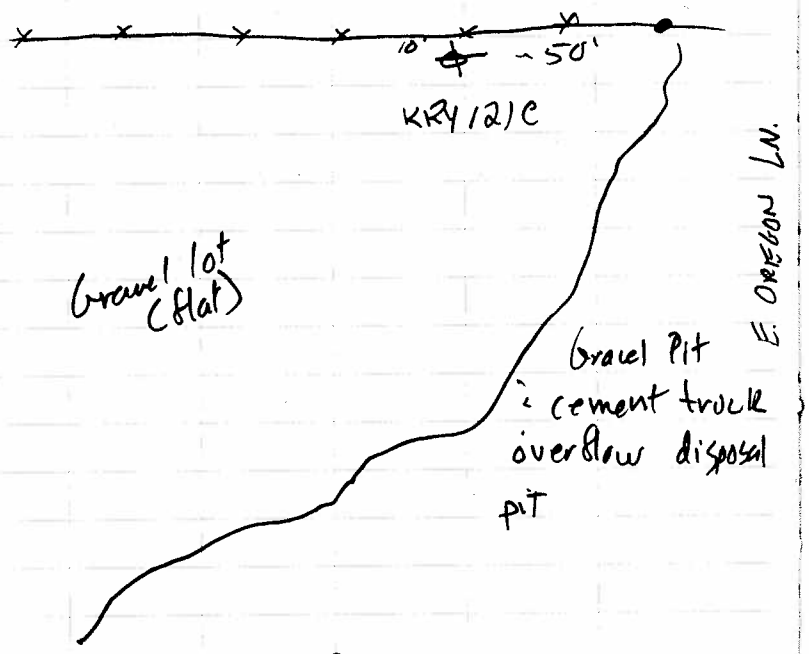
Nate has key to lockgate.

David Donohue 4/21/06

TUESDAY
April 25, 2006
Sunny, calm, 28°

On Site: D. Shaffer
S. Broesder
J. Allewalt
D. Donohue
Cascade - Sonic Rig
- HSA

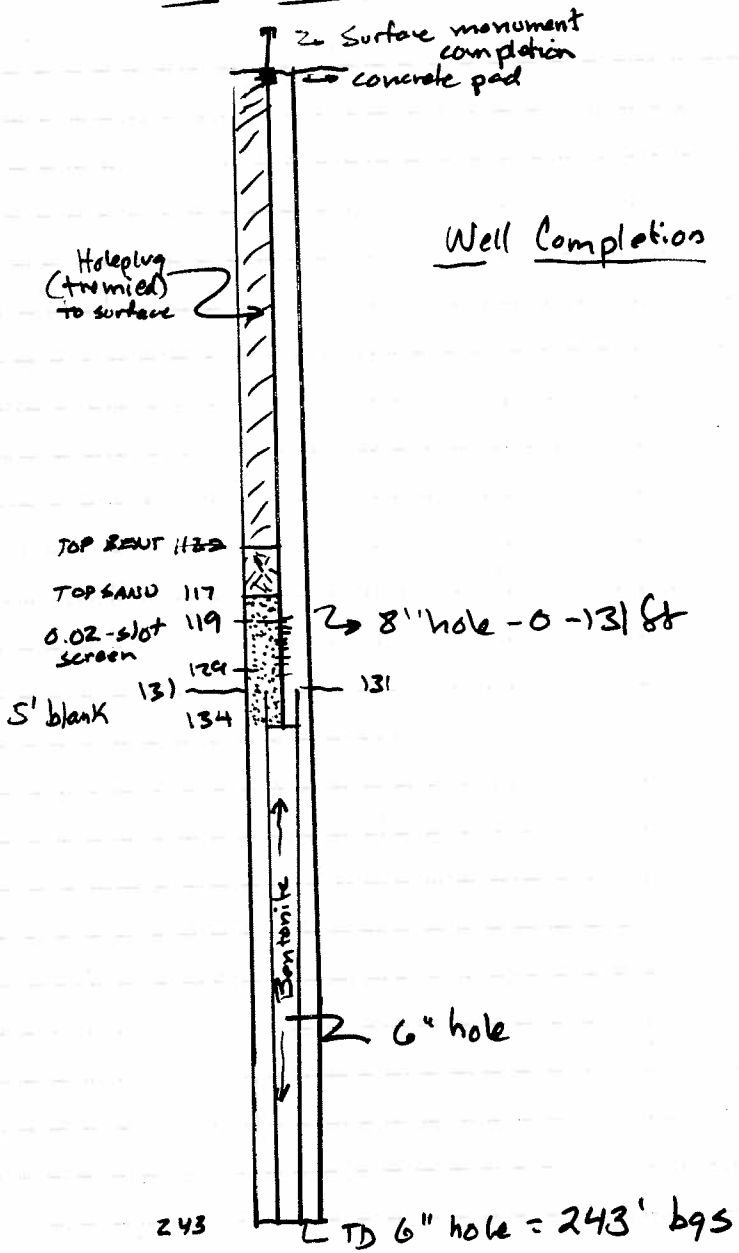
0715 - all crews meet at trailer for daily mtg.
- Sonic crew on well KRY 121C well.
- haul 4" PVC to site
- check on grout level in well
- will complete well as "B" zone well



TUESDAY 4-25-06 (cont.)

0900 - sonic rig drillers placing sand to prepare to pull casing
0915 - vibrating 8-inch casing to pull out while placing sand and building well
1000 - assist J. Faubion w/ logging-sampling another site well
1045 - sonic rig building well - pouring sand.
1100 - " " setting hole-plug above sand
1300 - pulling 8" casing and grouting annulus of well w/ Holeplug by tremie pipe.
1350 tower down.

WELL KRY121C



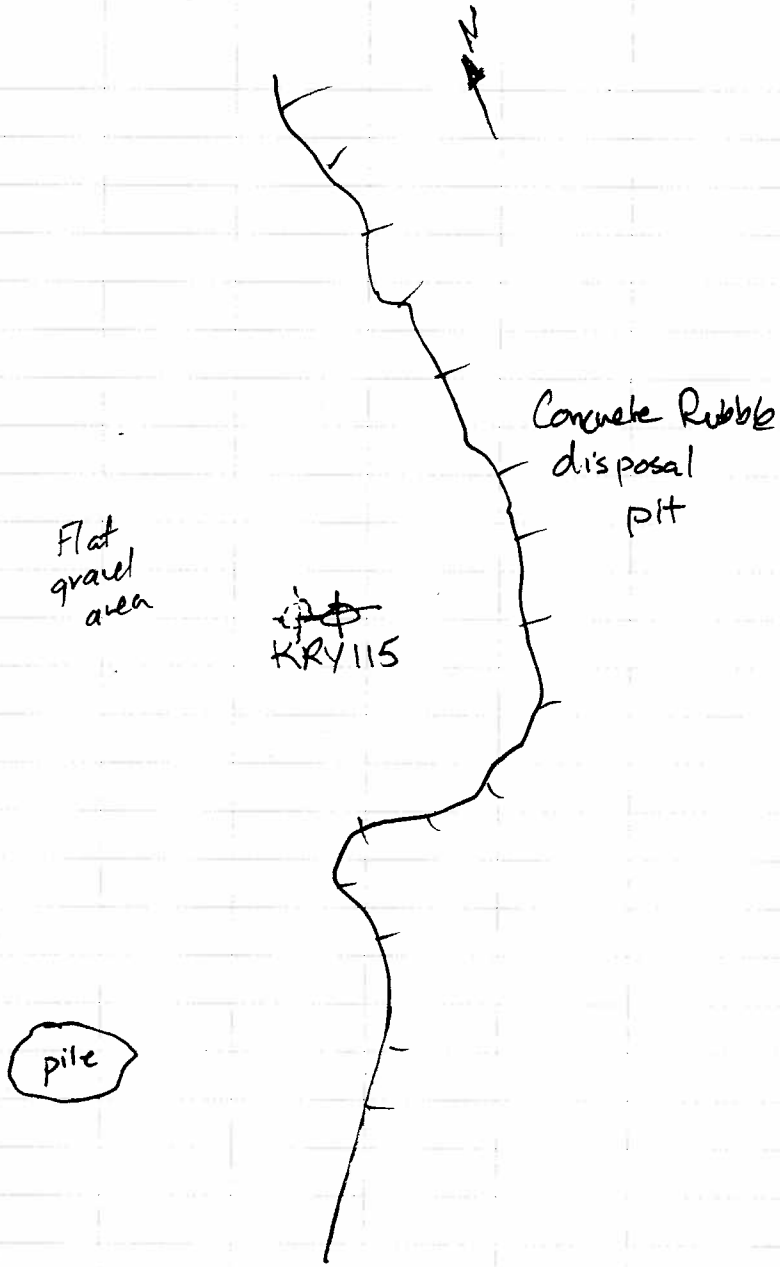
TUES

4-25-06 (cont.)

1400 - move sonic crew to next well location: KRY-115
- Nate reports illness - goes back to motel room
- Nate & Russ - decon 8" & 6" steel rest of afternoon
- assist drilling crew at KRY-138 - lithology only - very contaminated borehole

1700 - label borehole drill cuttings in decon area
- set monument surface casing at KRY 121C
- FID/PID - one machine not working

1800 - END OF DAY



KRY115B

WEDNESDAY

April 26 2006
Weather: Mostly cldy, calm, 35°
On site: D Shaller D. Donohue
S. Allewalt J. Faubion
S. Bronsdon
Cascade drilling crews - Sonic
HSA

0700 - meet at trailer area for H&S mtg.
0740 - move to site KRY115
collect: KRY115B SS001
0-2"
4-26-06 0740 hrs
2 - 8 oz jars
0800 - Sonic drillers setting up on B-zone well at KRY115
- begin drilling
- hit boulder/concrete slab @ 10' - must move hole ~5' south toward pit. drill to 35'. Rig needs repairs
1100 - drillers repairing rig. - Starter
1200 on rig engine is out. Kyle is calling to order replacement. Will be here in a.m. tomorrow. Sonic rig is down

Wednesday
April 26 (cont.)
1300 D. Shalhn assist HSA crew at sites
KRY-125
603 - at boat yard

5-2-06 - Tuesday

0730 - Warm up rig. Continue drilling from 35'. R. Laskowski - Tt EMI.
Cascade Drilling - Todd Merchom
Nate
Russ

Weather - Cloudy, rain showers 50°F
Objective - Continue drilling KRY115B and complete as monitoring well.

1600 hrs - TD hole at 122.5'
Begin pushing outer casing to TD and then cleaning out casing.
No samples collected today

1730 hrs
Drillers loading well supplies + bringing them to rig. Will set the well tomorrow.

1745 hrs - Drillers off-site,

EOD R. Laskowski

KRY115B
KRY112B

5-3-06 Wednesday
P. Cloudy 65° F
TtEmI - R. Laskowski, G. Niehefeldt
Cascade - Todd M., Nate, Russ.
0700 H+S Meet then to rig - begin setting KRY115B.

Riser	0 - 107
Screen	107 - 117
Sump	117 - 122
Sand	103 - 122.5
Bentonite seal	100 - 103
Grout	- rest of hole.

1030 hrs - G.N. goes with J. Allewalt to finish surface sampling + packing samples,
1200 hrs - Finish setting well. Mob rig to KRY112B. Being equip truck to decon area - decon casings, sampler, rods.
1400 hrs - Mob to KRY112B set up + begin drilling.
1800 hrs - down to 85'. Having trouble with heaving sands. Clearing sand out of casing.
1830 hrs - Drillers shut down + off site.
EOD R. Laskowski

KRY112B

5-4-06
Sunny 35°F in am
TtEmI - R. Laskowski
Cascade - Todd M., Russ G., Nate M.
0700 H+S meeting - then to rig.
Continue drilling KRY112B
Have to clear casing of heaving sands. Everytime they pull sample barrel, there are heaving sands. Spend time between each sample and each casing advancement clearing out heaving sands.

1330 hrs - Finish drilling KRY112B to 125'.
1700 hrs - Finish setting well. Deconning.

TD = 125'	
Screen	110-120
Sump	120-125
Sand	106-125
Bent Seal	102-106
Grout	0 - 106

1800 - Drillers off.
1830 - Off site
EOD R. Laskowski

KRY107B

5-5-06 Friday
Sunny 40°F in am
Objective - Mob to KRY107B, drill + install well.
TtEMI personnel - J. Faubion + G. Nivefeldt + R. Laskowski.
Cascade - Todd. M., Nick. C.,

0700 hrs - H+S meeting then crew mobs to 107B and begins drilling.

1600 hrs - In heaving sands.
1730 hrs - Stop drilling at 136' in clay, silt + gravel unit. Will set well next monday. Begin breaking down for the day. No samples collected for analysis.

1800 hrs - off site.

EOD R Laskowski

5-8-06 Monday
overcast, sprinkling
50's
John Ruth

Cascade crew
Todd M., Nick C.
Bill

07:00 Dan Schaffer conducts H+S meeting at field office

07:15 Sonic drill crew heads over to site KRY107B to begin installing well

07:55 Cleaning slough out of hole

08:00 Tripping drill pipe out of hole

08:30 Run PVC casing to 135'
Five foot sump from 130-135'
Pouring sandpack

09:00 Pouring sand, sand to 128'

09:25 Pipe settled to 136'
Sump 131-136 centralizers @ 131.5, 119'
Screen 121-131
Sand 117 HOSR 136 grout
Bentonite chips 114-HOSR 117

09:40 Pour bentonite chips on top of sand pack
0955 Setting up to pump grout
10:30 ~~Finish~~ adding grout
11:15 Finish completing well KRY 107B
11:30 Drillers break for lunch
11:55 Start setting up at site KRY 111B
12:20 Start drilling
13:00 Drilled to 38'
13:40 Drilled to 68' Mariah arrives
14:30 Drilled to 78'
15:00 Drilled to 98'
15:30 Mariah leaves KRY 111B site
15:55 Mariah stops by and says that we need to move barrels of cuttings ASAP from cement site to storage area
16:15 Driller dealing with heaving sands casing has 31 feet of heaving sands. Filled hole with water and will retrieve heaved sand with core barrel while adding more water. Driller's helper is picking up drill cutting drums

No returns from 98 to 108 Sloppy silts & sands fall out from core barrel

18:00 Drill crew still picking up drums. After drilling the last well in the concrete (McWilton) the monuments will need to be installed

18:05 Head to field office

Jon Roth 5/9/06

5-9-06 Dave D. Cell
Sunny, clear, frosty 46d - 0444
John Ruth (TTEMI)
Todd, Nick, Bill (Cascade)

07:00 Dave Donahue conducts safety meeting at field office.

07:20 Drillers head back to rig at site KRY111B to warm up rig

08:00 Rig is warmed up. They need to clear heaving sands out of hole before they continue drilling. Present total depth is approximately 100 feet.

08:15 Driller is pulling drill pipe out of hole and keeping the hole full of water. Drill pipe is out and there is approximately 45-50 feet of heaved sand in the casing will trip back into pull out heaved sand

08:25 Hydraulic fluid leak at vent cap. Stop tripping into hole. Shut down rig and clean up mess on rig

09:25 Rig is running and tripping in to clean hole

09:40 Tripped out and there is only about 15 feet of heaved sand left. Driller fills casing with water and trips back in.

09:50 Drilled to 118'

11:00 Drilled to 138' Dealing with lots of sediment in drill pipe while tripping out

11:15 Reach TD at 138' Encounter clay at 133 We will screen from 123 - 133 Jump to 138'

11:30 Driller breaks for lunch before setting well

12:00 Driller tripping in more casing to clean hole to bottom

13:00 Still cleaning out hole prior to well completion

13:25 Still hole cleaning, contact is at 133, trying to get hole cleaned to 138 Hole won't stay open below 134

13:45 Finish cleaning hole getting set to run PVC casing

14:00 PVC casing is in the hole
sump 133 - 138
screen 123 - 133
centralizers 134, 122

14:10 A lot of sediment is in the annulus between steel casing & PVC. Driller trying to pull back without lifting PVC

14:30 Pouring sand

15:00 Finish with sand & bentonite chips
sand 119 - 138
Bentonite chips 114 - 119

6 sacks sand
2 sacks 3/8 baleplug

Presently mixing grout

16:30 Finish grouting, clean up site, get ready to mobilize to decon area
10 sacks AQUATARD Grout

18:30 Leave field office site for motel

John Ruth 5/9/06

5/10/06
Sunny, clear, warm
Jack Roth
Todd, Nick, Bill - Cascade Sonic Crew

07:00 Dave D. conducts safety meeting at field office
07:15 Driller needs to replace battery cable on rig tender truck
09:00 Driller charging battery on rig tender truck. Still need to mobilize rig onto site KRY102B
09:45 Setting rig up on site KRY102B
10:30 Drilled to 38' Lost core from 18-38' Get lithology from shallow well log
10:40 Core barrel twists off Driller plans to leave it and plug and abandon hole and move rig and start over Cored barrel at 38' 20' core barrel 29-48'

11:10 Moved forward a couple of feet and drilling again
11:25 Drilled to 20' he will start sampling again
1:30 Drillers break for lunch
12:00 Start drilling
13:00 Drilled to 46'
Encounter loose, very permeable fine gravels and coarse sand at 40' Core barrel keeps ~~loosing~~ losing material and driller can't clean his hole to keep drilling
13:45 Drilled to 58'
Drilling in very permeable loose fine to medium gravels Driller uses some fingers inside core barrel to try to provide a sand catcher

14:30 Drilled TO 68'
15:45 Drilled TO 88'
16:00 Drilled TO 98'
16:30 Drilled to 108
17:00 Hit silt/clay aquitard at 108
17:55 Drillers leave site
Reach TD at 110'
I leave TO lock gate and head back to field office

[illegible] 5/10/06

5/11/06
Cloudy, cool
John Ruth (TTEMI)
Todd, Nick, Bill (Cascade)

07:00 Dave D. conducts morning Tailgate safety meeting

07:15 Discuss schedules with drillers

08:00 Sonic crew setting up to complete well KRY102B

08:15 PVC casing in hole
Pouring Sand
TD = 110'
Sump 105-110'
Screen 95-105'
Sandpack 91-110
5 sacks Sand

Bentonite chips
86-91'
2 sacks

09:00 Finish pouring sandpack
Pouring bentonite chips

09:25 Setting up to tremie grout

10:00 Mixing and pouring grout
10:45 Finish grouting
Start cleaning up site
Well still needs cement completion and bollards
10:55 Move sonic rig onto site KRY116B
11:15 Start drilling at KRY116B
11:35 Driller breaks for lunch
12:00 Driller returns and does some welding on the rig
12:20 Start drilling at 18'
12:40 Drilled to 38'
13:05 Drilled to 58'
13:50 Drilled to 78'
15:00 Drilled to 98'
15:45 Drilled to 118' TD
at 118 Top of clay at 105'
We plan to complete well w/ sump from 105 - 110
screen from 95 - 105

16:30 Driller stops working on the well for the day. They have to catch a plane tonight and will complete the well when they get back. Drill pipe is out of the hole and the hole is cased to 118 feet with steel
I head back to office to wash drill bags.

Arthur Ritter 5/11/06

5-16-06 - Tuesday
Tt EMI - R. Laskowski
Cascade - Todd M., Nick C., Bill M.
0700 H+S Meeting.
Sonic Crew loads equip + goes back to KRY116B to set well.

Sump 105.5-110.5
Screen 95.5-105.5
Sand 91-110.5
Bent. Seal 87-91

0930 hrs - begin grouting.
1045 hrs - finishing setting well.
Begin setting stick-ups on wells in the gravel pit.

1700 hrs - Prepping for installing bollards tomorrow.

EOD R. Laskowski

5-17-06 - Wednesday
Tt EMI R. Laskowski
Cascade Todd M, Bill M, Nick C.

0700 H+S meeting
Sonic crew putting rig into truck shop. Will being installing bollards for the day.

1730 hrs Finish for the day.

EOD R. Laskowski

5/18/06
Sunny clear
90° expected
John Ruth

Cascade
Todd
Bill
Nick

07:00 Dave Donohue gives safety meeting
07:20 Start to mobilize Sonic rig to site KRY 110 B
08:00 Still rigging up
08:05 Start drilling
08:30 Drilled to 20'
09:00 Drilled to 38'
09:30 Encounter loose fine sands from 48-58 Driller dealing with heaving problems
10:00 Drilled to 68'
11:10 TD @ 95' Hit clay at 89.5
11:15 Drillers break for lunch
11:50 Driller starts to build well
13:10 Steel casing breaks at 30'
13:30 Tried to pull PVC casing but it sheared off

The plan is to pull out the 30' of steel casing that broke off. Fish 70' of steel casing to surface then go back in and drill out plastic and 30' to bottom and rebuild new well in same borehole

15:00 All of the plastic is out of the hole. Driller trying to get back to bottom and get hole cleaned out.

16:15 Finish drilling out hole get ready to run PVC casing

16:30 Tagged bottom and hole legs then 90 feet deep. Trip back in to clean it out some more.

17:05 Ran PVC. Hole came in. Could only get PVC to 91.

So: Sump 86-91
Screen 76-86
Sand 72-91
Bentonite chips 68-72
grout 1-68

6 sacks sands 1½ bags chips

17:30 Finish pouring sand pack
Pouring chips

17:50 setting up to pump grout

[illegible] Driller leaves site

EOD

John Ruth
5/18/06

5/19/06
Cloudy, cool
Sprinkling
John Ruth
Cascade - Nick, Bill, Todd

07:00 Site safety meeting by Dave D.
07:15 Driller move off site KRY 110 B.

0805 Setting up at KRY106B
09:00 Drill to 6'
09:30 Drilled to 16'
09:50 working on rig for past 20 minutes
1005 Start drilling again
10:25 Drilled to 38' raining
10:55 Drilled to 48'
11:40 Drilled to 68'
12:00 Drilled to 78'
12:15 Drillers break for lunch
13:00 Drillers return and work on dead ~~rig~~ battery on tender truck

13:15 Start drilling
14:15 TD @ 88' Encounter
Clay at 83'
Completion plan is:

Sump	83-88
Screen	73-83
Sandpack	69-88
Chips	65-69
Grout	0-65

14:30 Cleaning out borehole
To get ready for completion
15:15 Pouring Sand
15:45 Pouring Grout
16:20 Finishing grouting Start
Cleaning up site To ~~move~~
17:30 Sonic crew moving move.
drums and deconning pipe
The plan is to drill KRY101B
Tomorrow

EOD

John Ruth

5/20/06
66's, overcast, cool
John Ruth
Cascade Crew: Todd, Bill, Nick

08:00 Site Safety meeting at
field office Then move
Sonic rig to site KRY101B

08:40 Electrical problems on
rig tender
09:55 Drilled to 38'
10:10 Drilled to 48'
10:30 Drilled to 68'
11:10 Drilled to 80'
11:15 Break for lunch
12:00 Start drilling again
13:15 Nick smashes his finger
with the hammer while
pounding drill pipe to clean
out kuttings!
13:45 Drilled to 98'. Dave
D. takes Nick to the hospital
right after it happened

15:00 TD @ ~~40'~~ R
(40) 105'

15:05 Start building well
16:30 Start to set up to grout. The last 20 min we had to wait for a downpour with lightning to pass through.
KRY 101B is being completed as follows:

sump	95-100
screen	85-95
sandpack	81-100
chips	77-81
grout	0-77

17:15 Driller quits for the day need to let grout set before cementing flush mount well completion. I head back to office

EOD

John Ruth
5/20/06

5/21/06
Sunny, clear, 60's
John Ruth
Cascade Crew: Todd, Nick, Bill

06:15 I arrive at site to meet drillers
06:50 Drillers arrive
07:00 J. Ruth conducts site safety meeting. Nancy G. is present for meeting
07:10 Drillers need to cement flush mount casing, decon pipe and move drums before moving to KRY113B
09:20 Finish piped decon getting setup to drill
09:30 Start drilling at KRY113B
10:40 Drilled to 18'
10:50 Stop drilling to tighten some hydraulic fittings
12:10 Drilled to 38' Drillers break for lunch
12:50 Start drilling
14:00 Drilled to 58'

Tough Time keeping the hole cleaned out. The interval from 29-58' is very clean well washed sand and gravels and appears to be very permeable

14:45 Drilled to 78' still drilling in permeable gravels

15:00 Drillers welding on rig

15:20 Start drilling again

16:00 Drilled to 98'

16:40 TD at 118'

16:50 Drillers and Nancy leave site. I stay to run samples.

17:10 Leave drill site for office

17:30 Leave field office

EOD

John Ruth
5/21/06

5/22/06
Cloudy, cool
John Ruth
Cascade Crew: Todd, Bill, Nick

07:00 Jessica conducts site safety meeting.

07:45 Sonic crew setting up to complete well KRY113B. Running drill pipe into borehole to clean it out. Drilled to 120' while cleaning

09:40 Pumping grout well completed as follows

Sump	112-117
Screen	102-112
Sand	98-120
Chips	94-98
Grout	0-94

10:30 Pulling casing, mixing grout

11:20 Rig Tender Truck rolls off site. Drillers break for lunch

12:00 Drillers back to decon
13:10 Decon finished. Mobilize
sonic to KRY103B
13:25 Start drilling
14:00 Drilled to 28'
15:00 Drilled to 68'
15:45 Drilled to 79' to make
sure we had hit the clay
contact
The plan is to complete
the well as follows
sump 64-69
screen 54-64'
17:45 Finish grouting
well is completed as
follows

65-70	sump
55-65	screen
50-70	sand
46-50	chips
0-46	grout

Hole collapsed back to 70
while cleaning casing prior to
running PVC pipe

I and Brian scoped out
Pacific Steel & Western Bldg
sites for later this week.
Pacific Steel said they would
clear out our drill area
by noon tomorrow.
Western Bldg site was
clear and ready to go
17:50 Driller & crew leave site
for the day
18:30 Leave office site

EOD

John Pitt
5/22/06

5/23/06
Sunny, clear, warm
John Roth
Sonic Crew: Todd, Bill, Nick

07:00 Dan S. conducts site safety meeting

07:15 Drillers leave to cement all remaining monuments

07:30 I work with Brian on field meters, water level probes.

08:00 Work with Dan Lowrie from Cascade who will do well development. Sneal truck needs new clean cable and everything is deconned

11:00 Start with Dan & Brian on developing well KRY116A - See well development field Book

13:15 Coordinate with Randy at Pacific Steel to get the last junk moved out so drill rig can set up

13:45 Drill rig setting up at KRY128B

14:00 Start drilling

14:30 Drilled to 28'

14:45 Drilled to 38' Drill rig needs repair

15:40 Still working on repairing rig

16:00 Start drilling again

16:20 Drilled to 48'

16:35 Drilled to 58'

16:50 Rig needs more welding on break out jaws

17:15 Back to drilling

17:25 Casing to 58' cleaning out inside of casing

17:40 Driller leaves to move drums. Crew leaves site

5/24/06
partly cloudy, cool
John Ruth
Sonic Crew - Todd, Bill, Nick

07:00 Brian A conducts site safety meeting.
07:15 Drillers head to site KRY 128B and start warming up rig
07:20 Start drilling
08:00 Drilled to 78'
08:25 Drilled to 88'
08:50 Drilled to 98'
09:20 Drilled to 108'
09:45 Drilled to 118
10:15 Drilled to 128'
10:50 Drilled to 138'
11:00 Drillers break for lunch
11:35 Start drilling again
12:25 Drilled to 148' welding rig, hardfacing breakout jaws we still haven't hit clay contact
13:45 Start drilling again, welder broke

14:20 Drilled to 158'
15:25 Drilled to 160
Hit clay silt at 158 and it was totally dry

16:00 Setting up to complete well
Tripping out of hole
16:15 Run PVC

Sump 155-160'
Screen 145-155
Sandpack
Chips
Grout

16:30 ~~Runn~~ Placing sandpack in hole
17:10 Pouring sandpack, moving drums
17:20 Still adding sand I leave to pump drill water
18:30 Leave site EOD

5/25/06
partly cloudy, cool
John Ruth
Sonic Crew: Todd, Bill, Nick

07:00 Brian A. conducts safety meeting
07:15 Sonic crew checks out pipe supplies and heads back to keep completing well KRY128B. They still needed to finish sand pack, adding chips, and grouting. This well will be a flush mount. We then plan to mobilize to site KRY122B behind Western Building Center.
08:30 I talk with Roy and Craig about setting up and leaving the rig there over the holiday weekend. Craig said that was fine.
We also talked about Craigs plans for paving near the well sites.

Craig plans to pave at the gate area but not at where the wells will be located. He was fine with us building a slightly elevated mounded and sloped flush mount completion.
09:00 I pick up supplies at grocery store (paper towels & bags and head back to office.

10:30 Sonic rig starts to decon well KRY128B is grouted. They need to go back later today and cement flush mount completion after grout has had time to set

11:30 Deconning Sonic rig
13:00 Mobilize Sonic rig to site KRY122B
13:20 welding on jaws
13:30 Spud in
13:50 Drilled to 18'

14:30 Drilled to 28'
15:40 Drilled to 58'
16:00 Drillers done drilling for the day. They head back over to KRY128B to cement flush mount completion. I head over to ID wells.

16:50 Drillers finished cementing monument at KRY128B.

17:00 Everyone leaves site.

EOD

John Rust
5/25/06

5-30-06 Tuesday

1315 hrs - R. Laskowski, J. Allewalt arrive on site, Sonic crew already arrived + getting equip. ready.
Sonic Crew - Todd, Nick, Bill.
Will continue drilling at KRY122B from 58'.

1600 hrs - Have TD at 98' in clay/silt confining unit. Begin putting casing down to TD.

1700 hrs - KRY122B

Sump	93-98'
Screen	83-93'
Sand	79-98'
Bent. Seal	75-79
Grout	1-75

Flushmount surface completion

1745 hrs - Drillers finish at putting in sand pack. Will complete well tomorrow. Had to leave - Building Center was closing for the night.

1800 hrs - off site

5-31-06 Wednesday

0700 hrs - H+S meeting.
Sonic Crew - Todd, Nick, Bill
TtEmI - R Laskowski

0730 - Sonic crew finishing completion of KRY122B.

0945 - Finish setting KRY122B - completion data on page 54. Breaking down + going to decon. After decon - crew breaks for lunch (mob over + set up on KRY125B first).

1215 hrs - Drilling KRY125B.

1330 hrs - Down to 58' - Todd + Bill go back to finish flushmount on KRY122B. Nick - welding grip plate on drill deck.

1600 hrs - Down to 98'

1800 hrs - Down to 138' in clay. End of core barrel snapped off. Hole caved to 118'. Will clear hole ~~tomorr~~ RL tomorrow morning. Breaking down for the day.

EOD RLaskowski

6-1-06 Thursday

0700 H+S Meeting
Sonic crew - Todd, Nick, Bill
TtEmI - R. Laskowski

0730 - Attempting to clear hole back down to 127'.

0830 - Cleared down to 126.5' Begin setting well.

1030 - Finished setting well, loading equipment for mob to decon (not finished) - just pulling casing + still pouring grout)

1145 - Mob over to decon

KRY125B
Screen 116-126'
Sand 112-126'
Seal 107-112'
Grout 1 - 107'
Flushmount Surface Completion.

1400 - Mob to KRY118B then go finish flushmount at 125B

1500 - Begin drilling KRY118B

1815 - Stop drilling at 98'

EOD RL

6-2-06 Friday

0700- H+S Meeting
Sonic Crew - Todd, Nick, Bill
TEMI - R. Laskowski

0720 - Back to KRY118B - continue drilling.

0820 - Finish drilling down to 115'
Begin setting well.

1130 - Finish setting KRY118B

Sump	105-110'
Screen	95-105
Sand	91-115
Seal	87-91
Grout	ø-87

Flushmount Surface Seal.

1330 - Finish decanning. Drillers go set flushmount at KRY118B.

1400 - Getting ready to mob to KRY130B at Kari Dodge. J. Faubion takes over on Sonic Rig - R. Laskowski is leaving for Helena. R. Laskowski

1440 Spud KRY 130B

1615 Breakdown (hydralics) 40'

1700 EOD

J- [signature] 6-2-06

6-3-06 Saturday

0700 Sonic Crew repairing rig - hydralic problem repaired 1400

1430 Restart, begin drilling from 40'.

1800 EOD drilled to 158', rig seems ok.

J- [signature] 06-03-06

6-4-06 Sunday

0700 Begin drilling 130B

0830 contact consolidated clay unit 163' drill to 169 T.D., begin construction.

1300 130B construction complete

1400 Rig off site, EOD.

J- [signature] 06-04-06

Completion

169' T.D.

1020 2" PVC screen 163'-153'

4.5' Tail pipe, .5" endcap

Bottom of well 168'

lost 1' in completion

163 Top of consolidated clay unit

6/5/06
Sunny, clear - partly cloudy
John Ruth
Sonic Crew - Todd, Nick, Bill

07:00 Joe conducts safety meeting
07:20 Driller's head over to Town pump to start drilling at KRY 129B Rig is all set up and ready to drill
08:30 Drilled to 58'
09:45 Drilled to 98'
10:20 Drilled to 118'
12:00 Drilled to 138'
14:00 STOP drilling at 142' This hole has been almost entirely clay and the driller is concerned as to whether he can pull his casing out without breaking it. We tagged the gravelly silty clay at 138' and recovered 138-142'

The clay was moist and not the dry hardpan but the driller was having trouble drilling and advancing casing. He said this was all the farther he could go. I had him drill down to 142 so we will see what is in the 140-142' core

14:10 Pull out core from 140-142' It shows we are in the dry, stiff hardpan clay silt. TD hole at 142'

14:15 Run PVC pipe. Bottom of sump at 140' Start pouring sand
14:45 Finish pouring sand setting up to grout
16:00 Finish grouting

KRY129B JR

	sump	~~135-140~~	137-142
	screen	~~125-135~~	127-137
bent	chips	~~118-122~~	118-122
bent	grout	~~0-118~~	0-118
sand		~~122-140~~	122-140

15:15 Mixing grout
16:00 Move rig off hole
Clean up site
16:30 Try to figure out if walmart is still a 4 inch well Drillers mobilizes back to decon area
17:15 Loading larger casing for completing a 4 inch well at KRY139B in walmart parking lot. Road to KRY131B was to greasy from recent rain to safely get the rigs down the hill.
17:30 Decanning Rig & pipe

Joe went to call U-Dig to get a utility check on a different location sited for well KRY131B The new location would be directly across from old location on south side of walmart parking lot based on discussions with Dave D.

18:00 Joe didn't call U-DIG so I did. CAN NOT dig before June 8th Thurs
Ticket # 0606052716
Mark site at walmart

18:30 Leave office for day

EOD

John Roth

6/6/06
Clear, Sunny, 70's
John Ruth

07:00 Everyone attends H&S meeting
07:30 Drillers getting up at KRY 139B in Walmart parking lot
07:45 Drilled To 18'
08:30 Drilled To 38'
10:50 Drilled to 66
11:30 Rig Problems Drill head wont go up or down Cables may have broken Driller needs To lay down mast
16:30 Rig still down, Rig moved offsite for repair
16:45 Leave

EOD

John Ruth

6/7/06
Sunny, clear, 90's
John Ruth

07:00 Arrive at Office, Roe H&S with Joe & Jessica and Dan

07:15 Rig is down for the day for repairs. I go over and flag off exclusion zone To a bigger size so rig can get back in

09:15 I talk with Brian at Walmart (assistant manager, Julie was gone for today) and updated him on the rig situation

17:30 Worked on well log spreadsheet Today and prepping for GW sampling. No work on rig

EOD

John Ruth

6/8/06
Cloudy, raining

- Sonic rig in repair Shop. Rig was repaired and put back together and cylinder was leaking. Tear it apart again and get it repaired.

EOD

John Ruth

6/9/06
Sunny, Clear 70's
John Ruth

07:00 H&S Safety meeting Nancy attends.

07:15 Sonic crew at Walmart site setting up to drill

07:50 Drilled to 88' ~~SR No recovery~~. Loose wet silts

08:30 Drilled to 88 Cased to 88' Run tag line and sloppy silts are up to 67' Core barrel won't retain sample and difficult to clean soupy silt out of hole All of the silty materials become real saturated with water standing in the hole for two days. Driller puts on

a different bit sub to try and clean hole.

10:45 Drilled to 118 Drilling in sticky silty clays and clayey silts
Drillers take lunch break
11:15 Start drilling
12:00 Drilled to 138'
12:30 Driller says he can't go any further with the big casing in these sticky clays. The plan is to reduce the casing size and build a 2-inch well. Driller needs to go back to the field office and load on smaller casing
16:00 Start drilling again
Spent the last 2½ hours tracking down some 2-inch PVC pipe to complete this well
Okeefe drilling had a trailer

of pipe behind the Elko Lodge and Dave Crawley the driller told us how to break into the trailer and bypass the locks

16:30 Tripping into hole
6-inch casing is inside the 8-inch casing
presently 8-inch casing to 122'
17:15 Drilled to 158'
It appears we may have hit the aquitard contact at 157' The sample was still moist and not the bone dry hardpan.
We drilled through silty clays right to the apparent contact. Some of the clays were very soft and wet but we didn't see any coarse granular material

not the contact

above the contact. We are going to drill 10 more feet to make sure we are truly at the contact. This well would probably make very little water.

17:30 Drilled to 168' Encounter sand and gravels at 162'

18:00 Driller stops for the day. Drilled to 178' Still drilling in sands & gravels we haven't hit dry aquitard contact yet

19:30 Finish running samples secure site. Drillers went to pick up PVC from O'Keefe trailer

6/10/06
raining, socked in
John Ruth

06:30 Meet drillers at rig
Trip in to drill below 178'

08:30 TD at 188'
Hit aquitard contact at 187' Driller has tripped out and is running PVC into hole
START building well
RAINING!

09:30 Setting up to grout
PVC pipe went to 181 feet
well completion is:

Sump	176-181
Screen	166-176
Beach Sand	162-181
Bentonite Chips	158-162
Grout	0-158'

10:00 Tripping 6 inch steel casing out, still grouting

10:30 6 inch casing out of the hole - 8 inch casing is down to 122' and is stuck tight

10:50 8 inch casing is coming out of the hole but it is tight

11:15 Still pulling 8 inch casing and grouting

11:45 Finish grouting start cleaning up site

12:15 I leave to check out of motel and head back to field office

13:35 Leave field office. Drillers will cement flush mounts at 129B & 139B

EOD

John Ruth

April 18, 2006 → 7

45A R19

"Rite in the Rain"®
ALL-WEATHER
FIELD
No. 350

KRY-LOGBOOK 3
Kalispell Pole + Timber,
Reliance, + Yale Oil
facilities
Kalispell, MT
FIELD ACTIVITIES
TETRA TECH EM INC

4-18
KRY 610 + 611 (refusal)
4-19 KRY 617 (

Joe Faubion
Geoff Neufeldt
50°F
clear - sunny

18 April, 2006
0700 Meet w/ Cascade @ breakfast
0800 on-site reliance
- Cascade site mob, drums, offload equipment
1400 setup on KRY 610 SB at Reliance site
1500 Advanced auger to 6', refusal
- limited recovery 0-3.5'
1530 move off original KRY 610, redrill at site 15' south of original location
1600 refusal 2nd try KRY 610 at 6' (boulder) - decision to try at KRY 611
1625 setup on KRY 611, refusal at 6' again on staked site, move north 10', redrill - refusal at 7'
1730 CME HSA rig off KRY 611 after 2 refusals, discuss tomorrows plans w Jesse (driller) and D. Donohue - to move onto staked sites north of fence
1900 off-site

04-18-06

Joe Fabiano
Geoff Wright
clear-cutting

19 April 06 Wed

0710 on site Rehoboth / KPT
- safety meeting, gather gear, discuss plan for day

0730 mob to SB617, set up - project 25' TD

0745 refusal at 4', move 10' west of staked location

0815 1st split spoon SB617 20% rec. 0-3.5

0930 S. spoon 3.5-8.0 5% rec., rocks in shoe

0940 8.5'-13.5 KRY617 SB001 8.5-13.5 0940

1000 13.5-18.5

1010 T.D. 25' KRY617

1100 Setup on KRY-616

1130 KRY 616 SB001 4-6' bgs > For analysis

1145 KRY616 SB002 8-10' bgs 12' TD. 1230 on KRY 119

1220 KRY 119 10-15' 100% rec in clay - no SB

1250 15-20 75% rec in clay - sand

1425 20-25 80% rec in f.w. gr sands

1500 27' T.D. install piezometer (2", .020 slot)
SWL ± 9.5' bgs
20' screen 25-5'
riser 5-0.3' ags
15½ bags 10-20 colo. silica sand 25-3' bgs
bentonite 3.0'

1600 piezometer const. complete

1615 Drillers offsite to get concrete for finish

19 April 06 (cont.)

1700 Cascade helper clean-up & prepare for surface completion

KRY-119 soil headspace PID / FID

10-15' bgs	~~0 ppm~~ JF	58 ppm	12
15-17	127 ppm		48
17-20	152 ppm		120
20-24	12 ppm		-0-

KRY

SB 617	PID	FID
8.5-13.5	90 ppm	12
13.5-18.5	245 ppm	212
23.5-25	110 ppm	58
18.5-23.5	135 ppm	105

KRY 616	PID	FID
4-6	7	0
8-10	24	18

1730 Confer w/ Cascade drillers and scout next boreholes

1800 KRY 119 piezometer SWL 9.7' bgs

1830 drop off gear at office trailer
clean up & drop off decon water - offsite

04-19-06

Joe Fashion
Geoff Nixfield

20 April 2006 Thurs clear-warm

0700 Tailgate safety meeting
0730 gear up for day - Cascade moves yesterdays drums in Release site around.
0740 Mob onto KRY-117 piezometer location. Refusal at 6' 1st setup
0830 move 5' south of staked KRY 117 for re-drill
0930 Advanced to 7', augers grinding on coarse gravels
1015 End of ese gravel 9.5', quick advance to 15' (3rd auger flight)
- spoon 10-15' 25% recovery in intercalated grey/green clays (10-11)
- med gr. well sorted sands + ↑ (11-15)
1040 spoon 15-20 well sorted green silica sand. (70% rec.)
1200 20-25 (90% rec.) in med gr. sands - fining downward
1215 25' T.D. KRY 117
completion: screen (.020 2" PVC) - 25'-5'
riser 5-0'
19 bags 10-20 colo silica sand 25-3'
3 bags 3/8 bentonite chips 3-0
- stickup 3.23' ags
- no analytical samples

20 April 2006

1300 KRY 117 surface completion done
- Jesse (Cascade) needs to unload 2 semis bentonite chips & sand, do site prep at NE cor release site, assorted errands and job prep tasks. Decision to complete no further HSA drilling today to give crew time for that.
- Joe and Geoff begin plumbing dewater trash pumps and transfer drummed water to settling tanks
1500 Assist cascade in unloading & site prep. through afternoon, transfer pumps up & running.
1500 - EOD Various data tabulation & equip. calibration, etc.
1900 EOD - off site

117
KRY FID Headspace
10-15 - 171 ppm
15-20 - 66 ppm
20-25 - 49 ppm

04-20-06

21 April 06 Friday : clear-calm

0700 onsite Reliance, tailgate safety meeting & prep for day's drilling activities

0710 1st auger flight to 4', spoon at 4-5 (1' barrel), again 5-6' KRY612 - composite sample for std. analytical suite + dioxin

			612 headspace FID
0750	KRY612 SB001	4-6'	4-6 -0-
0815	KRY612 SB002	8-10'	8-10 -0-

0830 TD KRY612 10' - mob off hole, rig decon for SB607

0845 Mob onto SB607

1000	KRY607 SB001	0-6"	1000 * MS/MSD
1005	KRY607 SB002	.5-1.0	1005
1007	KRY607 SS003	1.0-2.0	1007
1020	KRY607 SB001	4-6'	1020
1115		11-15	
1130	~~KRY607 SB002~~	15-20	T.D.

KRY607 SB002 15-18 1140

1140 15-20' wet SWL 14.5

607 Headspace FID PID

4-6	-0-	-0-
8-10	-0-	-0-
11-14'	-0-	-0-
15-20'	2.5	-7-

4-21-06

KRY123 SS001 0-.5' 1302

KRY123 SB001 4-6' 1400

KRY123 SB002 ~~18~~ 20-25' 1600

KRY123 ~~SB002~~ Headspace

4-6	-0-	8-10	-0-
15-20	-0-	10-15	8 ppm
20-25	2 ppm		

J-2

4-21-06

22 April 06 Saturday clear-mild

0930-1700

- At reliance site, organize office trailer w/ shelves, re-organize equipment & clean up

- no visitors, no Cascade activity

J. R. 04-22-06

23 April 06 Sunday clear AM rain PM

- Finish office organization, build workbench in water treatment shop, acquire PVC fittings at Home Depot

- Fasten ozone treatment unit to floor in water treatment shop

J. R. 4-23-06

clear - calm
50°F am

24 April 2006 Monday
0700 on site KPT, safety meeting & discuss plans for week w/ drillers 0-6" .5-1 1-2
0730 set-up on KRY-415 - NE corner relieve site 0-10'
0830 set up on KRY 135
- LNAPL monitoring site, no SB sample good downhole recovery 1-25', highly contaminated throughout - 5' ± 10'
1045 TD KRY135 25'
- mixed sand gravel/clay 0-10
- gravel/sand 10-11
- homogeneous glacial clays w/ more sand lenses 11-25' TD
KRY 135 construction
(20') .020 slot screen 25-5' bags
(17 bags) 10-20 colo. silica sand 25-3'
riser 5-0
(4 bags) Bentonite seal 3-0' stick-up

Headspace KRY135

	PID	FID
0-5	69	17
10-11	42	29
11-12	42	36
12-13	47	3
13-15	40	7
15-17	44	77
17-20	47	144
20-24-25	22	17

1300 KRY610 1300-1330 refusal 6'
1320 4-6
1400 8-10' 2nd try west loc 12' sw stake
1420 Down 12' slow advance
- refusal

Headspace 610

	PID	FID
46	32	290
8-10	135	860

KRY 136
samples
1450 KRY 136 SB001 - std + metals 4-6
~~1520 KRY 136 SB002 - std + metals 8-10~~
1700 KRY 136 SB003 - std + metals + SPLP
1545 KRY 136 SB002 11-13' 23-25

KRY136 Headspace

	PID	FID
4-6	.37	-18
8-10	-0-	-0-
13-14	16	34
18-20	55	114
23-25	40	123
34-35	36	213

25 April 06 Tuesday clear-calm

0700 on-site KPT - safety meeting, discuss order of events for day

- Cascade needs to repair decon sprayer hose before mobing onto KRY 618

0845 set-up on KRY 618

KRY 618 SS001 0-6"

KRY618 SB001 ~~[illegible]~~ 940 4-6 ft.

KRY618 SB002 955 8-10'

1030 T.D. KRY 618 20', med. gr. sands

- borehole location backfilled w/ 15-20' 3/8 bentonite chips 20 - surface

KRY 618	PID headspace	FID
0-6"	-0-	-0- ppm
2-4'	13	-0-
4-6'	32	-0-
6-8'	31	-0-
8-10	32	-0-
10-15	34	4 ppm
15-20	31	-0-

1045 mob to KRY 137, shallow LNAPL mw

4-25-06 (cont)

1105 Begin KRY137, no geochem samples - to drill 25' & install MW

- coarse gravel + soil 0-7, cohesive clays 7-20' (locally petro stained) 80% clay 20% v.f.g. sand 20-25'

- wet at 10.8 - bag & chill KRY 137 SB - 8-10' bgs for possible

KRY 137 Headspace	PID	FID
0-5	25	0
5-10	28	0
10-15	30	53
15-20	33	62
20-25		

1300-1400 construct KRY 137

25' T.D.

20' .020 PVC 2" screen 25-5'

12 bags 10-20 colo. silica sand pack 25-3'

3 bags bentonite 3-0'

stick-up completion

* SPLP - 1

25 April (cont.)
1400 - 1500 prep drillsite (KRY 138) & decon.
1520 spud KRY 138 - projected 35' T.D. - decon trailer on site 1540,
1530 Coarse gravels, auger is advancing slowly. 20% recovered in split spoon samples 0-5, 7.5-15. Coarse subrounded gravels, no stain or odor
1545 20-25 floating product in water, pervasive staining in sample
1600 Drilled to 25'
1430 T.D. 35

KRY 138 Headspace

	PID	FID
0-5	14	0
7.5-15	1	0
15-20	~~0~~	~~0~~ 43 97
20-25	115	440
25-30	23	38
30-35	27	49

- construct 25' mw KRY 138
1600 KRY138 complete
20' .020 2" PVC 25-5 riser 5-0, 18 bags 10-20 colo. silica 25-3, bentonite 3-0.

J-2
4-25-06

26 April 06 Wed.
0700
0730 Mob to KRY 606 at Office Max - set up to cut asphalt, 1.5' coarse gravel fill, good exposure of original surface after asphalt removal.
0830 KRY 606 SS001
0845 KRY 606 SB001 4-6'
0920 KRY 606 SB002 8-10'
0940 KRY 606 SB003 13-15 T.D.

KRY 606 Headspace

	PID	FID
0-6"	3ppm	Ø
3-5'	1 ppm	Ø
5-7'	32	135
9-10'	26	97
13'	222	1365
13-15'	35	425

1000 spud KRY 605

KRY SS001	1015	0-6"
605 SS002	1017	6"-12"
SS003	1019	12"-24"
KRY SB001	1025	4-6'
605 SB002	1035	8-10
~~SB003~~		NO smear zone sample

1030 Drive 5-10' auger flight
- 20% recovery in coarse gravel + sands

KRY 605 Headspace

	PID	FID
0-6"	5	Ø
6-12"	7	5
12"-24"	8	16
4-6'	2	Ø
8-10'	13	Ø

1200 spoon 11-13 no recovery, CSE gravels, to attach 4 auger & spoon 15-17

1240 refusal at 15', hammer s. spoon 10 mins - no recovery

1340 Setup on KRY-125A at Rocky Mountain Marine
- to drill 35', construct shallow monitoring well
- no soil samples.

1400 spoon 4-6 in green/grey to black silty clay loam soil

1420 spoon 8-10, 10% recovered

1440 18-23' 5% recovery
- cohesive clay - SWL ±19' 10YR 5-1

1440 spoon 25-27 - 1% recovered in cohesive clays 10YR 5-1

1450 spoon 30-35, 10% recovered in v. fg. sands

1500 Begin construction KRY 125A
25' TD.
20' .020 2" PVC screen 25-5'
riser (blank) 5-0
flush mount construction

KRY 125A Headspace ppm

	PID	FID
4-6	4	-0-
8-10	1	-0-
13-15	13	-0-
17-23	21	-0-

SWL 125A 15.15 bgs

1610 Setup on KRY 603

Samples KRY 603 SS001 0-2" 1545
KRY603 SB001 4-6' 1630
SB002 8-10' 1645
SB003 19-20 1735

4-26-06 (cont)

KRY603 Headspace PPM

	PID	FID
4-6	.75	-0-
8-10	.44	-0-
10-15	4.8	3.8
19-20	6400	502

1730 spoon 19-20, coarse gravel + sand, saturated strong odor & staining

1735 EOD - to leave HSA rig and equip. in Rocky Mtn. Marine yard overnight.

1740-1900 At Reliance site (office) - rinsate sample for surface samples, organize samples & clean-up.

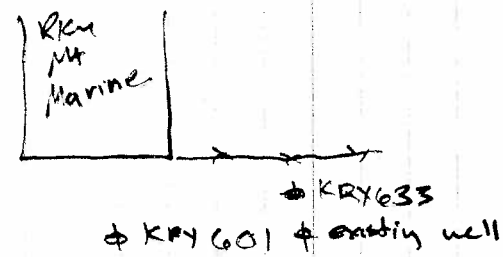
1910 off site

J. R.
04-26-06

THURSDAY D. Shaller

April 27, 2006

0715 - on site H.S mtg
- drill rig is on Rky Mt Marine at KRY601
- soil boring at west side of lot



0820 - sample: KRY5501

0835 KRY601SB01

0845 KRY601SB02
- sample driven from 19.0-20.0' had definite petro odor -

0935 - KRY601SB03

1000 - move rig to additional soil boring site KRY633 - closer to former excavation area

1010 - Sample: KRY633501 0-2"

1020 - " KRY633SB01 4-5'

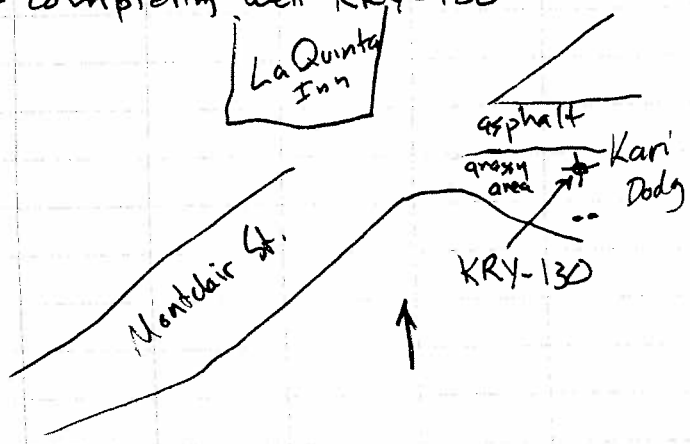
1045 " KRY633SB02 9-10'

1130 KRY633SB03 20-20.3

Thursday
4-27-06 (cont.)

- 1310 - move rig to decon area to wash off HSA rig.
- 1400 move to KRY 130 - drill & install one monitoring well
  - encounter fat clay unit from ~15 to 30' bgs. DRS & DD discuss how to complete this well. Water producing zone will be 30 feet & below. Decide to drill to 45ft and install 20' of screen from 25-45'.

1700 - completing well KRY-130



- move former decon water IDW drums

1800 - End of DAY

FRIDAY
April 28, 2006

D. Shaffer
D. Donohue
S. Broesder

Weather: Sunny, calm 48°

-0700 - mtg at trailer H&S sign
-0730 - HSA rig & crew:
- complete flush-mount surface at KRY130
- build decon pad w/ sand beneath plastic
- decon rig
- install starter on sonic rig.

Crew to lv today - noon.

- C of C equipment blank sample
- leave completed borehole logs in file folder w/ D.D.

rain - cool
A.M

02 May 06 ~~Monday~~ Tuesday

Joe Faubion
John Ruth
Jessica Arliorta

0700 Safety meeting

0730 Mob onto KRY 111A on gravel pit site

0745 KRY 111A SS001 0-2"
0800 KRY 111A SS002 6-12"
0805 KRY 111A SS003 12-24"

PID / FID Headspace 111A

0-2"	14ppm	-16ppm	
6-12"	9	-16	
12-24"	13	-9	
2-7'	15	-10	
7-9'	13	-10	T.D. 35' bgs
9-12'	46	1	25 mw
12-14	42	9	SWL 111A 16.2 1325
14-19	35	10	

0945 Complete KRY 111A
1030 Move onto KRY 647 - 15' soil boring
11:00 Drilling at 5'
11:25 Drilled to 15', Moriah & Colleen arrive on site @ 10:40
11:40 Decon augers
12:00 Break for lunch

12:20 Setup new TOC KRY 650
13:50 Drillers return and set up to drill at KRY 650
14:00 Start drilling
14:25 Drilled to 10'
14:35 Split spoon 10-12'
15:10 TD at 20'
15:30 Mobilize rig to KRY 107A
15:55 Start drilling at KRY 107A
17:15 Drilling at 25'
17:30 Stop drilling at 35' Start to complete shallow monitoring well
17:55 Pouring sand pack
18:15 Finish completion Still need to cement protective casing
18:25 Leave site for office

John Ruth 5/2/06

May 3, 2001

Jessica
Jim Roth
Randy

07:00 Randy conducts tailgate safety meeting

07:15 Augerrig setting up at site KRY112A

08:30 Start drilling Calibrate OVA
08:20 Drilling at 25'
08:30 Drilled to 30'
08:35 TD @ 35' Begin constructing well
09:30 well completed except for cementing protective casing
09:35 Mobilized auger rig to site KRY104A
10:10 Still setting up to drill at KRY104A
10:25 Drilled to 10'
10:40 Drilled to 15'
11:00 Met refusal at 16' Move rig forward 10' and redrill
11:10 Plug and abandon 1st borehole with bentonite chips
11:30 Start drilling again

11:55 Drilling at 13' Very tough slow drilling in dense gravels & cobbles

12:05 Stop drilling at 15' Drillers break for lunch

12:45 Try drilling again
13:00 Met refusal at 16' Plug and abandon borehole with bentonite chips
13:45 Move 20' north from second hole (Both plugged holes are south of 3rd hole

14:30 Drilled to 25' Drilling in sandy silty gravels & cobbles Drilling without center coring tool
14:35 Pull back augers and knock out plug to put coring tool back on so we can see water when we hit it

15:20 Drilling again with core barrel at 20'

15:35 Drilled to ~~35~~ JR 23' Moist at 23'

15:45 Drilled to 29' Spoon is wet at 27'

16:30 Drilled to 39' Augers getting very tight. Driller concerned about sticking or twisting off augers. May not be able to drill much further.

16:40 Drilled to almost 41 feet Driller doesn't want to drill any further due to very tight drill string. He wants to get out of hole before something breaks.

16:40 Start completing well screen from 20-40' Add ~~a few~~ JR 5-10 gal of water to get screen down due to sand heave.

17:30 Still adding sand pack

17:55 Finish completing well except for concrete work Head back to office

18:15 Leave Site

[illegible] 5/3/06

May 4, 2006

Sunny, clear
50-60°

John Ruth
Jessica
Al @ wait

07:00 Conduct site safety meeting at office
07:10 Driller goes for fuel & water
Move equipment to site
KRY 115A
07:30 Jessica and I try to find location KRY 102A

09:00 Setting up to drill
09:20 Drilled to 10' setting up to collect blow counts from 10-11.5, 11.5-13, 13-14.5

Interval	Blowcounts	
10-11.5	14, 9, 15	no recovery
11.5-13	9, 16, 13	50%
13-14.5	16 25 30	

09:40 Cat line cable tangles on pulley wheels, driller fixing cables
09:50 Start again with blow counts
10:15 Drilled to 15'
Samples collected for physical parameters, included one 5 gal bucket and 2 double bagged ziplock bag

10:30 Drilled to 23' hit water at 19' Driller rigging up for split spoon blowcounts with 18" spoon

Interval	Blowcounts	Recovery
23-24.5	10, 27, 41	100%
24.5-26	18, 27, 34	100%
26-27.5	18, 27, 44	

Collected 1 gal ziplock bag for physical parameters Became very gravelly at 25 No returns from auger flight for 5 gallon bucket sample. Plan to get a shelby tube of sand horizon at another well for saturated physical parameters

11:20 Drill to 35 and TD

11:25 Start building well screen 12-32 water is at 19

4 69

~~14:40~~ Pouring sandpack
2:45 Finished building well

13:00 Moving rig to site KRY 121A

13:25 Start Drilling at KRY121A

13:50 Drilled to 10' Collect blowcounts

Interval	Blowcounts	Recovery
10-11.5	4,6,9	100%
11.5-13	7,11,14	100%
13-14.5	6,9,12	100%

14:25 ~~14:25~~ Drilling at 20'

JR 14:35 ~~14:35~~ Drilled to 24 Encountered very contaminated sands & gravels, free product smells like crude oil

14:40 ~~14:40~~ JR Attempted Shelby Tube and met refusal

17,31,25

14:50 ~~14:50~~ JR Run 18" spoon for blow counts

Interval	Blowcounts	Recovery
24-25.5	17,31,25	100
25.5-27	27,44,48	100
27-28.5	37,40,42	100

15:20 Drilled to 29'

15:50 Reached TD @ 35' Begin building well

16:35 Finish completing well except for cement Drillers need to empty decon water

16:40 Jessica & Jesse go to Concrete company office to see if we can leave drill set up at KRY102A overnight

17:15 Setting up at KRY102A Deconning augers

8:25 Drilled to 5'

8:15 met refusal at 2 holes in the first few feet. Moved south and now drilled to 5' on third hole. Dense cobble & gravels at this location. Drilling without core barrel.

8:20 Drilled to 10' with core barrel

8:35 Drilled to 19 feet. Start putting equipment away for the night

8:45 Leave site for field office

9:55 Arrive at field office, gate locked and need key

John Rutter 5/4/06

5/5/06

Sunny, clear
70's today
John Rutter
Jessica Alfe

07:00 Conduct site safety meeting at field trailer

07:15 Start drilling at 19' (KRY102A)

07:45 Reach total depth at 35'. Encounter water at 20'

08:10 Building well, pouring sandpack

09:55 Still pouring sand

09:10 Installing bentonite seal

09:40 Installing bollard posts

10:00 Preparing to mobilize to site KRY116A

10:10 Setting up at site KRY116A

10:30 Head back to field office to figure out drilling progress status. Driller needs to know number of wells left for scheduling purposes

5/5/06 cont

10:45 Start drilling at KRY116A

11:10 Collecting blowcounts above water table

PID/FID	Interval	Blowcounts	Recovery
	10-11.5	12,16,18	100%
	11.5-13	9,11,12	100%
0/3	13-14.5	16,10,16	

11:30 Repairing rig last 10 minutes cable jumped shiv while collecting blowcounts

11:50 Drilled to 19. Collect Blowcounts within water table. Water at 13'

Interval	Blowcounts	~~PID/FID~~ JK
19-20.5	9,14,17	~~32/3~~ JK
20.5-22	5,7,9	
22.5-24	7,9,12	

12:15 lunch break

13:00 Start split spooning w/ blow counts

5/5/06 cont

13:50 Reach Total depth at ~~13~~ 35' JK

14:00 Start completing well building 2' sump

14:40 Still pouring sandpack

14:55 Finish pouring bentonite chips They will finish cement completion later Start cleaning up rig site to move to monitoring well location KRY128A

15:20 Set up HSA rig at KRY128A. Ambient PID/FID at borehole 0 PPM / 2.4 PPM.

15:25 Drill through asphalt

15:40 Retrieve 1st split spoon from 0-5' bgs. Poor recovery.

15:45 Retrieve 2nd split spoon from 5-10' bgs. Also poor recovery.

SA

5/5/06 cont

16:00 Encounter water @ 12.6' bgs

16:10 Recover split spoon from 10-15'.

16:20 No recovery from 15-20'.

16:40 Recovered spoon for 20-25' bgs. 40% recovery.

16:55 Begin setting screen & well construction.

TD @ 29'; collapse back to 27' & insert sump (2' length).

17:10 Continue adding sand.

17:20 Begin adding bentonite chips.

17:25 Hydrate bentonite.

17:28 Trim PVC.

17:35 Install flushmount outer casing unit.

17:50 Complete well KRY128A. Leave site

Jessica Allewalt

MONDAY

May 8, 2006

Weather: cldy, H rain, 45°

On site: D. Shaffer
J. Allewalt
J. Ruth
J. Faubion

0715- H:S meeting - all in attendance

0750 - mob HSA to borehole site KRY635

0900 Completed borehole KRY635 to 20'.

0915 - move to well site KRY134A

1000hrs - Nancy Gilkard arrives on site - drilling KRY134A.

ERM - gives OK to go on KPT site - "ozone is off"

1100 hrs - Moriah Bucy arrives on site (LHT DEQ)

1115 - mob rig to KRY640

1200- complete borehole KRY640 to 20' TD.

1315- move rig to KRY639

Moriah Bucy is concerned about utility marking on road on either side of drillhole site

— — — — orange

— — — — yellow

Mon

5-8-06 (cont.)

Collect sample: KRY447 SS001 @ 1330hrs

1340 - begin drilling KRY639

1430 - backfill borehole KRY639

1450 - move to borehole KRY638
move actual borehole location ~5' SW to avoid utilities

1530 - backfill borehole KRY638

1620 - setup to drill & install ~~well~~ borehole ~~KRY133~~ KRY654

1800 - backfill borehole KRY654 and clean up site
- haul barrels from sites to decon area

1830 - END OF DAY

David Shaffer
5-8-06

TUESDAY
MAY 09, 2006

Weather: foggy 30°
clears in a.m.

0715 - H&S tailgate mtg w/ all members

On Site: J. Faubion O. Shaffer J. Allavalt
S. Broesder D. Donahue
Marian Bury
N. Gilland
Sonic Crew - Cascade
HSA Crew - Cascade

0740 - HSA crew moves to next borehole site KRY653A

0745 - mast up
- J. Allavalt & D. Shaffer collect surface soil sample:
KRY653SS01 0740 hrs

- log borehole KRY653 -
FID/PID instrument reads high PID.
- do not get high readings on samples collected from borehole, no analytical sample collected

1000 - return to trailer to attempt to calibrate meter - not successful. Use other meter. Return to KRY133.

D. Sh. 5-9-06

TUES
5-9-06 (cont.)

1030 - HSA rig is on KRY133. Drill to build well only

1115 well is drilled to 30' bgs. Recovery is difficult because of wet gravels sliding out of sampler

1330 - HSA rig moves to KRY637
- fill H^+ gas, test FID/PID
- drill KRY637 to 15' bgs - contamination detected in smear zone / WT drive from 13.5-15.0 - sample

1500 - move HSA rig to KRY636 (near guard shack), move lumber piles and other materials to access, move out from under power lines.

1600 - difficulty driving spoon and retaining sample from 13.5-15', Jesse brings up augers ~1.5' and allows formation to fall in, then drives sample successfully - contamination present from in this drive.

1630 - request HSA crew begin surface completions on constructed wells.

1730 - back to trailer - prepare equipment rinsate for sample batch.

[illegible] 5-9-06

WEDNESDAY
May 10, 2006

Weather: clear, cool
calm

D. Shaller J. Allewalt

0700 - all hands at trailer, H&S meeting.
- HSA crew will be finishing up surface completions on wells for 1.5-2 hrs
- D. Shaller, J. Allewalt to conduct surface soil sampling on KPT property. w/ Mariah Bucy

1030 - HSA rigs moves on to KPT property to drill boreholes. Move to site KRY629.

1100 - slide bar on rig is not sized correctly. Driller reports is not usable.

1315 - HSA rig ready to drill at KRY629
- drill to 18.5' bgs
- move to adjacent site KRY630 - difficult drilling 0-10'

1550 - KRY630 - Nancy Gilland & Mariah Bucy at location

THURSDAY Weather. cdy calm,
MAY 11, 2006 45°
D. Shaffer, J Allenwalt
- move rig to monitoring well KRY110A
0830 - drill grinding on rock @ 5', decide to move ahead 5' to try again
- Mariah Bucy on drill site this A.M.
- difficult drilling in gravels to 9'. Clay from 9 to 41'. Gravels & sands at 41. Complete well to 56'. 20' screen.
1345 - Drillers completing construction of well KRY110A.
1430 - Decanning auger - heavy clay deposits make cleaning difficult.
1445 HSA rig moves to borehole KRY 622
Drill to 15' bgs, FID/PID readings non-detect, no sample collected
1550 - next hole KRY623
1630 - setup on KRY 623

Friday 5/12/06
Cloudy, cool
John Ruth
Dan Schaffer

07:00 Dave D. conducts site safety meeting
07:55 Rigging up auger rig at site KRY627
10:00 Plugging borehole
Collected 2 samples at KRY627
KRY627SB001 08:50 15-16.5
KRY627SB002 09:00 18.5-19.5

J. Allenwalt 5/12/06 cont
D. Donohue Windy, mostly sunny
1020 Mob drill rig at boring location KRY628
1030 Collect sample KRY628SS001
1035 Collect sample KRY628SS002
1040 Collect sample KRY628SS003
1145 Encountered contamination from 15-19 ft bgs; floating product + distinct chemical odor →

Friday 5/12/06 cont

1150 TD boring @ 20.5' bgs

1208 Collected subsurface soil samples:

KRY628SB001 6-7.5'

KRY628SB002 8-9.5'

KRY628SB003 14-15.5'

1215 Break for lunch. HSA rig needs afternoon for maintenance & repair.

SAllewalt

5-15-06 Monday

R. Laskowski, J. Allewalt, J. Faubion.

0700 hrs - HAS meeting. Drillers load equipment. Mob to KRY624

0825 hrs Drilling 624

Drill to 17' - collect sample KRY624SB001 15.5-17' 0912 hrs

0945 Set up on KRY626 + drilling. While drilling Jesse says the Tyler was confronted by an individual in the morning who said they could not come on to property thru the eastern gate. They would have to come thru gate that leads to BN's ozone area. Tyler went around and came thru the BN gate. The individual also said he had moved "something" which Tyler had not moved anything.

Drill 0-15.5' - TD

Sample KRY626SB001 14-15.5' 1040 hr.

1100 hrs Set up + start drilling KRY655

1145 hrs Drill to 9.5' break for lunch

1255 hrs Begin drilling again

Drill to 17' - TD

Sample KRY655SB001 15.7-17' 1345 hrs

5-15-06 - Continued

1405 - Set up on KRY656

Sample KRY65655001 0-6" 1405 hrs

Begin drilling

KRY656SB001 4-5.5' 1425 hrs

KRY656SB002 8-9.5' 1440 hrs

KRY656SB003 15.5-17' 1510 hrs

1515 - Finish - mob to KRY657

1530 - Begin Drilling

KRY65755001 0-6"

KRY657SB001 4-5.5' 1555 hrs

KRY657SB002 9-10.5' 1620 hrs

KRY657SB003 15.5-18.5' 1700 hrs

1700 hrs - Finish drilling start loading equipment.

1730 hrs - Drillers off site

EMI personel back to trailer to put away samples + unpack.

1800 hrs - off site

EOD P Lahouki

Retech

5/16/06 Nancy

Sunny, clear hot cascade

John Ruth Jesse

Randy Laskowski Kyle

Jessica Allewalt Tyler

07:00 Randy conducts safety meeting

08:00 Auger rig setting up at site KRY659

09:20 Finish at KRY659 TD @ 17'

09:30 Setting up at site KRY658 and start Drilling

10:10 Drilled to 14'

10:30 Reach TD @ 17'

10:40 Setup at KRY664

11:15 Drilled to 8'

11:25 5½ to 8' on bank

12:30 TD borehole at KRY664 @ 18.5'

12:40 Break for lunch

13:15 Start moving to KRY665

13:45 Start drilling at KRY 665
14:30 Drilled to 14 feet
15:15 TD @ 20.5
15:30 Pull onto location KRY 662
16:10 Drilled to 9'
16:50 Reach TD @ 19.5 feet at KRY 662. Driller is done for day. We head to office to do final sample
18:00 Leave office

EOD

John Ruth
5/16/06

5/17/06

Sunny, clear	Cascade
90's today	Jesse
John Ruth	Tyler
Jessica Allewalt	Kyle
Randy Laskowski	

07:00 Randy conducts site safety meeting.

07:30 Driller sets up on site KRY663 to drill borehole
08:00 Start drilling
09:15 Done drilling TD @ 17' move to ~~KRY 634~~ JR well KRY 106A
09:40 Setting up at well KRY106A
10:55 Drilled to 28' will complete well with

Sump	26-28
Screen	6-26
Sandpack	4-28
Chips	1-4
Cement	0-1

5-17-06 10 sacks sand
Continued 2 sacks Bentonite
11:15 Pouring sand pack
11:30 Pouring Bentonite chips
12:00 Drillers break for lunch
13:15 Setting up on site KRY 132A
13:30 Start drilling
14:00 Drilled to 20' Nancy says to check with Dave Wiking before we set up on spur line at KRY 108A
14:15 TD well at 28 GW at 8' bgs
14:30 Building well
15:10 Finish at site KRY 108A
15:30 Setting up auger rig at site KRY 632
15:45 Start drilling at KRY 632
17:00 TD @ 20.5, start cleaning up to move to KRY 633
17:20 Start drilling @ KRY 633
18:30 TD @ 19.5 very difficult drilling in gravels & cobbles
16:50 Cleaning up site
EOD

5-18-06 Thursday

0700 H+S Meeting
Drillers loading supplies.
Huger Crew - Jesse, Kyle, Tyler
Tt: R. Laskowski, J. Allewalt.

0860 hrs - Setup on KRY634

Samples - KRY634SS001 0-6" 0755 hr
KRY634SB001 4-5.5
KRY634SB002 8-9.5
KYY634SB003 15.5-18.5
TD at 18.5' - Boring only - no well

1000 hrs Setup + drilling at KRY114A

Samples — No samples - collected at KRY114B -
1115 hrs - Down to 19' -
Break for lunch -

1240 hrs - Begin setting KRY114A

5-19-06 – continued

KRY 108 A

Samples KRY108ASS001 0-2" 1015 hrs
No sample collected at smear zone - no elevated PID/FIDs + no odors or staining.

1260 hrs Start setting well.
1340 hrs Finish setting KRY 108 A

TD = 32'
Sump 30-32'
Screen 10-30
Sand 8-32
Bentonite 1-8
Cement 0-1 Stick up.

1400 Setup on KRY 101 A Begin drilling.
1515 hrs Begin setting well
TD = 31'
Sump - 29-31' Bentonite - 1-7'
Sand - 7-31' Cement - 0-1
Screen 9-29' Flushmount
No samples collected.

MONDAY D. Shaller
MAY 22, 2006 J. Allemalt
Weather: warm calm - 80's
T-storms in p.m. - shut down HSA for 0.5 hrs.
0700 - H&S meet w/ all hands
0730 - mobilize HSA to well KRY103A
need 2 SS samples
HSA crew: Jesse Kyle Tyler
Samples KRY103A SS01
0-0.5' 0745 hrs
KRY103ASS02
0.5-1.0' 0800 hrs
KRY103ASS03
1.0-1.5' 0805
KRY 103A SB001
5.5-6.5' 0830 hrs
KRY103A SB002
9.0-9.5 0855 hrs
KRY 103A SB003
9.5-10.5 0850
0920 - TD well @ 27.0' bgs
Construct well
1200 - move rig to KRY105A

May 26, 2006 (cont.)

At KRY105A - 2 SS samples:

KRY 105A SS01 1250hrs 0.5-1.0'

KRY 105A SS02 1258hrs 1.0-2.0

1230- encountering woody debris and large stump or timber @ 6 ft.

Sample: KRY 105A SB001 1250 4-6'

KRY 105A SB002 1420 8-9.5'

1330- TD of well = 27' bgs

1415- move rig to borehole KRY660

- DD says site has been utility cleared
- Nancy Gillard is on site

Borehole samples:

KRY 660 SS01 1610hrs 0.0.5'

KRY 660 SB001 1620hrs 4-5.5'

KRY 660 SB002 1655hrs 8.0-8.5

Odor in smear zone sample 15'-16'. Take FID/PID readings at 15-16 and 19.0-20.5 Sample 15-16'

KRY660 SB003 1720hrs

1720- thunderstorms in area - rig most down.

1800- finish borehole. Back to yard.

TUESDAY

MAY 22, 2006

Weather: cldy, cool then warms throughout day.

0715- tailgate mtg - all hands. New arrival is Dan from Cascade on well development rig.

- mobilize HSA to install 4" well on KPT property KRY113A.

- collect SS sample:

KRY 113A SS01 0820hrs 0.0-0.5

0940- collect sample:

KRY113A SB002 0940hrs 18.0-18.5

collect bucket of material for physical properties

KRY113A SB001 in 5-gal bucket and 1 gal ziploc for moisture

1100- stuck in well with big augers.

- remove big augers to clear plug in bottom auger to re-drill hole

1430- HSA having difficulty re-drilling well

Wednesday May 24, 2006
Clear, cool, slight breeze

0710 Safety mtg w/all field personnel.

0730 Recon HSA rig @ trailer & mob to KRY-139A in WalMart parking lot.

0820 Collect KRY139ASB001 from 13.5-15' bgs. Opportunistic grab due to petroleum odor & positive hit w/ both PID + FID.

0915 Begin well completion @ KRY139A. (FlushMount)

1120 Finish KRY139A & mob HSA rig/gear @ KRY129A on the Town Pump/Lucky Lils property.

1130 Break for lunch

1230 Return from lunch to Start drilling KRY129A.

1325 Collect sample KRY129ASB001 from ~~14.5-16'~~ based on slight hit w/ PID/FID.
15.5-17.5'

5/24/06 cont.

1440 Begin completing well KRY129A.

1600 Clean up at KRY129A: mob HSA rig at KRY609.

1620 Begin drilling @ soil boring KRY609.

1630 Collect KRY609SS001 from 0-2".

1640 Collect KRY609SB001 from 3.5-4.5'.

1655 Collect KRY609SB002 from 8.5-10'.

1735 Collect KRY609SB003 from 16-17.5' due to petroleum odor + hit w/ PID/FID.

1755 Finish boring KRY609.

SHlewa

5-25-06 Thursday
clear, breezy, 60°

0715 Tailgate safety mtg w/all personnel.

0730 ReCon HSA rig + equipmt, prep for today's work

0830 Mobilize @ KRY608 (Soil boring)

Collect KRY608SS001

0850 Collect KRY608SB001 from 3.5-5'

0905 Collect KRY608SB002 from 8.5-10'.

0920 Collect KRY608SB003 from 14-15.5'.

0930 TD @ 17'; ~~the~~ clean up equipmt +

KRY608 X_N 48.20889
Y_W 114.29584

KRY609 X_N 48.20935
Y_W 114.29541

GPS V
GARMIN
Accuracy
16 ft.

5-25-06 cont.

0945 C10 to Pacific Steel to check on access for KRY126A Jason agrees to move metal debris piles + posts so that we can get through.

1100 Mobilize vehicles + HSA rig at KRY126A after waiting for metal to be ~~the~~ cleared.

1130 Lunch 1215 collect KRY126ASS001

1230 Begin drilling KRY126A.

1235 Collect KRY126ASB001 from 3.5-5'.

1300 Collect KRY126ASB002 from 9-10'.

1340 TD @ 27' + begin completing the well.

1515 Finish well completion + move back to fenced area.

-S Allewalt

5-18-06 continued.

1400 hrs Finish setting KRY114A TD=29'

Sump = 27-29'
Screen = 7-27'
Sand = 5-29'
Bentonite = 1-5'
Cement 0-1' Stickup surface completion.

1425 hrs Set up + ~~drilling~~ RL at KRY651
Crew doing light maintenance on rig.

1440 hrs - Begin drilling KRY651

Sample KRY651SB001 17-20' 1600 hrs
TD at ~~20'~~ 18.5'

1600 hrs - Finishing boring - breakdown

1630 hrs - Begin drilling KRY652

Samples -
TD = 19'

1730 hrs - Finish drilling KRY652.
Load equipment - back to shop

1800 hrs

EOD
R Laskowski

5-19-06

0700 hrs H+S meeting - loading supplies.

Auger Crew - Jesse, Kyle, Tyler
TtEmI - R. Laskowski

0730 - mob to KRY100A

0755 - Begin drilling.

Samples - KRY100ASS001 0-6" 0755 hrs
KRY100A SB001 8-9.5' 0820 hrs
Did not collect 4-5.5' sample because we had no recovery from 4-8'.

TD = 28' - Set well

Sump 26-28'
Screen 6-26'
Sand 4-28'
Bent 1-4'
Cement 0-1' - Flushmount

1005 hrs - Finish up + mob to KRY108A
Collect surface soil w/ disp. trowel.

1015 hrs Begin drilling KRY108A

5-31-06 Wednesday
Sunny, cool ~45°F

0710 Daily tailgate safety mtg @ the trailer w/ all field personnel.
0745 Mobilize HSA rig @ well location KRY127A. Well location is moved to a spot W of orig. location so that we do not have to disassemble the GIPE residence fence.
0800 Begin drilling @ 127A. Collect surface soil sample KRY127ASS001 from 0-6".
0810 Collect KRY127ASB001 from 3.5-5'
0820 Collect KRY127ASB002 from 8-9.5'
0910 TD well @ 27'; begin well completion.
1030 Mobilize HSA @ KRY122A @ Western Bldg Supply; ~5' South of Deep well 122B.

5-31-06 cont.
1130 TD @ 29'; begin well completion @ 122A.
1210 Break for lunch.
1300 Return to KRY122A + set flushmount. Finish well completion.
1400 Decon HSA rig at the trailer.
1430 Mob + begin drilling at KRY109A near the Stillwater River.
1530 TD @ 27' + begin ~~[illegible]~~ setting well.
1730 Finish well completion. Brought HSA rig back to trailer for Decon.

JAllewalt

6/1/06 Thursday
Sunny, clear, 50°F

0705 Daily tailgate safety mtg w/ all personnel
0715 Go w/ drillers to check location for well 118A.
0730 Mob HSA rig @ KRY118A approx 5 ft south (closer to property fence) than where previously staked.
0750 Collect surface soil ~~KRY50~~ KRY118AS001 from 0-2".
0910 TD @ 28'. Begin screen installation.
1100 Finish well completion @ KRY118A + mob to opportunistic boring KRY-670 on Swank property.
1145 TD @ 14'.

Collected subsurface soil samples KRY670SB001 3.5-5' @ 1125 +

6/1/06 cont

KRY670SB002 from 8-9.5' @ 1135.

1200 Break for lunch.
1300 Return from lunch.

1300-1400 HSA rig waits while Sonic rig decons + then HSA decons.
1400 Mob to opportunistic boring KRY669 on the Klingler/BNSF property

1415 Begin drilling @ KRY669.
1515 TD @ 25'. Mob to next borehole KRY667.
1600 Begin drilling 667.
1700 TD @ 25'.
1730 Look @ possible opportunistic borehole locations
1600 Take HSA back to trailer.

6/2/06 Friday
partly cloudy, cool 50°F

0700 Daily safety mtg w/ all personnel.

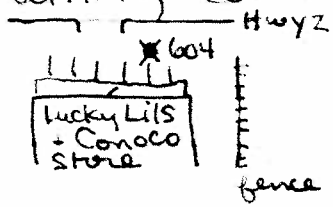
0715 Discussion w/ team regarding next opportunistic borehole location

0730 Locate next borehole @ Klingler/BNSF property

0800 Mobilize HSA rig at borehole KRY671 near the wood chip (overhead) loading bins. Begin drilling.

0900 TD @ 25'. Move HSA rig to trailer for decon.

1000 Mob to borehole location KRY604. This location was moved from its original spot due to overhead utility concerns.



6/2/06 cont.
New coordinates for 604:
XN 48.20867
Yw 114.29285
Accuracy 18' Garmin GPS

1015 Begin drilling through asphalt.

1200 TD @ 26.5'. Extremely pervasive odor noted @ water table ~22ft bgs.

1210 ~~[illegible]~~ Begin cleaning up equipment + patching asphalt.

1230 Move all equip + rig back to trailer
Break for lunch.

1330 Return from lunch.
Decon HSA rig.

1415 Mob @ opportunistic borehole KRY672 on Swank property
XN
Yw

1430 Begin drilling w/ →

6/2/06 cont

continuous Dames and Moore (sp?) spoons.

1630 TD @ 24'.
Collected following samples from this borehole.
1500 KRY672SB001 4.5-6'
1520 KRY672SB002 9-10.5'
1535 KRY672SB003 12-13.5'

1700 Remove HSA rig from KRY672 + begin setting bollards

1745 Finish work for the day.

6/3/06 Saturday
partly cloudy, windy, 55°F

0730 Daily tailgate safety mtg.
Begin loading up rig + equipmt for bollard/monument installation.

0800 GC around to well locations to check on locks & labels.

1230 Break for lunch. HSA finishes drilling holes for bollard posts.

1330 Return from lunch.

April 24, 2006

Surface Soil Sampling

GROUNDH2O SAMPLING

"Rite in the Rain."
ALL-WEATHER
FIELD
No. 350

KBY - Log Book 4

Kalispell Pole & Timber, Reliance,
& Yale Oil Facilities
Kalispell, MT
Field Activities

①

Surface Soil Sampling
April 24, 2006
Shane Braeseder Jessica Allewalt
Sunny, 60's (°F)

Arrive 13:57 @ KRY-425.
14:00 Collect Sample KRY425SS001 from 0-6"; directly east of stake.

14:11 Collect sample KRY423SS001 from 0-6"; At the stake.

14:20 Collect sample KRY422SS001 from 0-6"; At the stake.

14:35 Collect Sample KRY428SS001 from 0-6". Stake in Gipe horse pasture was knocked over when we arrived. Took sample from base of stake where it was laying.

14:40 Collect sample KRY424SS001 from 0-6" @ stake.

②

4-24-06 (cont.)

14:50 Collect sample KRY427SS001 from 0-6" @ stake.
14:55 Collect sample KRY426SS001 from 0-6" @ stake.
15:10 Collect sample KRY420SS001 from 0-6" @ stake.
15:22 Collect sample KRY617SS001 from 0-6"; ~3 ft N of stake.
15:27 Collect sample KRY616SS001 from 0-6"; ~3 ft SW of stake.
15:35 Collect sample KRY412SS001 from 0-6" @ center of RR tracks; (spur line) ~S-SE from stake.
15:55 Collect sample KRY411SS001 from 0-6" @ center of RR (spurline) tracks, ~15 ft S of stake.
16:55 Return from trailer (logged samples onto COCs & put on ice) to collect sample KRY414SS001 from 0-6" @ stake. Good sized tar spill at this location on the surface - permeates soil to about 6" bgs.

4-24-06 cont.

17:26 Set up @ KRY409 for surface soil sampling.

* 17:28 Collect sample KRY409SS001 from 0-6" @ stake.

17:32 Collect sample KRY409SS002 from 0.5-1.0' @ stake.

17:35 Collect sample KRY409SS003 from 1-2' @ stake.

* designated KRY409SS001 as an MS/MSD sample.

17:55 Collect sample KRY410SS001 from center of RR tracks from 0-6".

18:00 Finish surface soil sampling for the day.

JA

Surface Soil Sampling 4-26-06
Sunny 60°F
Shane Broesder Sampling

Arrive 13:01 at KRY-459
13:10 Collect Sample KRY459SS001 from 0-6" at the Stake.
Arrive 13:25 at KRY-456
13:35 collect Sample KRY456SS001 from 0-6" at the Stake.
13:45 collect Sample KRY640SS001 from 0-6" at base of Stake.
14:05 collect Sample KRY635SS001 from 0-6" at base of Stake.
14:09 Arrive at KRY451. Stake runover & laying on the ground. Replace Stake & colle ct Sample KRY451SS001 at 14:20 from 0-6" at base of Stake
14:24 Arrive at KRY475 Stake laying on the ground. Replace Stake & collect sample KRY475SS001 at 14:35 from 0-6" at base of Stake.
15:04 arrive at KRY 449 which is co-located w/ KRY 134 after returning samples to trailer. Collect Sample KRY449SS001 at 15:14 from 0-6" at base of Stake.

SCB

4-26-06 Cont.

15:29 Collect sample KRY46255001 from 0-6" at base of Stake

15:42 Collect Sample KRY46055001 from 0-6" at base of Stake

15:55 Collect Sample KRY46355001 from 0-6" at base of Stake

16:08 Collect Sample KRY51455001 from 0-6" at base of Stake

16:15 Finish Collecting Samples for the day at this Location

SCB

4-26-06 Cont.

Shane Broesder

KRY402 Arrive at ~~stake~~ at 16:25

collect Sample KRY40255001 at 16:30 from 0-6" at base of Stake

16:34 Collect sample KRY40355001 from 0-6" at base of stake.

Returned Samples 16:40 to trailer

5-1-06 Monday

R. Laskowski, J. Allewalt, G. Ninefeldt, V. Ruth

Sample ID	Time	Depth
KRY 432 55001	1705	0-.5'
KRY 433 55001	1710	0-.5'
KRY 436 55001	1720	0-.5'
KRY 437 55001	1725	0-.5'
KRY 438 55001	1735	0-.5'
KRY 439 55001	1730	0-.5'
~~KRY 440 55001~~	~~1740~~	~~0-.5'~~
~~KRY 440 55002~~	~~1742~~	~~0.5-1.0'~~
KRY 442 55001	1755	0-.5'
KRY 443 55001	1800	0-.5'
KRY 444 55001	1753	0-.5'
KRY 445 55001	1758	0-.5'

5-3-06 wednesday

J. Allewalt, G. Ninefeldt

Sunny, ~55°F, light wind

11:40 Collect KRY440SS001 from 0-6" bgs approx. 3 ft east of stake.

11:45 Collect KRY440SS002 from 0.5-1.0' bgs at same location as previous Sample.

11:50 Hit compacted / cemented cobbles + gravel - refusal w/ digging tools; unable to recover soil volume needed from sample interval 1-2' bgs.

5-8-06 Monday partly sunny, windy, ~55°F. J. Allewalt & D. Shaffer. KPT property.

1330 Collect surface soil sample KRY447SS001 @ stake from 0-6".

1400 Collected surface soil sample KRY471SS001 @ stake from 0-6."

J Allewalt

5-9-06 Tuesday
Sunny, calm 50°F, KPT/Klingler property. J Allewalt

1030 Collected sample KRY484SS001 @ stake from 0-6". *

* Moved location of stake approx. 35 ft east of where originally placed. Orig. location was in fresh wood chips from loading activities @ the Klingler facility. Moved 35' east into undisturbed soil.

1100 Collected sample KRY465SS001 @ stake from 0-6".

1115 Collected sample KRY466SS001 @ stake from 0-6".

1230 lunch

1415 Return to KRY486 & collect sample KRY486SS001 from 0-6" @ stake.

J Allewalt

5-10-06 ~~Tues~~ Wednesday
clear, sunny, ~55°F, slight breeze
Dan Shaffer, Jessica Ahlewalt, + Morian Bucy (MT DEQ) participating.

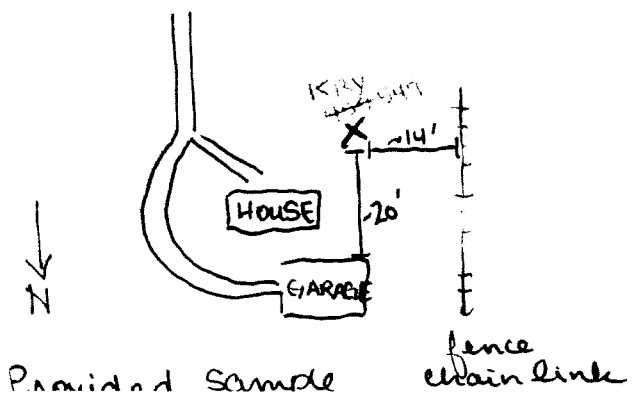
0855 Arrive @ KRY482. Collect sample KRY482SS001 from 0-6" @ the stake. MS/MSD sample
0900 At same hole; collect sample KRY482SS002 from 0.5-1.0'
0905 At same location/hole; collect sample KRY482SS003 from 1-2'.
0920 Collect sample KRY481SS001 from 0-6" @ the stake.
0930 Collect sample KRY480SS001 from 0-6" @ the stake. Sampling location is adjacent to a "Chevron Hydraulic Fluid" tank + equipment. Appears to ~~be~~ have contaminated the soil underneath it. Tank is ~2' east of sampling point.

5-10-06 cont
0945 Collect sample KRY479SS001 from 0-6" @ the stake.
0955 Collect sample KRY478SS001 from 0-6" @ the stake.
1025 Collect sample KRY494SS001 from 0-6" @ the stake.
1720 Collect sample KRY467SS001 from 0-6" @ stake.
1735 Collect sample KRY496SS001 from 0-6" @ stake.

Ahlewalt

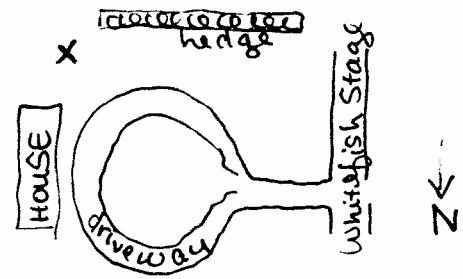
5-11-06 Thursday
partly cloudy, 50°F, slight breeze
Moriah Bucy (DEQ) + Jessica Allewalt participating.

1055 Arrive @ 560 4th Ave E. North @ the home of ~~Joe~~ Joseph + Sharon COPELAND.
1100 Collect residential soil sample KRY549SS001 from 0-2" @ stake.
Coordinates: X 48.20765
Y 114.30373
accuracy 18'
GPS Info: GARMIN GPS V
Sample Location



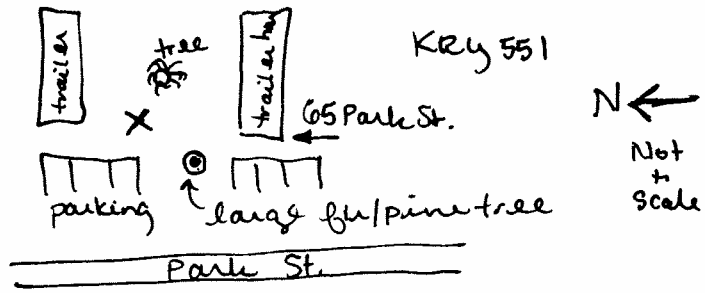
Provided sample

5-11-06 cont
1120 Arrive @ ~~503~~ 653 Whitefish Stage Rd at the ~~SR~~ SPRUNGER residence.
1130 Collect sample KRY550SS001 @ stake.
X_N 48.20761
Y_W 114.30512



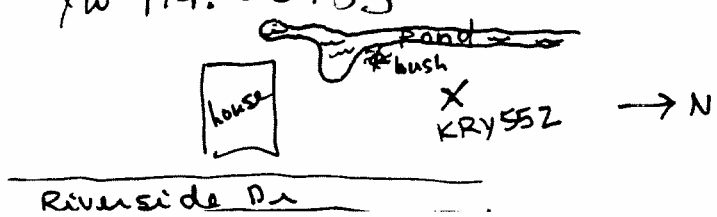
1144 Arrive @ 65 Park St to collect sample @ LAMMERT
Moriah speaks w/woman living in home; the stake is definitely not on Lammert property; woman says landowner is possibly MARIE CALLOWAY.
1150 Collect KRY551SS001 @ stake.
X_N 48.21261

5-11-06 cont

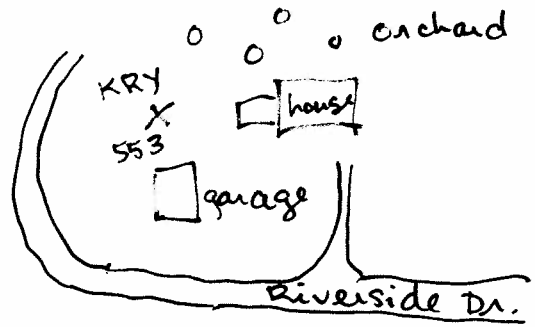


Woman living @ residence
(Tina Crow ; Tim + Tina Crow
65 Park St K-Spell MT 59901)
provided owner's address:
Marie Galloway
12881 Hwy 2 West
Marion, MT 59925

1210 Arrive @ Michael + Marie
BARE residence – 122
Riverside Dr.
1215 Collect KRY552SS001 @ stake.
X_N 48.21332
Y_W 114.30483

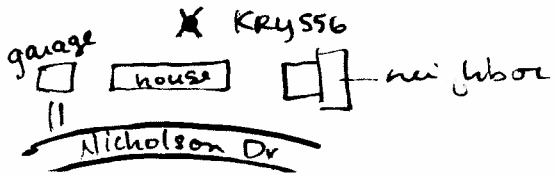


5-11-06 cont
1235 Arrive @ VALENTINE
residence (Connie Valentine)
@ 205 Riverside Dr.
1240 Collect sample KRY553SS001
@ stake.
X 48.21445
Y 114.30302



1248 Break for lunch to
call other residents.

1425 Arrive @ 175 Nicholson Dr
@ the home of Donald CROPSEY
1430 Collect sample KRY556SS001
@ stake.



5-11-06 cont.

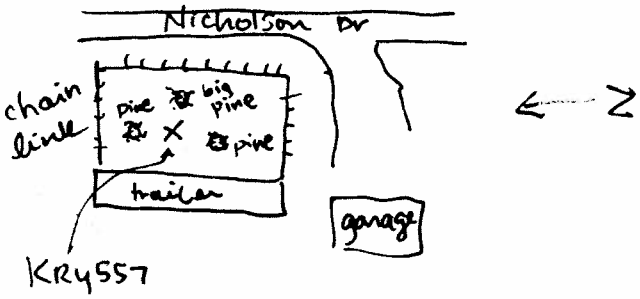
KRY556 coordinates

X_N 48.21405
Y_W 114.29309

1440 Arrive at 189 Nicholson Dr; residence of Carmella BOLIVAR.

1445 Collect Sample ~~KRY437SS001~~ KRY557SS001 @ stake.

X 48.21268
Y 114.29308



1515 Arrive @ Holcomb property to collect samples @ KRY429

1530 Collect KRY429SS001 from 0-2" @ stake.

5-11-06 cont

1535 Collect sample KRY429SS002 @ 0.5-1.0'

1540 Collect Sample KRY429SS003 from 1-2'

X 48.21172
Y 114.29608

1605 Arrive @ KRY430 Flathead Dr. (landowner FRALEIGH)

1610 Collect KRY430SS001

1615 Collect KRY430SS002

1620 Collect KRY430SS003

X 48.21191
Y 114.29501

1625 Finish surface soil sampling for the day

J Allewaert

5-15-06 Monday
clear, sunny, 85°, slight breeze
J. Allewalt participating.

1410 Collect KRY508SS001 @ stake
1420 Collect KRY506SS001 @ stake
from 0-6".
X 48.21031
Y 114.30025
Garmin GPS V

1445 Collect KRY507SS001 X 48.21051
from stake. Y 114.30032
X 48.21038
Y 114.30032

JAllewalt

5/16/06 Tuesday
clear, sunny, calm, 60°
J. Allewalt + J. Ruth
participating

0740 Collect KRY502SS001 @
Stake. X 48.21039
Y 114.30076

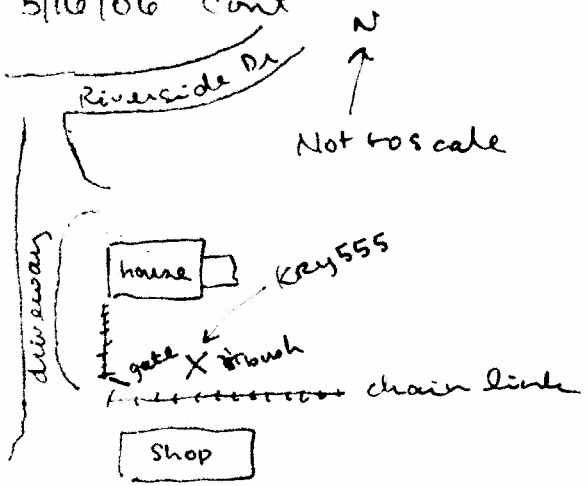
0805 Collect KRY504SS001 @
Stake. X 48.21040
Y 114.30054

0815 Collect KRY505SS001 @
Stake X 48.21035
Y 114.30056

1050 Collect residential soil
sample KRY555SS001 from
Steve SETTLE's property
(269 Riverside Dr) from
0-2". This location was
not previously staked;
sample was collected from
the yard @ GPS coordinates:
X_N 48.21381
Y_W 114.29903
(GPS V, Garmin 18' accuracy)

→

5/16/06 cont



Mr. Settle was provided a sampling receipt + mentioned his domestic water supply is a 40' well on the property.

J Allewalt

5-17-06 Wednesday
Sunny, Slight breeze, ~85°. J. Allewalt.

1550: Arrive @ KRY464 behind rock cutting facility

1555: Collect surface soil KRY4645S001 from 0-6" @ the stake.
X_N 48.21067
Y_W 114.30318

1605: Collect surface soil KRY4775S001 from 0-6" @ stake.
X_N 48.21042
Y_W 114.30273

1620: Collect surface soil KRY4935S001 @ stake from 0-6".
X_N 48.21073
Y_W 114.30192

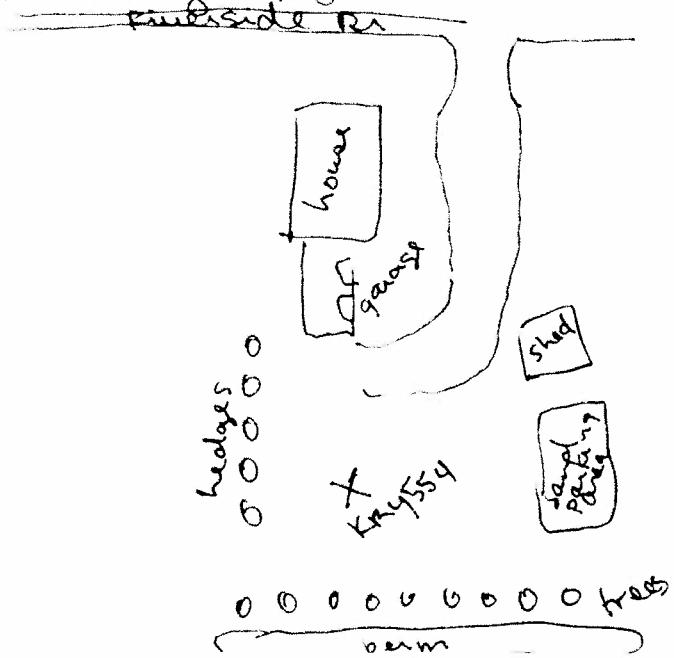
1655 Collect KRY4755S001 @ stake.
X 48.21018
Y 114.30063

J Allewalt

5-18-06 Thursday
Sunny, clear, slight breeze
65°
D. Donohue & J. Allewalt

1000 Arrive @ Riverside Dr @ BARTHEL / HALL (owner/renter) residence.

1010 Collect KRy554SS001 from 0-2" @ backyard
XN 48.21417°
YW 114.29973°
Accuracy 14 ft.



5-18-06 continued
Joe Faulkion Jessica Allewalt
Sunny, hot ~85°, breezy

1405 Collect surface soil sample KRy455SS001 from 0-6" @ stake
XN 48.21017
YW 114.29899

1410 Collect KRy454SS001 ~~@ stake~~ in center of RR tracks as plotted on sampling map. No stake at this location. 0-6" once scoria removed (~8").
XN 48.21023
YW 114.29918

1425 Collect KRy452SS001 @ stake from 0-6".
XN 48.21016
YW 114.29938

1430 Collect KRy453SS001 @ stake from 0-6"
XN 48.21018
YW 114.29984

5-22-06 Monday
J. Allewalt
partly sunny, 75°,
slight wind

1615 Collect surface soil
sample KRY499SS001
from 0-6" @ stake.
Xw 48.21036
Yw 114.30120
Garmin GPS V
Accuracy: 16 ft

1700 Collect sample KRY501SS001
from 0-6" @ stake.
MS/MSD sample.
Xw 48.21043
Yw 114.30099

J. Allewalt

5-31-06 Wednesday
J. Allewalt
Sunny, warm 60°F

0915 Arrive @ GIPE residence
(181 Montclair) + Collect
Surface Soil sample
KRY558SS001 from 0-2".
Xw 48.21113
Yw 114.29433

1345 Collect Surface soil
sample KRY515SS001 from
0-2" @ stake.
Xw 48.21231
Yw 114.29787
Accuracy 27'
1350 Arrive @ KRY483 in PENNOYER yard.
1400 Collect KRY483SS001
1405 Collect KRY483SS002
1410 Collect KRY483SS003
Xw 48.21156
Yw 114.29765
All samples collected from
location @ the stake.

Allewalt

GROUND WATER SAMPLING

GROUNDWATER SAMPLING
June 13, 2006 Tuesday
J. Allewalt R Laskowski
Sunny, warm

0720 Safety mtg w/ all personnel.
0730-0830 Load up trucks w/ equipment
0830 Mob to KRY102B for groundwater (GW) sampling.
0830-1000 Set up pump & equipment
1015-1115 Purge, collect parameters, & sample well
1105: Collect KRY102BGW001 (MS/MSD sample). See GW Sampling form for assoc. specifics.
1115-1215 Lunch
1215-1245 Pack up lab samples & prep for next well
1245 Mob to KRY115B
1245-1600 Take parameters, purge, collect sample KRY115BGW001 @ 1555.

Wednesday June 14, 2006
GW Sampling
J. Allewalt, R. Laskowski
partly sunny, warm

0800 ~~Arrive~~ Safety mtg w/all field personnel.
0800 - 0845 Set up pickups w/ field equipment
0845 Mob to KRY112BGW
0900 Set up bladder pump + equipment
0915 - 1015 Set up, & purge, collect parameters, sample well
1010: Collect KRY112BGW001
1015 - 1100 Set up @ KRY112A.
1110 - 1200: Purge, take parameters, & collect sample
1155: Collect KRY112AGW001
12 - 1300 Lunch
1300 - 1330 Prep for next GW Sample @ KRY116A
1430 - 1550 Purge, collect parameters, + sample well
1547: Collect KRY116AGW001

6-14-06 cont.
1600 Set up @ KRY101A
1630 Take samples to UPS for Shipment to Energy Labs
1715 Arrive back @ KRY101A
1720 - 1800 Purge, collect parameters, take GW sample KRY101AGW001 @ 1800.
1800 Back to trailer to finish up for the day.

Thursday June 15, 2006
GW sampling
J. Allewalt, R. Laskowski
RAIN all day, cold 45-50°

0730 Safety mtg w/all field personnel
0830 Mobilize to KRY103A.
0855 - 0925 Purge, take parameters, & collect sample.
→ 0925 Collect KRY103AGW001
0925 - 1000 Take samples back to trailer; run field errands
1200 - 100 Lunch
1300 Mobilize to KRY106B.
1300 - 1400 Sample well
└ 1400: Collect KRY106BGW001
1410 Mobilize to KRY106A
1430 - 1525 Sample well + collect sample KRY106AGW001 @ 1525.
1530 - 1600 Mobilize + set up @ KRY105A.
1600 - 1700 Sample well + collect sample KRY105AGW001 @ 1700.
1700 Finish for day; go back to trailer to clean up.

Friday June 16, 2006
GW Sampling
J. Allewalt R. Laskowski
Cloudy, sprinkling on + off

0730 Safety mtg w/all field personnel.
0830 Mobilize to KRY111B.
0850 - 0925 Sample well; collect KRY111BGW001 @ 0925.
0930 Move to KRY111A.
1030 - 1115 Purge, collect parameters + take sample KRY111AGW001 @ 1110. Collect dioxin dup KRY111AGW701
1200 Collect rinsate sample on bladder shroud KRY111AQE001.
1230 - 1335 J.A. packs up samples to take to ELI + R.L. samples KRY109A.
1335 Collect KRY109AGW001.
1430 Leave for Helena

Thursday June 22, 2006
J Allewalt D Shaffer
J Kuth D Donohue
M. Bucy J. Faulkion
Clear, sunny, 75°

0720 Safety mtg w/all field personnel.
0730 - 0845 Set up trucks w/ gear
0845 Mob to KRY113B. (J. Allewa & J. Faulkion)
0900 - 1010 Sample well + collect KRY113BGW001 @1011 w/oversight from Nancy Gilland from Retec.
1015 - 1100 Clean up + set up equipmt @ KRY113A. (D. Shaffer + J. Allewalt)
1100 - 1215 Sample well + collect KRY113AGW001 @ 1215
1215 - 1245 Fill sample jars (oversight still occurring)
1245 - 1400 Lunch

6-22-06 cont

1400 - 1500 Pack up some samples, prep for next well, KRY108A.
1500 - 1600 Sample well w/ M. Bucy (DEQ) + Nancy Gilland (oversight) & collect KRY108AGW001 @ 1550.
1615 Go back + get more supplies
1630 Mob to KPT-1.
1635 - 1700 Set up pump in well (4" well)
1700 - 1750 Sample well + collect KRYKPT1GW001 @ 1750.
1800 - ~~Mob~~ Head back to trailer for clean up + end of day

TA

Friday June 23, 2006
J. Allewalt

0730 Safety mtg w/all field personnel
0745 Take J.F. to clean water tank + fill @ Evergreen for decon work today.
0845 Go to water trmt store to pick up filters
0930 Mob to ~~KRY~~ KPT-5 on BNSF. Oversight by Nancy Gilland (Retec)
1005 Start pump + purging; water @ 16.04 from riser, screen from 13-28'. Went to put pump @ 23' from riser, but bottom of pump felt like it hit sediment about 4' shy of that. Would not drop any further, + did not want to stir up sediment, so pump is @ 19' below riser.

6-23-06 cont
1100 ~~Finish~~ Finish sampling KPT-5; collected KRYKPT5GW001 @ 1030
1110 Go pick up H_2O level meter from D.D. @ IW-3. Go to trailer to pick up new one.
1120 Lunch
1215 Set up @ KPT-16.
1220 Start pump, purge water, + collect parameters.
1300 Collect KRYKPT16GW001
1310 Collect dup sample KRYKPT16GW701.
1340 Pack up + get ready to head to Helena

Monday June 26 2006
R. Laskowski J Allewalt
sunny, hot 87°F
slight breeze

1000 Leave Helena
1300 Arrive in K-spell
1330 Go to trailer, unload pickups & prep for sampling
1600 Mob to KRY125B @ Rocky Mtn Marine.
1610 Start pump + purging No drawdown. SWL @ 21.45; pump @ 121' bgs.
1635 Collect sample KRY125BGW001.
1700 Mob to shallow well KRY125A.
1710 Start pump + purging @ KRY125A.
1745 Collect sample KRY125A GW001 SWL @ 15.44; pump @ 20' bgs.
1810 Head back to trailer.

6-26-06 cont.

1830 Complete rinsate sample KRY125AQE001 on bladder pump shroud.

1900 Finish for the day.

Tuesday June 27, 2006
Sunny, hot 94°
R Laskowski, J Allewalt

0720 Safety mtg
0750 Mobilize to KRY139Be WalMart parking lot (Row 4)
0830 Start pumping from 171' bgs @ KRY139B w/ electric compressor, but no luck. Bring pump + tubing to surface. Lines are correct, but air line appears blocked in pump; air is escaping through the screen. Spend time fixing + testing pump @ surface. Put pump back in well to ~140', will not pump. Call for gas compressor.
1020 Start pump + purge
1055 Collect sample KRY139BGW001
1055-1130 Fill sample jars.

6-27-06 Cont
1140 Set up @ KRY139A.
1148 Start pump + purge. Pump @ 18.5' SWL @ 9.5
1215 Collect sample KRY139AGW001
1215-1230 Fill sample jars.
1230 Break for lunch.
1330 Drop off samples at trailer Meet up with D. Schaffer + get bottles for ~~KRY~~ KPT 15,
1350 - Set up on KPT-15
1420 - Begin pumping
1445 - Sample KPT-15
Sample ID: KRYKPT15GW001
1530 - Finish sampling. Drop samples at trailer,
1530-1645 Pack up samples for shipment to lab; take to UPS store.
1645 Return to trailer to prep for next well; realize tubing supply is low, mob to KRY129A @ Town Pump.

6-27-06 cont.

1730 Start pump @ KRY129A. Pump @ 21.5'; water @ 14.18. bgs (flushmount)
1805 Collect sample KRY129AGW001
1845 Pack up & go back to trailer to unload & go to Home Depot for supplies.

Wednesday June 28, 2006
R. Laskowski, J. Allewalt
clear, slight breeze, hot, ~80°

0730 Safety mtg w/ all field personnel.
0730-0830 Load up pickups, get sampling teams squared ~~up~~ away w/ plan for the day.
0830 Sunscreen run @ Walmart.
0900 Mob to KRY122B @ Western Bldg Center.
0920 Start pump & purge water. SWL @ 13.19, stabilizes @ 13.20. Pump @ 88'.
0950 Collect sample KRY122BGW001; designate it as an MS/MSD.
0950-1015 Fill sample bottles.
1015 Return to trailer to put samples in frig.
1040 Mob to KRY121B @ McElroy & Wilken.
1120 Start pump & purge well water →

6-28-06 cont.

Screen is 119-129 bgs. SWL @ 20.89. Went to set pump @ 127' from riser (TOC), but hit soft resistance @ ~124'. Thinking it may be sediment, pulled the pump back to 122.5'. Water is pretty cloudy w/ sediment, but pumping just fine.

1210 Collect Sample KRY121BGW001

1210-1245 Fill sample jars.

1245 Take Samples to trailer.

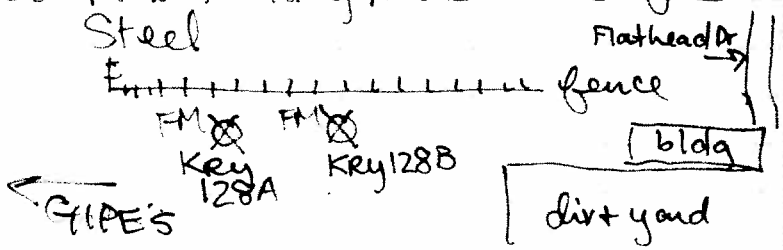
1300 Lunch

1400 Return from lunch.

1415 Start packing up samples to ship.

1415-1615 Pack samples + ship them to Helena

1630 Mob to KRY128B @ Pacific Steel



6-28-06 cont.

1715 start pump + purge well water

1750 Collect sample KRY128BGW001

1730 Collect rinsate sample KRY121BQE001 while waiting for parameters to stabilize.

1750-1830 Fill sample bottles.

1830 Go back to trailer to unload pickup. Finish for day.

June 29, 2006
R. Laskowski, J. Allewalt
Sunny, warm, ~75°

0730 Safety mtg w/ all field persons.
0730-0845 Prep, pack, discuss plan for the day.
0845 Mob to SW-9 in WalMart parking lot.
0910 Start pump + purging of well water. SWL @ 13.02
0935 Collect sample KRYSW9GW001
1000 Collect duplicate KRYSW9GW701.
1035 Head back to trailer to put samples in frig; get more supplies.
1040 Mob to PW-3 in grass east of Northern Propane.
1117 Start pump + purging. SWL @ 15.02. Pump @ 18' bgs Screen 12-22' (fluohmount)
1147 Collect sample KRYPW3GW001.
1230 At trailer packing dioxin samples Go to Fedex + ship samples to Pace.

June 29 - continued
1330 Back at trailer prepping to sample NTLmw-04.
1400 - Begin pumping at NTLmw-04
1435 - Collect sample KRYNTLmw04GW001
1500 - Collect Rinsate KRYNTLmw04GE001.
1530 - Back at trailer - packing up.

- Leave site for Helena.

EOD Laskowski

July 5, 2006 - Wednesday

R. Laskowski
Bladder pump sampling.

Samples - KRY118AGW001 1550 hrs
KRY118BGW001 1700 hrs
KRY114BGW001 1855 hrs

1900 hrs - Back at trailer unloading equip.

1930 hrs - Off site

EOD RL

July 6, 2006 Thursday

0630 - On site loading equipment.
0700 - Go over to Office Max area to sample wells. All wells have locks that our keys do not work on.
0730 - Talk w/ D. Donohue - he needs to talk to M. Bucy to check on Key or see if we can cut locks.
0800 - Call resident at RW-10 - set up time to sample their tap at 1:00 this afternoon.

Samples -
KRYGWY13GW001 1005 hrs
KRYCLCW1GW001 1130 hrs
KRYGWY14GW001 1255 hrs
KRYGWY14GW701 1330 hrs Dup
(Dup. for dioxin)
KRYRW10GW001 1340 resident well
KRYGW13GW001 1455 hrs
KRYGWY4GW001 1900 hrs
2000 hrs - Finish unpacking.
Off site

EOD RL

July 7, 2006 Friday
R. Larkowski

0630 - loading equipment - mob to GWY-12 near Pacific Steel.

Sample KRYGWY12GW001 0715 hrs

0800 - Back at trailer organizing equipment and packing samples

1050 hrs Arrange to get sample at Bob Stanecrts house
508 Flathead - 756 8735

KRYRW13GW001 1105 hrs

[redacted]

Groundwater Sampling

"Rite in the Rain"
ALL-WEATHER
FIELD
No. 350

KRY Logbook
#6

Kalispell Pole & Timber
Reliance & Yale Oil
Facilities

6/13/06
John Ruth
Dave Donohue

10:25 Start Sampling at well
KRY102A
Collect sample KRY102AGwool
@ 11:40

15:00 Start pumping at well
KRY115A
collect sample KRY115AGwool
at 16:30

John Ruth

6/14/06
John Ruth
Dan Shaffer

13:15 Set up at well
KRY104A
Collect sample KRY104A
Gwool
at ~~14:00~~ JR 15:50
Sample time labeled 14:00

16:45 Set up at well
KRY116BGwool
Collect sample KRY116BGwool
at 18:00

John Ruth

6/15/06
John Ruth
Dan Shaffer

07:45 Set up at well
KRY101B
Collect sample KRY101BGwool
at 09:00

10:00 Set up at well KRY103B
Collect sample KRY103BGwool
at 11:00

13:15 Set up at well
KRY100A
collect sample KRY100AGwool
at 14:15

15:00 Set up at well
KRY110A
Collect sample KRY110AGwool
at 16:15

John Fitts

6/16/06
Dan Shaffer
John Ruth

07:50 Set up at well KRY110B

Collect sample KRY110BGwool
at 09:15

10:45 Set up at well
KRY107B

Collect sample KRY107BGwool
at 12:15

12:30 Set up to sample well
KRY107A

Collect sample KRY107AGwool
at 13:30

14:30 Head back to Helena
for the weekend

6/20/06
Cloudy, warm 70's
John Ruth, Jessica Allewelt

07:00 Site safety meeting w/ Dave D.
08:30 Arrive at site KRY 121 A & B
09:00 Try to get sampling pump down well KRY121B pump would not go past 106 bgs. Decided to sample well KRY121A and re develop well 121B because it appeared to have a lot of sediment stirred up
11:55 Sampling KRY121A we will collect duplicate here
samples collected:
KRY121AGW001 11:30
KRY121AGW701 11:40

For the past 2 hours a spray crew has been spraying 2,4-D and milestone herbicide

14:30 Set up at well KRY130 A

6/21/06
John Ruth
Joe F.

07:00 Work on well
KRY130B

13:30 Check out IW wells
with Dave D., Mariah B
and Dan Shaffer

15:50 Set up to sample well
KRSK IW-5
Collect sample KRYIW5GWQ1
at 16:30

16:45 Set up to sample well
IW-6
Collect sample KRYIW6GWQ1
at ~~17:50~~ 17:15

17:25 Set up at well IW-1
collect sample KRYIW1GWQ01
at 17:50

18:00 Set up at well IW-2
collect sample KRYIW2GWQ1
at 18:30

18:40 Head back to field office
to put samples in
fridge and clean up gear

John Ruth

6/22/06
J. Ruth
D. Shaffer

07:00 H&S meeting

08:00 Set up to sample IW-4
Collect sample
KRYIW4GW001 @ 08:45
collected from fire hose

09:10 Set up to sample IW-7
Sample with our garden
hose
collect sample KRYIW7GW001
at 09:30 (actually
sampled at 09:50

10:00 Set up to sample IW-8
let run for a few minutes
100(?) gpm
collect sample KRYIW8GW001
at 10:15

10:30 Recon domestic
wells with Mariah

- No RW-4 well
95 Nickolson Drive

- RW-6 disconnected
could get water level
85 Nickolson

- 333 Montclair
RW-11
Need to run both outdoor
faucets so pump does
not cycle. pump in
basement on pressure
tank. well is under
driveway somewhere
There is a well log

275 Montclair
RW-3
no one home
log cabin

RW-7
438 Flathead Drive
by Peffies / Trailer
no electricity
Can not sample

RW-2
450 Flathead
on city water
No well to sample
Can not Sample
white house w/ Chain link
fence

460 Flathead
RW-1
renters, ~~[illegible]~~
pumphouse on side of
house
Knock before sampling
2 car garage, then house
sample during day to
avoid renters

RW-8
Mountain Springs Hot Tubs
by Office Mark
stop by and talk with
Randy He will hook
up garden hose from
inside building
Need a long purge
due to very large
pressure tank. We didn't
see Tank but Randy says
it is the size of a pickup
This well serves both
the hot tub shop and the
casino across the street

15:00 Set up at KRY130B
Sample w/ peristaltic
pump Set pump at 40' bgs

16:30 Sample KRY130B GWOOI
Collected at 16:30

17:30 Set up at well GW-1

19:00 Leave GW-1
Collect sample
KRYGW1GW001 @
19:30

19:30 Leave office

John Ruth

6/23/06
John Ruth
Dan Shaffer
Clear, expected 80's

07:20 Site safety meeting
08:10 Set up at KPT-7 and KPT-8 wells
08:30 Start pumping at well KPT-7

09:00 Collect sample KRYKPT7GW001 at 09:00

09:10 Set up to sample KPT-8

10:30 No water to surface at KPT-8. Pump set at 115. Pine compressor won't pump from that depth with pump that has two different size tubing (1/4 & 3/8)
10:45 Go get gasoline compressor
11:10 Start pumping water to surface

12:05 Finish sampling at KPT-8

13:30 Set up at well KPT-6
13:55 Start pumping
14:20 Collect sample at 14:20 KRYKPT6GW001
15:00 Move to KPT-12
15:50 Still purging at KPT-12 sample
16:15 Leave site for office

Jon Rieth

6/26/06
Sunny Clear 90's
John Ruth
Jeff Nimefeldt

15:00 Set up at KRY122A
18:00 Still filling sample bottles at KRY122A
we had to pump this very slowly to avoid crash down. Pumped at 1 GPM very

18:15 Leave site, lock gate

18:30 Do an equipment rinsate sample

Jon Rieth

6/27/06
Geoff Winsfeldt
John Ruth
Sunny, clear, 90's

09:00 Set up at well pair
KPT-15 / GW-5
deep shallow
Setting up to do GW-5 first

10:00 Finish sampling at GW-5
Jessica & Randy need gas compressor so we want to do KPT-15 and move to KPT-10

11:00 Start pumping at well KPT-10
lock to well was frozen and we needed to use lock lubricant to free it

12:30 Finish sampling KPT-10
Dan Shaffer arrives to work with Geoff. I leave to rig up PVC pipe for sampling contaminated wells

14:00 Try to set up PVC pipe setup. Difficult to work with. Go to Northwest Pipe Company and buy HPDE pipe on rolls 1" ID x 1/2" ID

Dave D., Nancy

17:00 Set up and sample well KPT-19
small amount of product

19:30 Head back to field office.

John Ruth

6/28/06
Sunny, clear, hot
John Ruth, Keith Nineto IDT

09:15 Set up to sample KPT-20
No observed product
sample with peristaltic pump

10:00 Pumped 1 gallon
Slight sheen

11:15 Finish at KPT 20
very ~~[illegible]~~ frothy water
difficult to fill VOA vials without bubbles
Took a duplicate sample at this well

11:25 Set up at KPT-21
Sample w/ peristaltic pump No product present
13:00 Finish at KPT-21

15:00 Set up at KPT-4
No product
SWL @ 17.62 bTOC (PVC)
Set 1" PVC to 18' bTOC
Set 1/2 PVC to 20 bTOC
Set peristaltic tube at 21' bTOC

15:30 Purging well
16:25 Finish at KPT-4
Move to KPT-3
Nancy is with us

17:45 Sample KPT-3
SWL at 15.97 bTOC
1" pipe at 18' bTOC
1/2" pipe at 19' bTOC
Peristaltic Tube at 21 bTOC

18:10 Setting up at KPT-2
19:00 Pumping purge water
~~1" pipe~~ SR
SWL 16.88 bTOC (PVC)
1" pipe 19' bTOC
1/2" pipe 20' bTOC
Tubing end at 21' bTOC

19:38 Sample KPT-2

19:45 Head back to field office to ice samples

20:20 Leave office for night

John Ruth

6/29/06
John Ruth Greg Ninefeldt
Clear, Sunny, 90 Today

08:50 Return to well KPT-3 to collect EPH sample. EPH bottle broke during transport to field office

09:15 Set up at KRY114A

10:20 Start pumping, measured 0.77 feet of product with interface probe
1 sample with peristaltic pump through tubing set up
SWL 18.10 BTOC
Product 17.33 BTOC
1 inch tubing 20' BTOC
1/2 inch tubing 22' BTOC
peristaltic tubing 23' BTOC
Casing has 3' stickup
screen 7-27' bgs

11:30 Finish at site
KRY114A Take
samples back to fridge

13:00 set up at site GWRR-8
3' PVC stickup
SWL 21.61' BTOC
1" tube set 24' BTOC
1/2" tube set 26' BTOC
Peristaltic tube set 27' BTOC
No measurable product
with interface probe
Probe was clean and
purge water is clear
SWL is above screen
Screen is 20.5-30.5 bgs
14:15 Finish at well GWRR8

14:45 Set up to sample domestic
well RW-6 SWL is
approximately 10-15' down
we did not take a water
level and only put clean
peristaltic (polyethylene tubing)
Tubing in well

14:55 Needed to use black
1/2 HDPE Tubing as sleve
for clear Tubing. Small
Tubing kept curling in
hole

15:55 Finish Sampling
purged 6 gallons and
sampled

16:00 Head back to unload
trucks

16:30 Cleaning up site
office

John Rist

7/5/06
John Ruth
Sunny/hot 90°

11:15 Arrive on site and organize field sampling gear
12:00 Pick up additional rental vehicle at Enterprise
13:15 Figure out remaining wells to sample

14:15 Start set up at GWRR-2
no measurable product
SWL 16.62 BTOC
Screen 13-23 Bgs 2' stickup
1" Tube 18' BTOC
1/2 Tube 20 BTOC
Sample Tube 21 BTOC
15:30 Start pumping with peristaltic pump
16:50 Finish sampling start to put equipment away
17:10 Leave GWRR-2 to dump trash

17:25 Set up at well GWRR-5 Measure 0.05 feet of product

SWL at 16.5' BTOC
Stickup 1.5'
Screen 13-23' bgs
1" Tube 18' BTOC
1/2" Tube 19' BTOC
Sample Tube 20' BTOC

18:35 Start pumping large Thunderstorm starting high winds

19:30 Finish sampling major lightning, downpour

20:00 Leave office

John Ruth

7/6/06
John Ruth
Clear, sunny, warm

06:45 Arrive at office.
Pull Tubing from
well GWRR-5. Replace
bailer oil skimmer

07:30 Looked for well
GWRR-4. Could not
find it

08:00 Set up at well
GWRR-6

screen 5-15' bgs
stickup 2'
SWL 10.19 BTOC no product
1" Tube 12'
1/2" Tube 13
sample Tube 14'

08:40 Start pumping
09:30 Finish Sampling Tear down
to move

10:15 Setup on GWRR-3

stickup 1 foot
screen 9-19 bgs
SWL 11.64 BTOC no product
1" tube 13' BTOC
1/2" Tube 14' BTOC
Sample Tube 15' BTOC

11:00 Start pumping
I have been getting Jue
Set up to sample
11:40 Start Sampling

12:00 Move To GWRR-7
screen Product at ≈ 11.3
6-16 bgs SWL at ≈ 12.6 BTOC
stickup 2'
1" Tube at 13.5 BTOC
1/2" Tube at 14.5 BTOC
Sample tube at 15.5 BTOC

13:00 Start pumping
A real mess cleaning up interface
probe

14:20 Leave GWRR-7
This well is an oily mess. Time to go get more 1" tubing

14:45 Dump purge water
15:30 Major downpour and lightning hits

17:10 Storm is tapering off 6 inch lake in front of field trailer. Decided to wait on 1 inch tubing until tomorrow to see if we really need it.

17:40 Set up at well GWRR-9
screen 16-26' bgs
Stickup 2'
SWL 18.44 BTOC
no measurable product or visual
1" Tube 20 BTOC
1/2" Tube 21' BTOC
Sample Tube 22' BTOC

18:40 Start pumping
19:55 Leave well GWRR-9 to take samples to the field office

20:20 Leave office

John Smith

7/7/06
John Ruth
Sunny, clear, warm

07:15 Arrive at field office and get ready to sample PW-2 by Northern Energy propane

08:15 set up on PW-1

screen 14.5 - 24.5 bgs
stickup - 0.5
SWL 18.24 BTOC
no observable product
lots of vapors
1" tube 19' BTOC
1/2" Tube 20' BTOC
Sample Tube 21' BTOC

09:15 Start pumping

10:35 Leave site
one note There was bentonite on the saran wrap when the 1-inch Tube was pulled
no product

12:30 Leave field office after packing up samples and returning rental rig

John Ruth

CONTENTS

PAGE	REFERENCE	DATE

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

ALL-WEATHER
FIELD BOOK

Name TETRA TECH EM INC

Address 7 West 6th Ave, Suite 612
Helena, MT 59601

Phone 406 442-5588

Project KRY Kalispell Pole & Timber,
Reliance Resinem & Yale Oil Co.
Facilities

This book is printed on "Rite in the Rain" All-Weather Writing Paper - A unique paper created to shed water and enhance the written image. It is widely used throughout the world for recording critical field data in all kinds of weather. For best results, use a pencil or an all-weather pen.

Specifications for this book.

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 350	Item No. 350F

May 23, 2006 San Antonio

0700 Daily tailgate meeting. Well development rig/crew not on site

0730 Well development rig/crew (Dan) from Cascade arrives. Brief Dan on general well development tasks. He has some setup to do.

0800 John Roth & I review cleanliness issues with Dan, Ask for steam cleaning of cable, surge block, pumps, etc before & between wells.

1030 Dan continuing to setup. Decon of tools, change out of cable with new one. Set up of pumping rig.

1130 Mob'd to KRU-116A. Took initial water depth information & entered into well development datasheet. Dan continuing with setup of surge block/gasket.

1213 Began bailing. Surge block inoperable due to bad gasket.

~~12:00~~ 5/23/06 (continued)

1230 - completed 15 bailers. Very silty. Began pumping. Horiba meter will not calibrate (DEQ's) — bailer not sealing at times

1305 - Pumped total ~25 gal. Water cleared up dramatically.

1315 - Measured pump rate at ~2 gpm.

1320 - First 55 gal drum filled. Starting 2nd.

1435 - 2nd drum 3/4 full. Tried surge block a few times. Restarted pumping

1450 Pumped until barrel #2 full. Water running almost clear. Total 110 gal pumped. Remeasured water level / total depth. Decon pump & tools. Moved to KRY-112A

1515 Setup at KRY-112A

1535 Began surging. Surge block has new gaskets.

1550 Began pumping. Pumped ~25 gal

1608 Surged again. Pumped again

1643 One 55 gal drum full. Surged again then pumped ~20 gal.

1653 Stopped pumping & Surged again

1715 Resumed pumping.

1730 - Finished pumping. Total volume pumped = ~400 gal. Decon equip. Remeasured well.

1800 - Done for day. Cascade transferred drums to water treatment area.

[signature]

5/24/06 - Brian Antonich

0700 - Arrived at site for safety briefing.

0715 - Assisted Cascade (Dan) with transfer of development water (4 drums) to 3k tank.

0815 - Ordered water parameter meter from Fire.

0825 - Mob'd to KRY-115A. Took water level measurements.

0842 - Development rig at 115A setting up. Surged well.

0850 - Began pumping

0915 - Surged. Restarted pumping

0930 - Surged. Bailing

1000 - Started pumping

1015 - Surged. Restarted pumping

1045 Finished development Total 100gal purged
1110 Setup at KRY-111A, Decon'd tools. & Took well measurements
1120 Began surging. Started pumping. Observable sheen on water in barrel. Some odor.
1138 Surged well. Odor like penta.
1143 Started pumping again.
1200 Surged well
1210 Restarted pumping.
1220 Stopped pump. Surged again
1242 Stopped pumping, Began decon
1300 Took final water level readings Completed decon. Broke for lunch
1330 Dan (Cascade) moving 55 gal drums from KRY-115A & 111A to treatment area & pumping to large tank.
1436 Take water level measurements at KRY-107A.
1517 Development rig at KRY-107A, Begin surging.
1522 Began pumping
1550 Stopped pumping. Surged.

1607 Resumed pumping
1635 Completed pumping. Total of 100 gal. Decon'd. Took final water level msmts.
1658 Rig at KRY-121A Starting surge
1703 Started pumping, Some odor/sheen
1747 1st 55 gal drum filled. Dan surged twice during this period. Odor more like Resinery smell. Different than at KRY-111A.
1752 Restarted pumping
1835 Stopped pumping. Total 100 gal. Decon Equip/tools
1852 Demob from KRY-121A
1900 Complete demob. Leave site

0700 5/25/06 Brain Antonelli Site safety briefing. Pump yesterday's devel. water to large tank
0850 Mob to KRY-104A for water level measurements.

0900 Development rig (Dan) at well 104A
0905 Begin surging.
0915 Rig unable to pump water. Only ~25' of hose & 12V cable.
0918 Mob'd to KRY 102A to take water level measurements.
0930 Requested Dan (cascade) lengthen hose/cable pump rig to get to about 34' bTOC.
1130 Dan has modified pump setup. Attempt pumping but will not pump. May be too much mud. Dan commences bailing (½ success)
1150 Dan breaks for lunch.
1300 Dan completing mods on pumping unit. Spliced in second pump
1306 Started pumping. Dan had just prior to pumping, surged & bailed well. Had removed ~8 gal of muddy water with bailer.
1329 Stopped pumping. Surging. Bailing
1414 Started pumping.
1427 Stopped pumping. Surging. ~~Bailing~~
1434 Bailing

1440 Pumping
1458 Water running clear.
1500 Stopped pumping. Total volume pumped = ~72 gallons. Took final water level measurements still ~4' sediment in well. Will need additional development
1515 Decon equip & tools. Moved devel. water to treatment area & transferred to large tank.
1530 Done for day. ~~[illegible]~~

— Tuesday May 30, 2006
Well Dvlpmt partly cloudy, warm ~60°F.
1330 Safety mtg
1500 - 1930 well dvlpmt @ KRY102B; 110' depth. 110 gal pumped.

— Wed May 31, 2006
7:10 - 9:00 Cont well dvlpmt @ KRY102B; additional 100 gallons pumped.

5/31/06 cont.

900 - 1330 Dvlpment of KRy102A; bottom is 35', 150 gallons pumped.

1430 - 1700 Dvlpmt of KRy107B; bottom is 138', 155 gallons pumped.

1700 - 1900 Dvlpmt of KRy112B; bottom @ 125'; 110 gallons pumped.

6/1/06 Thursday

0715 Safety mtg

0830 Begin dvlpmt @ KRy112B (cont from day before)

1000 Finish dvlpmt @ 112B; additional 110 gallons pumped Mob to KRy116B.

1000 - 1200 Dvlp KRy116B; 118' bottom, 550 gallons pumped

1200 - 1300 Lunch

1300 - 1600 Return to 116B; bail + Surge more; very dirty

1600 - 1900 Pump more @ KRy116B [illegible] ~440 gallons

6/2/06 Friday

0710 Safety mtg

0730 - 1230 Dvlpmt of KRy115B, 122' deep, Pumped 220 gallons well pumped dry; recovered in 15 mins.

1230 - 1430 Dvlp ~~116B~~ KRy111B; Bottom @ 138', pumped 110gall

1430 - 1600 Move drums

1600 - 1900 Dvlp KRy101B; bottom @ 120'

MONDAY JUNE 5, 2006
PARTLY CLOUDY, COOL 50-60°F

0730 SAFETY MTG W/ALL FIELD PERSONNEL.
0800 LVPMT RIG PREPS FOR DAYS WORK; LOADS DRUM, SUPPLIES, ETC. MOB TO KRY101A.
0800-0845 SURGED & BAILED WELL. BAILER IS REMOVING THICK SEDIMENT.
0845-1030 PUMP + DEVELOP WELL 192.5 GALLONS OF H_2O PUMPED
1045 MOB TO KRY100A + GET EQUIP READY
1115 ASKED TO MOVE TO ANOTHER LOCATION BY MILL OPERATOR. MOB TO KRY103B. ASKED TO MOVE SO LARGE EQUIP CAN B LOADED ON SEMIS.
1130 GET TO KRY103B + PUT TOWER DOWN. POWER TAKE OFF (PTO) MALFUNCTIONS; NO POWER TO DRILL RIG SETUP. CALL KYLE FOR ASSISTANCE.

6/5/06 CONT

1145 KYLE FIXES PTO; SET UP EQUIP FOR DVLPMT
1200 Break for lunch
1300 Return from lunch; measure H_2O level + TD.
1310 Begin surging 103B.
1330 Begin bailing; bailer is pulling up thick, fine silt/clay.
1445 Start pumping
1515-1545 As water is pumping @ 103B, begin surging + bailing KRY103A.
1550 Collect parameters; water clears
1600 Finish KRY103B; go to trailer to pick up more drums + pallets
1610 Begin pumping KRY103A.
1620 Pump fails; Dan attempts to salvage it.
1640 Leave to get a replacement pump →

6/5/06 CONT.

1650 Return to KRY103A to do wiring & installation of new pump.
1650-1745 Continuing pump issues; switch to Grundfos pump
1745 Finally get pumping w/the Grundfos
1830 Finish dvlping KRY103A. Clean up & go back to trailer.

TUESDAY JUNE 6, 2006
CLEAR, SUNNY, WARM 80°F

0715 Safety mtg w/all personnel
0715-0815 Dan takes care of daily logs & other paperwork reqrmts for Cascade.
0830 Dan + HSA crew go to refuel trucks.
0900 Start dvlpmt @ KRY105A.
1030 Complete dvlpmt @ 105A; back to trailer for drums + pallets for next well.
1045 Mob to KRY106B + begin surging; SWL @ 7.9
1045-1115 Surge well
1115-1145 Bailing well
1145-1230 Pump w/Grundfos; water clears; finish KRY106B.
1230 Break for lunch
1330 Back from lunch; pick up drums from trailer
1345 Over to KRY106A; water @ 8.3'
1345-1430 Surge + bail KRY106A

6/6/06 CONT.

1430 - 1515 Move drums w/ Gradall back to trailer
1515 - 1545 Pump KRY106A
1545 Water clears; no odor, finish KRY106A
1555 Set up @ KRY110B + begin surging
1615 Finish surging + begin bailing
1630 Finish bailing, begin pumping.
1630 - 1730 Pump + take water to trailer for trmt
1730 - 1900 Finish pumping KRY110B.
1900 - 2000 Take H_2O to trailer for trmt
2015 End of day

6/7/06 Wednesday
Sunny, calm, warm 55°F

0715 Safety mtg w/ all field personnel
0715 - 0800 Prep for the day; gather supplies, get gasoline for the generator, etc.
0800 Mobilize dvlpmt rig @ KRY110A. SWL @ 6.8'
0810 Begin surging well; ground H_2O under some hydraulic pressure
0830 Begin surging. Bailer removes thick sediment
0900 Finish bailing and start pumping.
0950 Finish pumping KRY110A; 150 gallons removed.
1000 Clean up @ 110A. Mobilize to KRY109A. SWL @ 6.9' bgs.
1005 Begin surging - extremely thick, soupy silts/clays @ bottom
1015 Begin bailing. →

6/7/06 Wednesday CONT.

1015 Bailing... bailer is having difficulty recovering the sediment (valve @ bottom of bailer is intermittently sticking open). Slow success w/ bailing.

1100 Begin pumping; bailer was able to remove ~~[illegible] gallons~~ 10gal of thick sand + silt.

1110 Pump is pulling water + sediment & then stops. May have burned it up w/ the level of sediment.

1120 Switch to Grundfos pump & start pumping again. Pumping @ ~15 ft

1145 Finish pumping KRY109A; ~75 gallons removed. Clean up + go to trailer to empty water for trmt.

1230 Finish unloading dvlpmt water; break for lunch

1330 Return from lunch; mobilize @ KRY118A

6/7/06 cont.

1335 Set out outriggers + discover the dvlpmt rig has a flat tire.

1335-1500 Run errands & help w/ water trmt while waiting for the tire guy. Tire is patched

1500 Begin surging; SWL @ 10'.

1510 Begin bailing well.

1545 Finish bailing; ~12 gallons bailed.

1550 Begin pumping

1600 Take SWL + depth w/ probe on KRY118B while waiting for pump on 118A.

1615 Still pumping 118A. Water still pretty cloudy after pumping for ~50 gal.

1625 Well water finally clears up after 100 gallons.

1630 Mobilize to KRY118B.

~~1635~~ 1635 Start surging KRY118B.

~~1635 Start bailing~~

→

6/7/06 cont.

1650 Finish surging & begin bailing.

1700 Finish bailing & begin pumping on KRY1181B.

1745 Finish pumping KRY1181B Go back to put dulpmt water into trmt system.

1830 Leave for day.

6/8/06 Thursday

cloudy, sprinkling, warm 45°

0720 Safety mtg w/all personnel.

0800 Mobilize dulpmt rig to KRY135A; SWL 13.9' w/approximately 4" of tarry product.

0810 PICTURE TAKEN of first bail w/ product Continue manual bailing.

1045 Finish bailing w/ disposable bailer + line 18 gallons removed

1200 Set-up on 123A
- bailed & surged
- pumped 75g

1400 Set-up on 125A at Rocky mtn Marine
- unproductive well surged & baled

1700 - drawdown w 12V pump
- business closed 1700, to be completed

6-8-06

Joe Meubion
Don Lawrie

6/9/06 Friday cloudy 70°

0700 safety meeting
0730 mob to 114A
0800 To hand develop 114A - contaminated
1000 End hand development 114A
0900 Set up on ~~114A~~ 114B to pump while hand bailing 114A

J~ Z
6-9-06

1300-1470
134A - purge 100g

6/10/06 Saturday cloudy rain PM

0700 safety meeting
- to repair equipment, water treatment today
- Don Lawrie (cascade) plumbs 2 stage pump, repair to Grundfos & Decon

J~ Z
6-10-06

~~113A 108B~~

~~6/11/06 Monday~~ 6/11/06 Sunday rain

0700 Setup on 113A
0840 End dev. 113A 60g purged
0915 begin pumping 113B after surge/bail
1015 End dev 113B - 135g purged
1140 Begin pumping 108A after surge/bail
1230 End dev 108A 25g purged
1245 Begin pumping 100A after surge/bail
1350 End dev 100A 100g purged

6/12/06 Monday cloudy 70°

1300 Set up on 132A surge/bail
1405 development 132A complete 140 gallons purged
1520 setup on 122A
1615 122A complete 125g purged
1630 Begin pumping 122B, after surge/bail
1730 122B complete 140g purged

J~ Z

6/13/06 Tuesday

warm
-cloudy

0900 set up on 133A
- surge/bail to 1020
1135 133A complete 130g purged
1230 set up on 121B, 4" drop
well - very muddy, 2+ feet
silt in bottom (134)

1600 121B complete, 200g purged

J-[illegible]
6-13-06

6/14/06 Wednesday

0730 set up on 129A
- poor discharge - well drains
down
0900 End div 129A 25g purged
~~1015~~
1015 Begin 129B
- surge/bail
1145 End 129B 130g purged

J-[illegible] 6-14-06

1330 set up on 125A
1450 125A complete
25g purged
1430 Begin pumping 125B
after surge/bail
1550 125B complete 155g
purged

6/15/06 Thursday

0900 set up on 139B
- surge/bail
1245 End 139B, 210 g purged
1300 set up on 139A 4" well
- surge/bail
1430 End 139A, 100g purged
1500 set up on 130A
- surge/bail
1545 End 130A - clear
- 100 g purged
1600 Set up on 130B
- surge/bail, begin pumping w/ grundfos @ 1640
1742 130 B complete, 150 g purged

J-Z
6-15-06

6/16/06 Friday

0700 Safety meeting
- Dew Lowrie & development rig to Superior MT for completion of development there
- water treatment JF

J-Z
6-16-06

6/19/06 Monday

0800 set up on 132A
-100g purged
1200 End 132A

1200-1400 Decon development rig, pump off 132A dev. water

1500 set up on 122A, surge/bail to 1600 (18g) -pump 70 w/groundfos
1645 End 122A
1700 set up on 122B
-pump/bail 100g
1930 End 122B
1930-2000 pump off dev. water, decon
2005 EOD

J~ 6-19-06

6/20/06 Tuesday

0800 set up on 126A
-surge/bail purge 100g

1015 set up on 127A
-surge/bail purge 100g

1200-1700
-head development of contaminated wells 137, 138

J~ 6-20-06

6/21/06 Wednesday

1200 - 1700
Develop 128A, 128B at Pacific yard, hand development of 135A

7/26/06

1015 J. Faubion, B. Antonioli arrived from Helena.

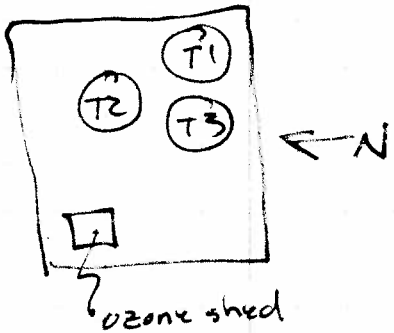
1100 GPS'd background soil sample locations
1213 Measured river stage at KRY 203/303
stage = 5.95' below top of reference rebar (btor)
Measured water level at KRY-109A
= 10.55' btoc
1225 170 Nicolson - Lyle Pauli
KRY 204/304 Stage = 2.45' btor

1245 KRY 202/302 stage = 2.60' btor
1253 KRY105A - 8.2' btoc

1300 KRY201/301
stage = 1.8' btor
1304 KRY100 - 10.7' btoc
1314 KRY 200/300
stage = 2.5' btor

1430 Pack up surplus supplies

1530 Sampled treated water



KRY800QI004 EPH (Tank T1)
KRY800QI005 SVOC, PCP, EPH & Dioxin (Tank T2)

APPENDIX C

PHOTOGRAPHIC LOG

SITE PHOTO – April 10, 2006 - Reliance facility fenced area. View north toward railroad spur line and Swank property.

MOBILIZATION – April 10, 2006 – Preparing the site for the field staging area and water treatment area

MOBILIZATION – April 10, 2006 – Laying down secondary containment liner in the water treatment area.

MOBILIZATION – April 12, 2006 – Water treatment area containing a shed for the ozone treatment system, 350-gallon stock tanks for settling out coarse-grained sediment, and 3,000-gallon tanks for storing untreated and treated water.

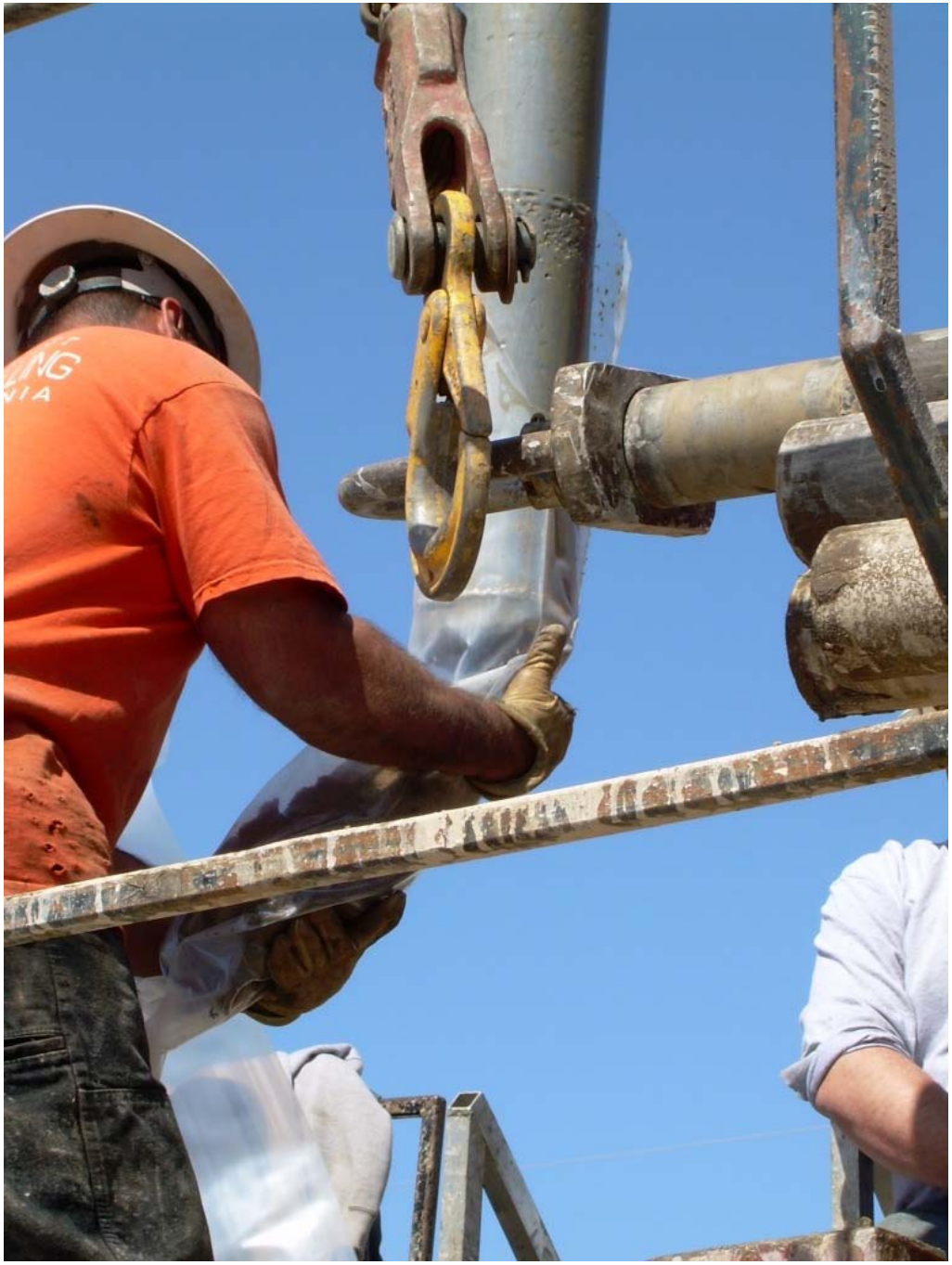
SOIL SAMPLING – April 30, 2006 – Collection of contaminated subsurface soil from KRY136A for headspace soil gas measurements. A HSA split-spoon sampler containing the core sample is shown in the foreground.

SOIL SAMPLING – May 30, 2006 – Collection of a subsurface soil sample from a Dames and Moore sampler during HSA drilling.

SOIL SAMPLING – April 22, 2006 – A TtEMI geologist classifies soil recovered during sonic drilling at monitoring well KRY121B.

MONITORING WELL INSTALLATION – April 22, 2006 – Rotosonic drill rig at deep well KRY115B

MONITORING WELL INSTALLATION – April 22, 2006 – Image of the sonic drill head while drilling deep well KRY121B.



MONITORING WELL INSTALLATION – April 22, 2006 – Collecting a soil core sample during sonic drilling at KRY121B.

MONITORING WELL INSTALLATION – May 30, 2006 – Sonic drill rig installing deep well KRY113B.

MONITORING WELL INSTALLATION – May 30, 2006 – Installation of a protective stick-up casing at well KRY113B.

DECONTAMINATION – May 30, 2006 – Decontaminating the sonic drill rig using a power steam cleaner

DECONTAMINATION – May 30, 2006 – Decontaminating the sonic core barrels with a power steam cleaner

MONITORING WELL INSTALLATION – May 23, 2006 – HSA drill rig during installation of monitoring well KRY113A

MONITORING WELL INSTALLATION – May 23, 2006 – HSA drill rig installing KRY113A

DECONTAMINATION – May 30, 2006 – Decontaminating the HSA auger flights with the steam power washer

WELL DEVELOPMENT – May 24, 2006 – Well development set-up at KRY111A.

WELL DEVELOPMENT – June 21, 2006 – Hand bailing of LNAPL well KRY136A due to significant LNAPL presence

DECONTAMINATION – May 24, 2006 – Decontaminating well development equipment

GROUNDWATER SAMPLING – June 15, 2006 – Collecting a groundwater sample from KRY101A using the bladder pump

GROUNDWATER SAMPLING – June 27, 2006 – Collecting a groundwater sample from KRY139B using the bladder pump

GROUNDWATER SAMPLING – June 27, 2006 – Sampling design for wells with LNAPL (well KPT-19)

GROUNDWATER SAMPLING – June 27, 2006 – Groundwater sampling from a well with LNAPL using the peristaltic pump (KPT-19)

IDW MANAGEMENT – May 25, 2006 – Ozone generator for treating investigation-derived waste water

IDW MANAGEMENT – May 17, 2006 – Setting up the sand filtration system

IDW MANAGEMENT – May 17, 2006 – Operational sand filtration unit.

IDW MANAGEMENT – June 26, 2006 – Ozone treatment system

APPENDIX D

MONITORING WELL AND BOREHOLE LOGS

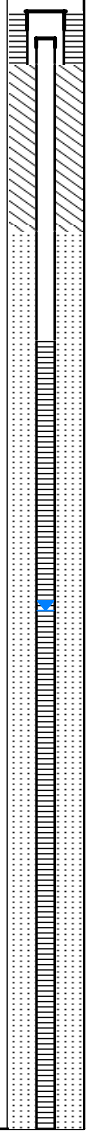
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY100A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2936.7			Ground Surface			
	0		***Silt with gravel - ML*** Brown silt and gravel with variable sand content.	KRY100ASS001	18/24	
	1		***No returns***			
2935.0	2					
2934.0	3					
2933.0	4					
2932.0	5					
2931.0	6		***SAND with silt - SM*** Brown silty fine sand. Damp, soft. Not enough recovery for sample collection			
2930.0	7					
2929.0	8		***Sand with gravel - SP to SW*** Grey-brown fine to medium grained sand and fine to medium grained gravel. Loose, wet at 9.5 feet bgs.	KRY100ASB001	25/44	
2928.0	9					
2927.0	10		***Sand and gravel - SW*** As above and becoming coarser (both sand and gravel).		28/50	
2926.0	11		***Sand and gravel - SW*** Grey/green medium to coarse grained sand and gravel.		19/34	
2925.0	12					
2924.0	13					
2923.0	14					
2922.0	15					
2921.0	16		***Gravel with sand and silt - GW*** Greyish sandy, silty gravel. Very loose.			
2920.0	17					
2919.0	18					
2918.0	19		***Sand with some gravel - SW*** Medium to coarse sand with some gravel, some silt.			
2917.0	20					



DRILLING DATE: 5-19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 28
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.60
GROUND SURFACE ELEVATION (ft AMSL): 2936.71
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY100A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2916.0	21					
2915.0	22					
2914.0	23					
2913.0	24		***Sand with gravel - SW to SP*** As above with zones of fine to medium grained sand with minor gravel.			
2912.0	25					
2911.0	26					
2910.0	27					
2909.0	28		End of Log			
2908.0	29					
2907.0	30					
2906.0	31		**Monitoring well KRY100A was completed using 2-inch ID, schedule 40 PVC casing, screened from 6 to 26 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump (26-28' bgs) with #3 sand placed as sand pack. The sand pack was placed from 4 feet (2 feet above top of screen) to 28 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A flush mount surface completion was installed in the cement at the surface.**			
2905.0	32					
2904.0	33					
2903.0	34					
2902.0	35					
2901.0	36					
2900.0	37					
2899.0	38					
2898.0	39					
2897.0	40					

DRILLING DATE: 5-19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 28
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.60
GROUND SURFACE ELEVATION (ft AMSL): 2936.71
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY101A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2941.3			Ground Surface			
	0		***Sand and gravel with variable silt - SW*** Brown sand and gravel with vairable silt. No odors or staining.	No Samples	18/48	
2940.0	1					
2939.0	2					
2938.0	3					
2937.0	4		***Sand with gravel - SW*** Brown silty sand and gravel. No odors or staining.			
2936.0	5				16/50	
2935.0	6		***Silty sand - SM*** Brown fine sandy silt to silty fine sand with some gravel. No odors or staining.			
2934.0	7					
2933.0	8		***Sand with gravel - SW*** Brown fine to coarse sand and gravel with some silt. No odors or staining.		15/49	
2932.0	9				19/45	
2931.0	10					
2930.0	11					
2929.0	12					
2928.0	13					
2927.0	14		***No Returns***			
2926.0	15					
2925.0	16		***Sand with trace gravel and silt - SP*** Brown fine to medium sand to medium to coarse sand with trace gravel and silt.No odors or staining.		15/42	
2924.0	17				16/38	
2923.0	18					
2922.0	19				12/45	
	20					

DRILLING DATE: 5-19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2941.08
GROUND SURFACE ELEVATION (ft AMSL): 2941.32
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY101A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2921.0						
	21					
2920.0						
	22					
2919.0						
	23					
2918.0						
	24					
2917.0						
	25					
2916.0						
	26					
2915.0						
	27					
2914.0						
	28					
2913.0						
	29					
2912.0						
	30		***Gravel with sand - GW*** Sandy gravel.			
2911.0						
	31		End of Log			
2910.0						
	32					
2909.0						
	33					
2908.0						
	34					
2907.0						
	35					
2906.0						
	36					
2905.0						
	37					
2904.0						
	38					
2903.0						
	39					
2902.0						
	40					

Monitoring well KRY101A was completed using 2-inch ID, schedule 40 PVC casing, screened from 9 to 29 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump (29-31' bgs) with #3 sand placed as sand pack. The sand pack was placed from 7 feet (2 feet above top of screen) to 31 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A flush mount surface completion was installed in the cement at the surface.

DRILLING DATE: 5-19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2941.08
GROUND SURFACE ELEVATION (ft AMSL): 2941.32
DRILLING CO.: Cascade

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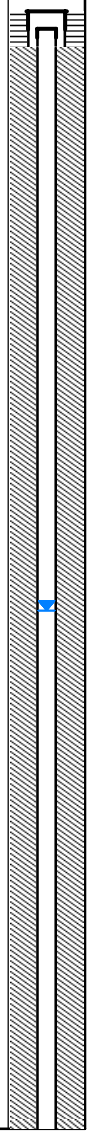
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY101B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2941.3			Ground Surface			
	0–4		***Gravelly Sands - SP*** Light olive-brown, fine to coarse-grained, poorly sorted, %25 fine to coarse-gravels, dry. (2.5Y5/4)	No samples		
	4–15		***Sandy Gravels and Cobbles - GW*** Multi-colored gravels, light olive-brown sand, fine to coarse gravelly cobbles to 6-inches, slightly moist.			
	15–16		***Sand - SP*** Olive-brown, very fine to fine-grained, well-sorted, loose, slightly moist (2.5Y4/3)			
	16–25		***Silty Sand - SM*** Olive-brown, mottled with brownish-yellow silt, very fine to fine-grianed sand, wet at 16 feet (10YR6/6)			
	25–30		***Gravelly, Silty Sand - SP*** Yellowish-brown, fine to medium-grained, moderately sorted, 20% gravel - fine to coarse (10YR5/6)			



DRILLING DATE: 5/20/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 105
TOTAL WELL DEPTH (ft btoc): 100
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.8
GROUND SURFACE ELEVATION (ft AMSL): 2941.3
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY101B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2910.0	31		***Gravelly Sand - SW*** Greenish-gray, fine- to coarse-grained, poorly sorted, 25% fine gravel, trace coarse gravel, unconsolidated, wet (Gley2 5/1)			
2909.0	32					
2908.0	33					
2907.0	34					
2906.0	35					
2905.0	36					
2904.0	37					
2903.0	38					
2902.0	39					
2901.0	40					
2900.0	41		***Gravelly Sand - SW*** As above, greenish-gray, slightly clayey, wet, sloppy. 10% silt.			
2899.0	42					
2898.0	43					
2897.0	44		***Gravelly Sands - SW*** As above; changing to light olive-brown, 3% cobbles (2.5Y5/4)			
2896.0	45					
2895.0	46					
2894.0	47					
2893.0	48		***No Returns***			
2892.0	49					
2891.0	50		***SAND - SP*** Greenish-gray, very fine to fine-grained, well-sorted, loose, sloppy, becoming clayey at 54 feet (Gley 2 5/1)			
2890.0	51					
2889.0	52					
2888.0	53					
2887.0	54		***SAND - SW*** Greenish-gray, fine to coarse-grained, poorly sorted, 15 to 20% fine gravel, trace coarse gravel, unconsolidated.			
2886.0	55					
2885.0	56					
2884.0	57					
2883.0	58		***Gravelly Sand - GW*** Sandy gravels and cobbles, multi-colored grains, fine to coarse gravels, cobbles to 3 inches, 30% fine to coarse sand, wet.			
2882.0	59					
	60					

DRILLING DATE: 5/20/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 105
TOTAL WELL DEPTH (ft btoc): 100
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.8
GROUND SURFACE ELEVATION (ft AMSL): 2941.3
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY101B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2880.0	61					
2879.0	62					
2878.0	63					
2877.0	64					
2876.0	65					
2875.0	66		***Sand - SW*** Light olive-brown, fine to coarse grained, poorly sorted, loose, unconsolidated, 5% fine to medium-sized gravel, wet			
2874.0	67					
2873.0	68		***Sandy Gravels - GW*** As above			
2872.0	69					
2871.0	70		***Sand - SP*** Light olive-brown, trace yellowish-red, fine to medium-grained, 10% coarse-grained, moderately well sorted, becoming very fine to fine-grained from 73 feet to 74 feet, wet.			
2870.0	71					
2869.0	72					
2868.0	73					
2867.0	74		***Sandy Gravels - GW*** Multi-colored, light olive-brown sand, fine to coarse gravels, 35% fine to coarse sand, wet			
2866.0	75					
2865.0	76					
2864.0	77					
2863.0	78		***No Returns***			
2862.0	79					
2861.0	80					
2860.0	81					
2859.0	82		***Clayey Sand - SC*** Fine to medium grained, 35% clay, sticky, 5% gravels with cobbles, wet.			
2858.0	83					
2857.0	84					
2856.0	85					
2855.0	86					
2854.0	87					
2853.0	88					
2852.0	89					
	90					

DRILLING DATE: 5/20/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 105
TOTAL WELL DEPTH (ft btoc): 100
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.8
GROUND SURFACE ELEVATION (ft AMSL): 2941.3
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY101B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2850.0	91		***Clayey Sand - SC*** As above, 15% gravels and cobbles, wet.			
2849.0	92					
2848.0	93					
2847.0	94					
2846.0	95					
2845.0	96					
2844.0	97					
2843.0	98		***Silty, Gravelly Clay - CL/ML*** Light yellowish-brown, 5% large gravels and cobbles, 30% silt, non-plastic, soft to stiff, grades to clayey silt (2.5Y6/3)			
2842.0	99					
2841.0	100					
2840.0	101					
2839.0	102					
2838.0	103					
2837.0	104					
2836.0	105		End of Log			
2835.0	106					
2834.0	107		**Monitoring well KRY101B was completed using 2-inch ID, schedule 40 PVC casing, screened from 13 to 33 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump (33-35" bgs) with #3 sand placed as sand pack. The sand pack was placed from 11 feet (2 feet above top of screen) to 33 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. An above-ground surface completion was installed in the cement at the surface.**			
2833.0	108					
2832.0	109					
2831.0	110					
2830.0	111					
2829.0	112					
2828.0	113					
2827.0	114					
2826.0	115					
2825.0	116					
2824.0	117					
2823.0	118					
2822.0	119					
	120					

DRILLING DATE: 5/20/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 105
TOTAL WELL DEPTH (ft btoc): 100
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.8
GROUND SURFACE ELEVATION (ft AMSL): 2941.3
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY102A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2944.0	-1					
2943.0	0		Ground Surface			
			Silty Gravel - GM Light brown, silty gravels. Dry and very loose.	No samples	18/48	
2942.0	1					
2941.0	2					
2940.0	3					
2939.0	4					
2938.0	5				16/50	
2937.0	6					
2936.0	7					
2935.0	8				15/49	
2934.0	9					
2933.0	10				19/45	
2932.0	11					
2931.0	12					
2930.0	13					
2929.0	14		***Sandy Gravel - GM*** Sand and gravel. Fine to coarse sand with silt and 55% gravel. Dry to slightly moist. Loose.			
2928.0	15					
2927.0	16				15/42	
2926.0	17				16/38	

DRILLING DATE: 5-4-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 33
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2945.27
GROUND SURFACE ELEVATION (ft AMSL): 2942.72
DRILLING CO.: Cascade

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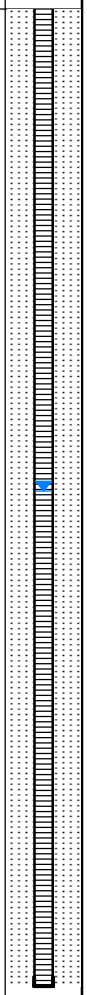
LOG OF BOREHOLE
Monitoring Well ID: KRY102A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2925.0	18					
2924.0	19				12/45	
2923.0	20		***Sandy Gravel - GM*** Brown sandy gravel. Trace cobbles. Water at 20 feet bgs. Loose.			
2922.0	21					
2921.0	22					
2920.0	23					
2919.0	24		***Poor to No Returns*** Gravels up auger flights.			
2918.0	25					
2917.0	26					
2916.0	27					
2915.0	28					
2914.0	29					
2913.0	30		***Sandy Gravel - GM*** Brown sandy gravel with trace cobbles. Wet and loose.			
2912.0	31					
2911.0	32					
2910.0	33					
2909.0	34					
2908.0	35		End of Log			
2907.0	36					
2906.0	37					



Monitoring well KRY102A was completed using 2-inch ID, schedule 40 PVC casing, screened from 13 to 33 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 11 feet (2 feet above top of screen) to 33 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Borehole collapse filled the borehole from 33 to 35 feet bgs.

DRILLING DATE: 5-4-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 33
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2945.27
GROUND SURFACE ELEVATION (ft AMSL): 2942.72
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY102B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2944.0	-2					
	-1					
2943.8			Ground Surface			
2943.0	0		***Gravel with sand and silt - GM*** Silty, sandy gravels and cobbles, brown, 30% silt, 10% fine-to coarse-grained sand; poorly sorted fine to coarse gravels, cobbles to 4 inches in diameter, dry (7.5YR5/4)	No Samples		
2942.0	1					
2941.0	2					
2940.0	3					
2939.0	4					
2938.0	5					
2937.0	6					
2936.0	7					
2935.0	8					
2934.0	9					
2933.0	10					
2932.0	11					
2931.0	12		***Gravel with sand and silt - GM*** As above with with fewer cobbles (5%), dry to slightly moist at 18 feet, 40% silt. (7.5YR5/4)			
2930.0	13					
2929.0	14					
2928.0	15					
2927.0	16					
2926.0	17					
2925.0	18					
2924.0	19					
2923.0	20		***Gravel with sand and silt - GM*** Brown, 35% fine to coarse gravel, trace cobbles, poor returns (lost most of core). (7.5YR5/4)			
2922.0	21					
2921.0	22					
2920.0	23					
2919.0	24		***GRAVEL with silt- GM*** Gravelly silt as above - very poor returns from 18 to 38 feet.			
2918.0	25					
2917.0	26					
2916.0	27					

DRILLING DATE: 5/10/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 110
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2945.26
GROUND SURFACE ELEVATION (ft AMSL): 2942.79
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY102B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2914.0	28					
2913.0	29					
2912.0	30					
2911.0	31					
2910.0	32					
2909.0	33					
2908.0	34					
2907.0	35					
2906.0	36					
2905.0	37					
2904.0	38		***GRAVEL with sand - GW*** Red-green to gray, fine to coarse, trace cobbles, 40% sand, fine to coarse, poorly sorted; 15% silt, wet.			
2903.0	39					
2902.0	40		***GRAVEL with sand - GW*** As above. Silty from 41 to 44 ft, wet, gravels from 38 to 46 were loose and appear to be the most permeable section encountered thus far; difficult drilling below 46 feet because loose fine gravels fell out of core barrel and can't clean hole..			
2901.0	41					
2900.0	42					
2899.0	43					
2898.0	44					
2897.0	45					
2896.0	46					
2895.0	47					
2894.0	48					
2893.0	49					
2892.0	50		***GRAVEL with sand - GW*** As above. Red-green, gray fine to coarse, subrounded, loose, permeable, 25% sand, fine to coarse, poorly sorted, 5% silt, wet.			
2891.0	51					
2890.0	52					
2889.0	53					
2888.0	54					
2887.0	55					
2886.0	56					
	57					

DRILLING DATE: 5/10/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 110
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2945.26
GROUND SURFACE ELEVATION (ft AMSL): 2942.79
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY102B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2884.0	58					
2883.0	59					
2882.0	60		***GRAVEL with sand - GW*** As above.Fragments of gravelly clay/silt at 68 feet.			
2881.0	61					
2880.0	62					
2879.0	63					
2878.0	64					
2877.0	65					
2876.0	66					
2875.0	67					
2874.0	68					
2873.0	69					
2872.0	70					
2871.0	71					
2870.0	72					
2869.0	73					
2868.0	74					
2867.0	75					
2866.0	76					
2865.0	77		***SILT with clay - ML*** Brown, 20% clay, sticky, soft, wet (7.5YR5/4)			
2864.0	78					
2863.0	79		***SAND - SP*** Brown, fine- to medium-grained, moderately well sorted, trace gravel, slightly silty, loose, wet Very gravelly from 82 to 83 ft. (7.5YR5/4)			
2862.0	80					
2861.0	81					
2860.0	82					
2859.0	83		***SAND, silty - SM*** Brown, fine grained, well-sorted, 25-30% silt, thin gravel seams, becoming very fine grained at 87 feet. (7.5YR5/4)			
2858.0	84					
2857.0	85					
2856.0	86					
	87					

DRILLING DATE: 5/10/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 110
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2945.26
GROUND SURFACE ELEVATION (ft AMSL): 2942.79
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY102B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2854.0	88–89		***SAND with gravel - SW*** Brown with multi-colored fine to coarse-grained sand; predominantly coarse-grain, 5% small to medium-sized gravels, unconsolidated, loose, wet. (7.5YR5/4)			
2853.0	89–90					
2852.0	90–91					
2851.0	91–92					
2850.0	92–93					
2849.0	93–94					
2848.0	94–95					
2847.0	95–96					
2846.0	96–97					
2845.0	97–98		***SILT, clayey - ML*** Brown, 15% clay, 20% very fine-grained sand. (7.5YR5/4)			
2844.0	98–99		***SAND - SP*** Fine to medium-grained, moderately to well-sorted, intermittent medium-sized gravel			
2843.0	99–100					
2842.0	100–101					
2841.0	101–102					
2840.0	102–103					
2839.0	103–104					
2838.0	104–105					
2837.0	105–106		***CLAY with sand and silt - CL*** Light brown to gray, 35% silt, numerous inclusions of fine gravel, very stiff, moist clay; contact was difficult to pinpoint due to sloughing gravels. (10YR5/4)			
2836.0	106–107					
2835.0	107–108					
2834.0	108–109					
2833.0	109–110					
2832.0	110–111		End of Log			
2831.0	111–112		**Monitoring well KRY102B was completed using 2-inch ID, schedule 40 PVC casing, screened from 95 to 105 feet bgs with 0.020-inch slotted PVC screen and a 5 foot sump (105'-110" bgs) with #3 sand placed as sand pack. The sand pack was placed from 91 feet (2 feet above top of screen) to 110 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. An above-ground surface completion was installed in the cement at the**			
2830.0	112–113					
2829.0	113–114					
2828.0	114–115					
2827.0	115–116					
2826.0	116–117					

DRILLING DATE: 5/10/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 110
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2945.26
GROUND SURFACE ELEVATION (ft AMSL): 2942.79
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY103A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2939.0	-2					
2938.0	-1					
2937.3			Ground Surface			
2937.0	0		***Wood Chips*** A combination of wood chips, wood chips with gravel, and no recovery.	KRY103ASS001	18/48	
				KRY103ASS002		
2936.0	1			KRY103ASS003		
2935.0	2					
2934.0	3					
2933.0	4					
2932.0	5				16/50	
2931.0	6			KRY103ASB001		
2930.0	7					
2929.0	8				15/49	
2928.0	9		***Sand and wood chips - SP*** Grey, fine to medium grained sand. Wet. Some wood chips down to 14 feet.	KRY103ASB002	19/45	
2927.0	10			KRY103ASB003		
2926.0	11					
2925.0	12					
2924.0	13					
2923.0	14		***Sand - SP*** Light grey, medium grained, loose, wet, sand.			
2922.0	15		***Gravel - GP*** Gravel with coarse sand. Losse, wet.			
2921.0	16		***Sand - SP*** Grey, medium grained sand. Dense, wet.		15/42	
2920.0	17		***No Returns***		16/38	

DRILLING DATE: 5-22-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.30
GROUND SURFACE ELEVATION (ft AMSL): 2937.33
DRILLING CO.: Cascade

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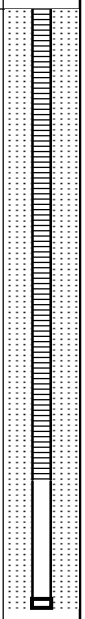
LOG OF BOREHOLE
Monitoring Well ID: KRY103A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2919.0	18					
2918.0	19				12/45	
2917.0	20		***Sand - SP*** Sand as above.			
2916.0	21		***No Returns***			
2915.0	22					
2914.0	23					
2913.0	24					
2912.0	25		***Sand - SP*** Coarse sand with some pebbles, some silt. Loose, wet.			
2911.0	26		***No Returns***			
2910.0	27		End of Log			
2909.0	28					
2908.0	29					
2907.0	30					
2906.0	31					
2905.0	32					
2904.0	33					
2903.0	34					
2902.0	35					
2901.0	36					
2900.0	37					



Monitoring well KRY103A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 25 to 27 feet, with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 27 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-22-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.30
GROUND SURFACE ELEVATION (ft AMSL): 2937.33
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY103B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2938.0	-2					
2937.3	-1		Ground Surface			
2937.0	0		***Wood Chips, bark, dark black topsoil*** Wood bark, dark olive, brown, black, trace clay and cobbles at 6 feet.	No samples		
2936.0	1					
2935.0	2					
2934.0	3					
2933.0	4					
2932.0	5					
2931.0	6					
2930.0	7					
2929.0	8		***Sand - SP*** Dark Greenish-gray (gley24/1), very fine to fine-grained, well-sorted, loose to medium dense, moist to wet, water at 9 feet, 5% cobbles from 11 to 12 feet, 20% cobbles from 12 to 13 feet.			
2928.0	9					
2927.0	10					
2926.0	11					
2925.0	12					
2924.0	13		***Clay CH*** Clay, grayish-brown (2.5Y5/2), fat, very plastic, sticky, medium stiff, moist.			
2923.0	14					
2922.0	15					
2921.0	16					
2920.0	17					
2919.0	18					
2918.0	19					
2917.0	20					
2916.0	21					
2915.0	22					
2914.0	23					
2913.0	24					
2912.0	25					
2911.0	26					
2910.0	27					

DRILLING DATE: 5/22/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 78
TOTAL WELL DEPTH (ft btoc): 70
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2939.94
GROUND SURFACE ELEVATION (ft AMSL): 2937.25
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY103B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2909.0	28		***Sand - SP*** Sand, grayish-brown (10YR5/2), very fine to fine-grained, well-sorted, soft, loose, very moist to wet, cohesive.			
2908.0	29					
2907.0	30		***Sand - SP*** Grayish-brown, fine to coarse-grained, poorly-sorted, very loose, wet.			
2906.0	31					
2905.0	32		***Gravel with Sand - GW*** Sandy gravel, mulit-colored, fine to medium, 15% fine sand, wet.			
2904.0	33		***Clay - CH*** As above, grayish-brown, fat, very plastic, soft, 5% coarse gravels, very moist to wet.			
2903.0	34					
2902.0	35					
2901.0	36		***Gravel with Sand - GW*** Sandy gravels, multi-colored fine to coarse gravels, 10% fine to coarse sand, wet.			
2900.0	37					
2899.0	38					
2898.0	39					
2897.0	40		***Clay - CH*** Clay as above.			
2896.0	41					
2895.0	42					
2894.0	43		***Gravel with Sand - GW*** Sandy gravels, mulit-colored grains, grayish-brown sand, fine to coarse, 15% very fine to coarse sand, clayey from 43 to 44', loose, wet.			
2893.0	44					
2892.0	45					
2891.0	46					
2890.0	47					
2889.0	48		***No returns***			
2888.0	49					
2887.0	50					
2886.0	51					
2885.0	52		***Clay - CH*** Clay, as above.			
2884.0	53		***Sandy Gravels - GW*** As above.			
2883.0	54					
2882.0	55					
2881.0	56		***Sand with Gravel - SP*** Gravelly sand, light olive-brown (2.5Y5/4), fine-grained, well-sorted, 10-15% fine to coarse gravel.			
2880.0	57					

DRILLING DATE: 5/22/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 78
TOTAL WELL DEPTH (ft btoc): 70
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2939.94
GROUND SURFACE ELEVATION (ft AMSL): 2937.25
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY103B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2879.0	58					
2878.0	59					
2877.0	60					
2876.0	61		***Gravel with Sand - GW*** Multi-colored fine to coarse gravel, 30% fine to coarse, poorly sorted sand, wet.			
2875.0	62					
2874.0	63					
2873.0	64		***Clay with Silt - CL*** Light olive-brown, 25% silt, soft, moist.			
2872.0	65					
2871.0	66					
2870.0	67		***Clayey Silt - ML*** Silty clay, light olive-brown, 30% clay, moist, 5-10% fine gravel.			
2869.0	68		***Gravelly Clay - CL*** Gravelly clay, light yellowish-brown, sticky, plastic, 20% gravel, wet.			
2868.0	69		***Clay with Silt - ML*** Light yellowish-brown, 15-20% clay, 15% fine to coarse gravels, non-plastic, medium stiff to very stiff.			
2867.0	70					
2866.0	71					
2865.0	72					
2864.0	73					
2863.0	74					
2862.0	75					
2861.0	76					
2860.0	77					
2859.0	78		End of Log			
2858.0	79					
2857.0	80		**Monitoring well KRY103B was completed using 2-inch ID, schedule 40 PVC casing screened from 55 to 65 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 65' to 70'.The sand pack was placed from 50 feet (5 feet above top of screen) to 70 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout was placed from top of bentonite chip layer to surface. A 6-inch diameter, above-ground well monument surface completion was inserted in cement at surface.**			
2856.0	81					
2855.0	82					
2854.0	83					
2853.0	84					
2852.0	85					
2851.0	86					
2850.0	87					

DRILLING DATE: 5/22/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 78
TOTAL WELL DEPTH (ft btoc): 70
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2939.94
GROUND SURFACE ELEVATION (ft AMSL): 2937.25
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY104A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2945.0	-1					
2944.1			Ground Surface			
2944.0	0		***SAND - SW*** Brown, fine- to coaorse-grained, loose, moderately unconsolidated, dry.	No Samples		
2943.0	1					
2942.0	2					
2941.0	3		***GRAVEL with sand and silt - GW*** Sandy, silty, gravels and cobbles, brown, fine to coarse gravels, 3 to 6-inch cobbles, 35% fine sand and silt, dry.(from cuttings)			
2940.0	4					
2939.0	5					
2938.0	6					
2937.0	7					
2936.0	8					
2935.0	9					
2934.0	10		***GRAVEL with sand and silt - GW*** Silty sandy gravels as above; 40% silt, 5% fine sand, trace clay, dry.(from cuttings)			
2933.0	11					
2932.0	12					
2931.0	13					
2930.0	14					
2929.0	15					
2928.0	16					
2927.0	17					

DRILLING DATE: 5-3-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 40.5
TOTAL WELL DEPTH (ft btoc): 40
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2946.68
GROUND SURFACE ELEVATION (ft AMSL): 2944.11
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY104A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2926.0	18					
2925.0	19					
2924.0	20		***GRAVEL with sand and silt - GW*** Silty gravels and cobbles as above, slightly moist at 23 feet, difficult drilling in dense gravels and cobbles.			
2923.0	21					
2922.0	22					
2921.0	23					
2920.0	24					
2919.0	25		***GRAVEL with sand and silt - GW*** Silty gravels, trace cobbles, 40% silt, some clay, abundant yellow and orange-mottling, limonite(?), hematite zone appears oxidized, very moist, spoon is wet at 27 feet (poor recovery)			
2918.0	26					
2917.0	27					
2916.0	28					
2915.0	29		***GRAVEL with sand - GW*** Silty gravels as above, may be grading to gravelly sand, difficult to tell due to augers hanging up in overlying gravels and cobbles. Spoon at 29 to 34 feet showed a fwe inches of gravelly sand, fine- to medium-grained.			
2914.0	30					
2913.0	31					
2912.0	32					
2911.0	33		***SAND with silt - SM*** Brown, fine-grained, 10% medium, 30% silt, 15% fine to coarse-sized gravel, wet.			
2910.0	34					
2909.0	35					
2908.0	36					
2907.0	37					

DRILLING DATE: 5-3-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 40.5
TOTAL WELL DEPTH (ft btoc): 40
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2946.68
GROUND SURFACE ELEVATION (ft AMSL): 2944.11
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY104A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	38					
2905.0	39					
2904.0	40					
2903.0	41		End of Log			
2902.0	42					
2901.0	43					
2900.0	44					
2899.0	45					
2898.0	46					
2897.0	47					
2896.0	48					
2895.0	49					
2894.0	50					
2893.0	51					
2892.0	52					
2891.0	53					
2890.0	54					
2889.0	55					
2888.0	56					
2887.0	57					

Monitoring well KRY104A was completed using 2-inch ID, schedule 40 PVC casing screened from 20 to 40 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. The sand pack was placed from 18 feet (2 feet above top of screen) to 40 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout placed from top of bentonite chip layer to surface. Six-inch diameter above-ground surface completion installed in cement at surface.

DRILLING DATE: 5-3-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 40.5
TOTAL WELL DEPTH (ft btoc): 40
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2946.68
GROUND SURFACE ELEVATION (ft AMSL): 2944.11
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY105A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2931.0	-2					
2930.0	-1					
2929.4			Ground Surface			
2929.0	0		***Wood Chips***			
2928.0	1			KRY105ASS01 KRY105ASS002		
2927.0	2		***No Returns***			
2926.0	3					
2925.0	4		***Sand - SP*** Sand, med grained, gray, moderately well sorted, dense.			
2924.0	5		***Sand - SM*** Sand, silty, gray, slightly clayey. Finer than above. Damp, stiff.	KRY105ASB001		
2923.0	6		***Wood***			
2922.0	7		***Sand - SP*** Sand, meium grained, gray as above.			
2921.0	8		***Gravel with sand - GW*** Gravel, sandy, well graded, very wet, loose, very few fines.			
2920.0	9					
2919.0	10		***No Returns*** ***Sand - SP*** Sand, well sorted, gray med to fine grained. Loose, wet.			
2918.0	11		***No Returns***			
2917.0	12					
2916.0	13					
2915.0	14					
2914.0	15		***Sand - SP*** Sand, gray, medium grained.			
2913.0	16		***No Returns***			
2912.0	17					

DRILLING DATE: 5-22-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 28
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.27
GROUND SURFACE ELEVATION (ft AMSL): 2929.38
DRILLING CO.: Cascade

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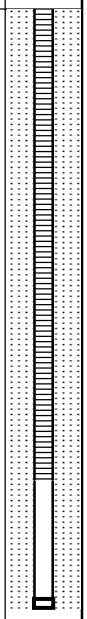
LOG OF BOREHOLE
Monitoring Well ID: KRY105A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2911.0	18					
2910.0	19					
2909.0	20		***Sand - SP to GP*** Coarse sand, well sorted, grades to pebble size gravel. Little to no fines.			
2908.0	21		***No Returns***			
2907.0	22					
2906.0	23					
2905.0	24					
2904.0	25		***Sand - SP*** Sand, coarse, varied colors, little to no fines. Very loose and wet.			
2903.0	26		***No Returns***			
2902.0	27					
2901.0	28		End of Log			
2900.0	29					
2899.0	30					
2898.0	31					
2897.0	32					
2896.0	33					
2895.0	34					
2894.0	35					
2893.0	36					
2892.0	37					



Monitoring well KRY105A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 25 to 27 feet, with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 28 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-22-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 28
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.27
GROUND SURFACE ELEVATION (ft AMSL): 2929.38
DRILLING CO.: Cascade

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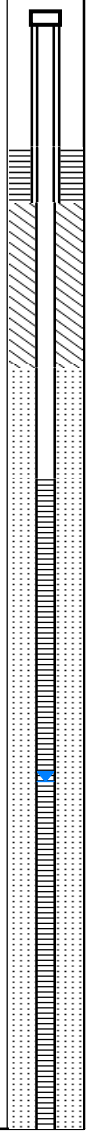
LOG OF BOREHOLE

Monitoring Well ID: KRY106A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2931.0	-2					
2930.0	-1					
2929.4			Ground Surface			
2929.0	0		***Sandy Gravels - GW*** Olive brown sand gravels. Fine to medium grained gravels. Slightly moist. ***No Returns***	No Samples		
2928.0	1					
2927.0	2					
2926.0	3					
2925.0	4					
2924.0	5		***Sandy Gravels - GW*** Gravelly sand. Olive brown, stained black, no oldor. Fine to very fine grained sand. Fine gravels. ***No Returns***			
2923.0	6					
2922.0	7					
2921.0	8					
2920.0	9					
2919.0	10		***Gravelly Sand - SP*** Gravelly sand. Olive brown, stained black. No odor.Slightly moist, wet at 8 feet. ***No Returns***			
2918.0	11					
2917.0	12					
2916.0	13					
2915.0	14					
2914.0	15		***Gravelly Sand - SP*** Olive brown gravelly sand. Fine to medium grained. ***No Returns***			
2913.0	16					
2912.0	17					



DRILLING DATE: 5-17-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.25
GROUND SURFACE ELEVATION (ft AMSL): 2929.44
DRILLING CO.: Cascade

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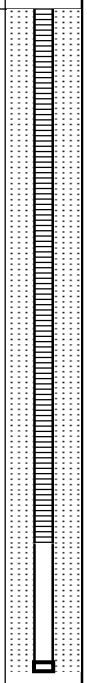
LOG OF BOREHOLE
Monitoring Well ID: KRY106A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2911.0	18					
2910.0	19					
2909.0	20		***Sand - SP*** Olive brown sand. Fine to medium grained. ***No Returns***			
2908.0	21					
2907.0	22					
2906.0	23					
2905.0	24					
2904.0	25					
2903.0	26					
2902.0	27					
2901.0	28					
2900.0	29		End of Log			
2899.0	30					
2898.0	31					
2897.0	32					
2896.0	33					
2895.0	34					
2894.0	35					
2893.0	36					
2892.0	37					



Monitoring well KRY106A was completed using 2-inch ID, schedule 40 PVC casing, screened from 6 to 26feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 26 to 28 feet, with #3 sand placed as sand pack. The sand pack was placed from 4 feet (2 feet above top of screen) to 29 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-17-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.25
GROUND SURFACE ELEVATION (ft AMSL): 2929.44
DRILLING CO.: Cascade

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Helena, Montana
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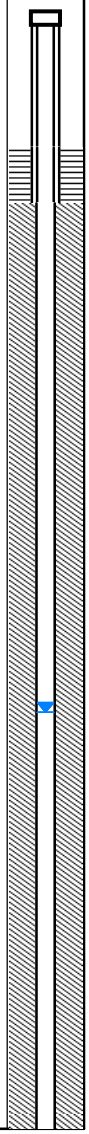
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY106B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2931.0	-2					
	-1					
2930.0						
2929.6			Ground Surface			
2929.0	0		***Wood Chips, bark, dark black topsoil***	No Samples		
2928.0	1					
2927.0	2					
2926.0	3		***Gravelly Sand - SP*** Light olive-brown, fine to coarse-grained sand, porly sorted, 20% fine to coarse gravels, dry. (2.5Y 5/4)			
2925.0	4					
2924.0	5					
2923.0	6					
2922.0	7					
2921.0	8		***No Returns***			
2920.0	9					
2919.0	10					
2918.0	11					
2917.0	12		***Sandy Gravels and Cobbles - GW*** Multi-colored gravels, light olive-brown sand, fine- to coarse-grained gravels, 10% cobbles, 30% fine to medium sand, wet at 14.5 feet.			
2916.0	13					
2915.0	14					
2914.0	15					
2913.0	16					
2912.0	17					



DRILLING DATE: 5/19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 88
TOTAL WELL DEPTH (ft btoc): 88
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.42
GROUND SURFACE ELEVATION (ft AMSL): 2929.58
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY106B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
	18					
2911.0			***No Returns*** Drilling in gravelly sands.			
	19					
2910.0						
	20					
2909.0						
	21					
2908.0						
	22					
2907.0						
	23					
2906.0						
	24					
2905.0						
	25					
2904.0						
	26					
2903.0						
	27					
2902.0						
	28					
2901.0						
	29					
2900.0						
	30					
2899.0						
	31					
2898.0						
	32					
2897.0						
	33					
2896.0						
	34					
2895.0						
	35					
2894.0						
	36		***Gravelly Sand - SP*** Light olive-brown, fine to coarse sand, moderately to poorly sorted, loose, 30% fine to coarse gravels, wet. (2.5Y 5/4)			
2893.0						
	37					
2892.0						

DRILLING DATE: 5/19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 88
TOTAL WELL DEPTH (ft btoc): 88
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.42
GROUND SURFACE ELEVATION (ft AMSL): 2929.58
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY106B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
	38		***No Returns*** Drills like sandy gravels.			
2891.0	39					
2890.0	40					
2889.0	41					
2888.0	42					
2887.0	43					
2886.0	44					
2885.0	45					
2884.0	46					
2883.0	47		***Sandy Clayey Gravel - CL*** Reddish-brown, fine to coarse grave,l 30%fine to coarse sand, loose, 25% clay, sticky, wet. (2.5Y 4/4)			
2882.0	48		***No returns*** .			
2881.0	49					
2880.0	50					
2879.0	51					
2878.0	52					
2877.0	53					
2876.0	54					
2875.0	55					
2874.0	56					
2873.0	57					
2872.0						

DRILLING DATE: 5/19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 88
TOTAL WELL DEPTH (ft btoc): 88
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.42
GROUND SURFACE ELEVATION (ft AMSL): 2929.58
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY106B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2871.0	58					
2870.0	59					
2869.0	60		***Sand - SP*** Light olive-brown, fine to medium-grained, moderately well-sorted, loose, wet (2.5Y 5/4)			
2868.0	61		***Sandy Gravels - SP*** Light olive-rown, fine to coarse gravels, 15% sand, fine to medium-grained, wet.			
2867.0	62					
2866.0	63		***Gravelly Sand - SP*** Light live-brown, fine to coarse-grained, poorly sorted, loose, 20% gravels, fine to coarse, wet.			
2865.0	64					
2864.0	65					
2863.0	66		***Sandy Gravels - GW*** As above.			
2862.0	67					
2861.0	68					
2860.0	69					
2859.0	70		***Sand - SP*** Light ellow-brown, very fine to fine-grained, well sorted, loose, sloppy, wet (2.5Y 6/4)			
2858.0	71					
2857.0	72		***Sandy Gravel and Cobbles - GW*** Multi-colored gravels and cobbles, light yellow-brown sand, fine to coarse gravels, 10% cobbles, 20% fine to medium sand, wet, trace clay.			
2856.0	73					
2855.0	74					
2854.0	75		***Sand - SP*** Sandy gravels and cobbles, as above			
2853.0	76		***Sandy Gravels - GW*** Light olive-brown, 30% clay, 5-10% fine gravel.			
2852.0	77					

DRILLING DATE: 5/19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 88
TOTAL WELL DEPTH (ft btoc): 88
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.42
GROUND SURFACE ELEVATION (ft AMSL): 2929.58
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY106B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2851.0	78					
2850.0	79					
2849.0	80		***Gravelly Clay - CL*** Sandy, clayey gravels, cobbles multi-colored gravels and cobbles, light yellowish-brown clay and sand(2.5Y6/4), fine to coarse gravels, 25% fine to medium sand, 15% clay, wet.			
2848.0	81					
2847.0	82					
2846.0	83		***Gravelly Clay - CL*** Light yellowish-brown, medium, stiff to very stiff, 15% coarse gravels, clayey gravel lense from 85 to 85 feet, moist to very moist.			
2845.0	84					
2844.0	85					
2843.0	86					
2842.0	87					
2841.0	88		End of Log			
2840.0	89					
2839.0	90		**Monitoring well KRY106B was completed using 2-inch ID, schedule 40 PVC casing screened from 73 to 83 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 83' to 88'.The sand pack was placed from 69 feet (4 feet above top of screen) to 88 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout was placed from top of bentonite chip layer to surface. A 6-inch diameter above-ground surface casing was inserted in cement at surface.**			
2838.0	91					
2837.0	92					
2836.0	93					
2835.0	94					
2834.0	95					
2833.0	96					
2832.0	97					

DRILLING DATE: 5/19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 88
TOTAL WELL DEPTH (ft btoc): 88
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2932.42
GROUND SURFACE ELEVATION (ft AMSL): 2929.58
DRILLING CO.: Cascade

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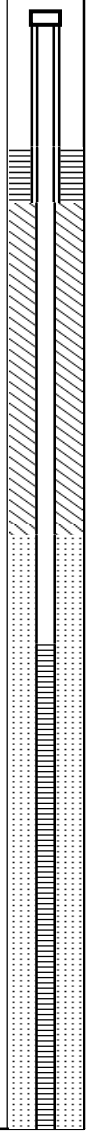
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY107A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2938.0	-2					
2937.0	-1					
2936.3			Ground Surface			
2936.0	0		***Gravel - GM*** Brown, sandy, silty, gravels. Dry, no odor. ***No Returns***	No samples		
2935.0	1					
2934.0	2					
2933.0	3					
2932.0	4					
2931.0	5		***Gravel - GM*** Brown, silty, sandy, gravels with cobbles. Slightly moist. ***No Returns***			
2930.0	6					
2929.0	7					
2928.0	8					
2927.0	9					
2926.0	10		***Gravel - GM*** As above. ***No Returns***			
2925.0	11					
2924.0	12					
2923.0	13					
2922.0	14					
2921.0	15		***Gravel - GM*** Sandy, silty, gravel with cobbles. ***No Returns***			
2920.0	16					
2919.0	17					



DRILLING DATE: 5-2-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.92
GROUND SURFACE ELEVATION (ft AMSL): 2936.32
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY107A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2918.0	18					
2917.0	19					
2916.0	20		***Sand - SP*** Light brown, fine grained sand. Minor silt. Wet. No odor, trace gravel, some silt. ***No Returns***			
2915.0	21					
2914.0	22					
2913.0	23					
2912.0	24					
2911.0	25		***Sand - SP*** Sand as above. ***No Returns***			
2910.0	26					
2909.0	27					
2908.0	28					
2907.0	29					
2906.0	30		***Sand - SP*** Sand as above becoming gravelly with depth. ***No returns***			
2905.0	31					
2904.0	32		**Monitoring well KRY107A was completed using 2-inch ID, schedule 40 PVC casing, screened from 9 to 29 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 7 feet (2 feet above top of screen) to 29 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2903.0	33					
2902.0	34					
2901.0	35		End of Log			
2900.0	36					
2899.0	37					

DRILLING DATE: 5-2-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.92
GROUND SURFACE ELEVATION (ft AMSL): 2936.32
DRILLING CO.: Cascade

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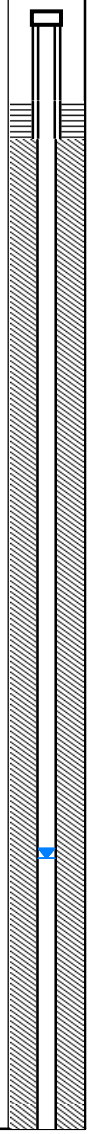
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY107B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
	-2				
2937.0	-1				
2936.2			Ground Surface		
2936.0	0		***Gravelly Silt - GM*** Brown gravelly silt with some sand, gravel is fine to coarse-grained, abundant cobbles. No odors. So staining. Becomes more sandy at 18 feet.	No samples	0.31/-3.34
2935.0	1				
2934.0	2				
2933.0	3				
2932.0	4				
2931.0	5				0.11/-3.86
2930.0	6				
2929.0	7				
2928.0	8				
2927.0	9				
2926.0	10				0.15/-2.86
2925.0	11				
2924.0	12				
2923.0	13				
2922.0	14				
2921.0	15				0.54/-3.98
2920.0	16				
2919.0	17				
2918.0	18				
2917.0	19				
2916.0	20		***No returns***		0.7/-4.34
2915.0	21				
2914.0	22				
2913.0	23				
2912.0	24				
2911.0	25		***No Returns*** Driller reports sand-like drilling		
2910.0	26				
2909.0	27				



DRILLING DATE: 5/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 136
TOTAL WELL DEPTH (ft btoc): 136
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.73
GROUND SURFACE ELEVATION (ft AMSL): 2936.17
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY107B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2908.0	28					
2907.0	29					
2906.0	30					
2905.0	31					
2904.0	32					
2903.0	33					
2902.0	34		***Sand and Gravel - SP*** Brown, some silt, scattered cobbles. No odors or staining.		1.2/-1.45	
2901.0	35					
2900.0	36					
2899.0	37					
2898.0	38		***Sand - SP*** Brown, fine to medium sand.			
2897.0	39					
2896.0	40		***No Returns***			
2895.0	41					
2894.0	42		***Clay - CL*** Brownish-gray clay and silt with fine to medium-grained. Compact.			
2893.0	43					
2892.0	44					
2891.0	45					
2890.0	46		***Silt and Gravel - GM*** Brown silt and gravel. Some clay and sand.			
2889.0	47					
2888.0	48		***Sand - SP*** Brown, fine-grained with trace scattered gravels.			
2887.0	49					
2886.0	50					
2885.0	51					
2884.0	52					
2883.0	53					
2882.0	54					
2881.0	55					
2880.0	56					
2879.0	57					

DRILLING DATE: 5/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 136
TOTAL WELL DEPTH (ft btoc): 136
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.73
GROUND SURFACE ELEVATION (ft AMSL): 2936.17
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY107B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2878.0	58		***Sand - SP*** Brown, fine-grained with silt. Silt content varies from some to abundant, trace gravel. Heaving sands.			
2877.0	59					
2876.0	60					
2875.0	61					
2874.0	62					
2873.0	63					
2872.0	64					
2871.0	65					
2870.0	66					
2869.0	67					
2868.0	68					
2867.0	69					
2866.0	70					
2865.0	71					
2864.0	72					
2863.0	73					
2862.0	74					
2861.0	75					
2860.0	76		***Silt - ML*** Brown with some fine sand. Trace gravel.			
2859.0	77					
2858.0	78		***Sand with Gravel - SP*** Brown with trace gravel. Gravel is fine to coarse, moderately compact.			
2857.0	79					
2856.0	80		***Sand - SW*** As above. Brown, fine to coarse with trace gravel. Compact.			
2855.0	81					
2854.0	82					
2853.0	83					
2852.0	84		***Sandy Gravel - GM*** Brown sandy gravel with some silt.			
2851.0	85		***Sand - SP*** Brown, fine to medium-grained sand with some silt, scattered trace gravel.			
2850.0	86					
2849.0	87					

DRILLING DATE: 5/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 136
TOTAL WELL DEPTH (ft btoc): 136
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.73
GROUND SURFACE ELEVATION (ft AMSL): 2936.17
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY107B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2848.0	88					
2847.0	89					
2846.0	90					
2845.0	91					
2844.0	92					
2843.0	93					
2842.0	94					
2841.0	95					
2840.0	96					
2839.0	97					
2838.0	98		***Sand with Gravel - SW/SP*** Brown, fine to medium-grained sand with scattered fine to coarse gravel, some silt.			
2837.0	99					
2836.0	100					
2835.0	101					
2834.0	102					
2833.0	103					
2832.0	104					
2831.0	105					
2830.0	106					
2829.0	107					
2828.0	108		***Sandy Gravels - SW*** Brown, silty, fine to coarse-grained sand and gravel. Very compact. Becoming a sandy silt and gravel at 116 feet.			
2827.0	109					
2826.0	110					
2825.0	111					
2824.0	112					
2823.0	113					
2822.0	114					
2821.0	115					
2820.0	116					
2819.0	117					

DRILLING DATE: 5/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 136
TOTAL WELL DEPTH (ft btoc): 136
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.73
GROUND SURFACE ELEVATION (ft AMSL): 2936.17
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY107B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2818.0	118		***Sand - SW*** Brown, silty sand to sandy silt with moderate fine to coarse gravel, very loose.			
2817.0	119					
2816.0	120					
2815.0	121					
2814.0	122					
2813.0	123					
2812.0	124					
2811.0	125					
2810.0	126					
2809.0	127					
2808.0	128		***Sandy and Silty Gravel - GW*** Brown fine to coarse gravel with sand, silt, and cobbles.			
2807.0	129					
2806.0	130					
2805.0	131		***Clay and Silt - CL*** Brown clay and silt with fine to medium grained gravel, tightly packed, semi-plastic.			
2804.0	132					
2803.0	133					
2802.0	134		***Clay and Silt - CL*** Brown, dense, hard clay and silt with some fine to coarse gravel.			
2801.0	135					
2800.0	136		End of Log			
2799.0	137					
2798.0	138		**Monitoring well KRY107B was completed using 2-inch ID, schedule 40 PVC casing screened from 121 to 131 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 131' to 136'.The sand pack was placed from 117 feet (4 feet above top of screen) to 136 feet bgs. Medium (<3/8") bentonite chips were placed above sand packfrom 114 to 117 feet. Portland cement-grout was placed from top of bentonite chip layer to near- surface. A ten-inch diameter well box inserted in cement at surface.**			
2797.0	139					
2796.0	140					
2795.0	141					
2794.0	142					
2793.0	143					
2792.0	144					
2791.0	145					
2790.0	146					
2789.0	147					

DRILLING DATE: 5/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 136
TOTAL WELL DEPTH (ft btoc): 136
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2938.73
GROUND SURFACE ELEVATION (ft AMSL): 2936.17
DRILLING CO.: Cascade

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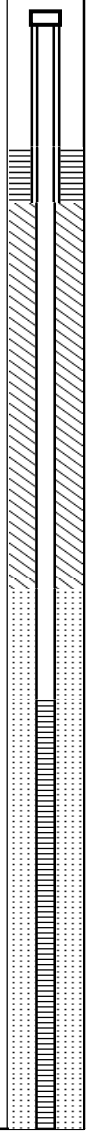
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY108A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2940.0	-2					
	-1					
2939.0						
2938.5			Ground Surface			
	0		***Silt and gravel - GM*** Brown silt, sand and gravel with wood fiber and greeenish shavings. ***No Returns***	KRY108ASS01	49/6	
2938.0						
	1					
2937.0						
	2					
2936.0						
	3					
2935.0						
	4		***Silt and gravel - GM*** Kark brown silt, sand and gravel. Abundant gravel. ***No Returns***		53/9	
2934.0						
	5					
2933.0						
	6					
2932.0						
	7					
2931.0						
	8					
2930.0						
	9					
2929.0						
	10					
2928.0						
	11					
2927.0						
	12					
2926.0						
	13					
2925.0						
	14					
2924.0						
	15					
2923.0						
	16					
2922.0						
	17				40/6	
2921.0					38/13	



DRILLING DATE: 5-19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 32
TOTAL WELL DEPTH (ft btoc): 32
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 29.41.11
GROUND SURFACE ELEVATION (ft AMSL): 2938.50
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY108A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
	18		***Gravel - GP*** Medium grained rounded gravel.			
2920.0					41/17	
	19		***Sandy gravel - GW*** Gravelly sand to sandy gravel.			
2919.0			***No Returns***			
	20					
2918.0						
	21					
2917.0						
	22					
2916.0						
	23					
2915.0						
	24		***Gravelly sand - SW*** Brown gravelly sand. Some silt.			
2914.0						
	25		***No Returns***			
2913.0						
	26					
2912.0						
	27					
2911.0						
	28					
2910.0						
	29		***Gravelly sand - SW*** As above.			
2909.0						
	30		***No returns***			
2908.0						
	31					
2907.0						
	32		End of Log			
2906.0						
	33					
2905.0						
	34					
2904.0						
	35					
2903.0						
	36					
2902.0						
	37					
2901.0						

Monitoring well KRY108A was completed using 2-inch ID, schedule 40 PVC casing, screened from 10 to 30 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 30 to 32 feet, with #3 sand placed as sand pack. The sand pack was placed from 8 feet (2 feet above top of screen) to 32 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 32
TOTAL WELL DEPTH (ft btoc): 32
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 29.41.11
GROUND SURFACE ELEVATION (ft AMSL): 2938.50
DRILLING CO.: Cascade

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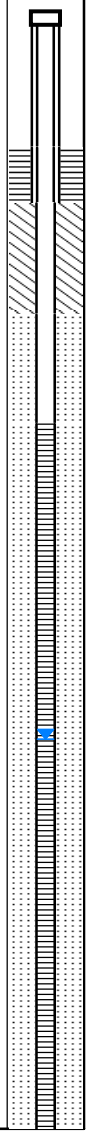
LOG OF BOREHOLE

Monitoring Well ID: KRY109A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2927.0	-2					
	-1					
2926.0			Ground Surface			
2925.7	0		***Gravelly sand - SW*** Dark grayish brown gravelly, silty, sand. Dry, loose.	No Samples		
2925.0	1					
2924.0	2		***No Returns***			
2923.0	3					
2922.0	4		***Gravelly sand - SW*** Light olive brown gravelly sand. Some cobbles.			
2921.0	5		***No Returns***			
2920.0	6					
2919.0	7					
2918.0	8					
2917.0	9					
2916.0	10					
2915.0	11					
2914.0	12					
2913.0	13					
2912.0	14		***Gravelly sand - SW*** Olive brown, gravelly sand. Wet, loose.			
2911.0	15		***No Returns***			
2910.0	16					
2909.0	17					



DRILLING DATE: 5-31-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.85
GROUND SURFACE ELEVATION (ft AMSL): 2925.65
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY109A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2907.0	18					
2906.0	19		***Gravelly sand - SW*** Gravelly sand. Rock in shoe, poor recovery.			
2905.0	20		***No Returns***			
2904.0	21					
2903.0	22					
2902.0	23					
2901.0	24		***Sand - SP*** Well sorted, med to coarse sand and fine gravel. Wet, loose.			
2900.0	25					
2899.0	26		***No Returns***			
2898.0	27		End of Log			
2897.0	28		**Monitoring well KRY109A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 25 to 27 feet, with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 27 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2896.0	29					
2895.0	30					
2894.0	31					
2893.0	32					
2892.0	33					
2891.0	34					
2890.0	35					
2889.0	36					
	37					

DRILLING DATE: 5-31-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.85
GROUND SURFACE ELEVATION (ft AMSL): 2925.65
DRILLING CO.: Cascade

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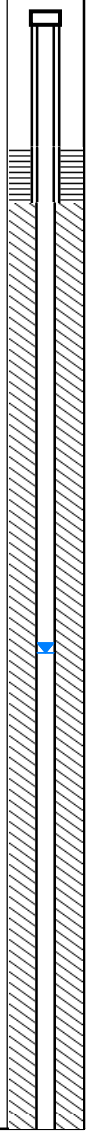
LOG OF BOREHOLE

Monitoring Well ID: KRY110A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2926.0	-2					
2925.0	-1					
2924.3			Ground Surface			
2924.0	0		***Gravel - GP*** Gravels, cobbles.			
2923.0	1		***No Returns***	No Samples		
2922.0	2					
2921.0	3					
2920.0	4					
2919.0	5					
2918.0	6					
2917.0	7					
2916.0	8					
2915.0	9		***Clay - CH*** Brown, wet, fat clay.			
2914.0	10		***Clayey sand - SC*** Sand, clayey, wet, losser that fat clay above.			
2913.0	11					
2912.0	12					
2911.0	13		***No Returns***			
2910.0	14		***Clayey sand - SC to CL*** Clayey fine sand. Grades in and out of fat clay to clayey sand.			
2909.0	15					
2908.0	16					
2907.0	17					



DRILLING DATE: 5-11-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 55
TOTAL WELL DEPTH (ft btoc): 55
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.90
GROUND SURFACE ELEVATION (ft AMSL): 2924.29
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY110A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	18					
2905.0	19		***Clayey sand to fat clay - SC to CH*** Claey sand to fat clay.			
2904.0	20					
2903.0	21					
2902.0	22					
2901.0	23					
2900.0	24		***Clay - CH*** Fat clay, highly plastic, dark grayish brown.			
2899.0	25					
2898.0	26					
2897.0	27					
2896.0	28					
2895.0	29					
2894.0	30					
2893.0	31					
2892.0	32					
2891.0	33					
2890.0	34					
2889.0	35					
2888.0	36					
2887.0	37					

DRILLING DATE: 5-11-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 55
TOTAL WELL DEPTH (ft btoc): 55
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.90
GROUND SURFACE ELEVATION (ft AMSL): 2924.29
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY110A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2886.0	38					
2885.0	39					
2884.0	40					
2883.0	41		***Gravel - GP*** Gravel, varied colors, angular. Wet, loose.			
2882.0	42		***No Returns***			
2881.0	43					
2880.0	44		***Sand - SP*** Well sorted medium grained sand.			
2879.0	45					
2878.0	46					
2877.0	47					
2876.0	48					
2875.0	49					
2874.0	50					
2873.0	51		***No Returns***			
2872.0	52		**Monitoring well KRY110A was completed using 2-inch ID, schedule 40 PVC casing, screened from 35 to 55 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 32 feet (2 feet above top of screen) to 55 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2871.0	53					
2870.0	54					
2869.0	55		End of Log			
2868.0	56					
2867.0	57					

DRILLING DATE: 5-11-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 55
TOTAL WELL DEPTH (ft btoc): 55
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.90
GROUND SURFACE ELEVATION (ft AMSL): 2924.29
DRILLING CO.: Cascade

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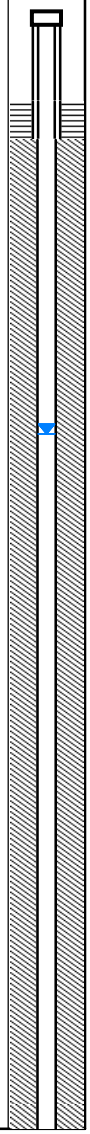
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY110B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2924.3	-2, -1, 0		Ground Surface			
2924.0 – 2915.0	0 – 9		***Sandy Gravel and Cobbles - GW*** Olive-brown, fine to coarse gravels, cobbles to 5 inches, fine to medium sand, slightly moist to dry (2.5Y4/3)	No Samples		
2915.0 – 2906.0	9 – 18		***Silty Clay - CL*** Grayish-brown, slightly plastic to plastic, very moist, 10-20% silt, medium stiff to stiff. (10YR5/1)			
2906.0 – 2905.0	18 – 19		***Sandy Clayey Gravel - GP*** Grayish-brown fine gravel, trace cobbles, 20% fine sand, very moist.			
2905.0 – 2902.0	19 – 22		***Gravelly Clay - CL*** Brown, 25% gravels, medium to coarse, 5% small cobbles, very slightly moist, grayish-brown, 20% fine to coarse gravel, slightly plastic, soft.			
2902.0 – 2897.0	22 – 27		***Clay - CH*** Grayish-brown, plastic, soft to medium stiff, very moist. Fat clay. (10YR5/1)			



DRILLING DATE: 5/18/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 95
TOTAL WELL DEPTH (ft btoc): 91
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.96
GROUND SURFACE ELEVATION (ft AMSL): 2924.33
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY110B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2896.0	28					
2895.0	29					
2894.0	30					
2893.0	31					
2892.0	32					
2891.0	33					
2890.0	34					
2889.0	35					
2888.0	36					
2887.0	37					
2886.0	38					
2885.0	39					
2884.0	40					
2883.0	41					
2882.0	42					
2881.0	43					
2880.0	44					
2879.0	45					
2878.0	46					
2877.0	47		***Sandy Gravel and Cobbles - GW*** Grayish-brown, fine to coarse gravels, 25% sand fine to coarse grained, clayey in part, 10% silt, wet (10YR5/1)			
2876.0	48					
2875.0	49					
2874.0	50		***No Recovery*** Drilled through loose, very fine silty sands.			
2873.0	51					
2872.0	52					
2871.0	53					
2870.0	54					
2869.0	55					
2868.0	56					
2867.0	57					

DRILLING DATE: 5/18/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 95
TOTAL WELL DEPTH (ft btoc): 91
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.96
GROUND SURFACE ELEVATION (ft AMSL): 2924.33
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY110B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2866.0	58		***Clayey Gravelly Sand - SC*** Grayish-brown, fine to coarse-grained, poorly sorted, 15-20% fine to coarse gravels, 5% cobbles, 25% clay, wet. (10YR5/2)			
2865.0	59					
2864.0	60					
2863.0	61					
2862.0	62					
2861.0	63					
2860.0	64					
2859.0	65					
2858.0	66					
2857.0	67					
2856.0	68		***No recovery*** No recovery - blew out sample bags with loose fine sand			
2855.0	69					
2854.0	70					
2853.0	71					
2852.0	72					
2851.0	73					
2850.0	74		***Sand - SP*** Grayish-brown, fine grained, well-sorted, 10% medium-grained, loose to very loose, wet. (10YR5/2)			
2849.0	75					
2848.0	76					
2847.0	77					
2846.0	78		***Clayey Sandy Gravel - GW*** Multi-colored predominantly fine gravel, 40% fine to coarse sand, 10% clay, wet.			
2845.0	79					
2844.0	80					
2843.0	81					
2842.0	82		***Clayey Silty Sand - SC*** Grayish-brown, fine-grained, 10% medium to coarse-grained, moderately to well-sorted, 10% silt, 20% clay, 10% fine gravel, wet. Becoming cleaner with less clay from 88 to 89 feet. (10YR5/2)			
2841.0	83					
2840.0	84					
2839.0	85					
2838.0	86					
2837.0	87					

DRILLING DATE: 5/18/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 95
TOTAL WELL DEPTH (ft btoc): 91
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.96
GROUND SURFACE ELEVATION (ft AMSL): 2924.33
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY110B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2836.0	88					
2835.0	89		***Silty Gravelly Clay - CL*** Light yellowish-brown, 5% fine to coarse gravel, 15% very fine sand and silt, stiff to very stiff, moist. (2.5Y6/3)			
2834.0	90					
2833.0	91					
2832.0	92					
2831.0	93					
2830.0	94					
2829.0	95		End of Log			
2828.0	96					
2827.0	97					
2826.0	98					
2825.0	99					
2824.0	100					
2823.0	101					
2822.0	102					
2821.0	103					
2820.0	104					
2819.0	105					
2818.0	106					
2817.0	107					
2816.0	108					
2815.0	109					
2814.0	110					
2813.0	111					
2812.0	112					
2811.0	113					
2810.0	114					
2809.0	115					
2808.0	116					
2807.0	117					

Monitoring well KRY110B was completed using 2-inch ID, schedule 40 PVC casing screened from 76 to 86 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 86' to 91'. The sand pack was placed from 72 feet (4 feet above top of screen) to 91 feet bgs. Medium (<3/8") bentonite chips were placed above sand packfrom 62 to 72 feet. Portland cement-grout was placed from top of bentonite chip layer to near- surface. A six-inch above-ground steel monument casing was installed as a surface completion.

DRILLING DATE: 5/18/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 95
TOTAL WELL DEPTH (ft btoc): 91
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.96
GROUND SURFACE ELEVATION (ft AMSL): 2924.33
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

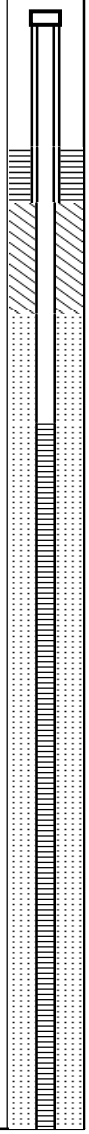
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY111A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2936.0	-2				
2935.0	-1				
2934.4			Ground Surface		
2934.0	0		***Clay/gravel - GC*** Sandy loam to silty clay to gravel and clay	KRY111ASS001	14/0
				KRY111ASS002	9/0
2933.0	1			KRY111ASS003	13/0
2932.0	2		***Gravel and clay - GC*** Silty clay with gravel and sand.		
2931.0	3				
2930.0	4				15/0
2929.0	5				
2928.0	6				
2927.0	7		***Gravel with silt, clay, sand - GC*** Silty sand and gravel to sandy clay.		
2926.0	8				15/0
2925.0	9				
2924.0	10		***Gravel, sand, clay - GC*** Clayey gravel to gravel to sand and clay. 12-14 feet have black petroleum stained gravels with sand and clay. Strong odor, floating product.		
2923.0	11				7/9
2922.0	12				13/0
					9/12
2921.0	13				16/1
2920.0	14				
2919.0	15				12/14
2918.0	16		***No Returns***		
2917.0	17				



DRILLING DATE: 5-02-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.61
GROUND SURFACE ELEVATION (ft AMSL): 2934.43
DRILLING CO.: Cascade

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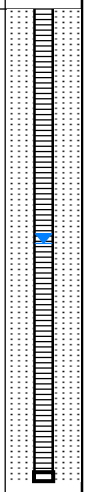
LOG OF BOREHOLE
Monitoring Well ID: KRY111A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2916.0	18					
2915.0	19		***Sand - SP*** Well sorted sands, saturated and stained. Strong odor and stain throughout. Floating product throughout.			
2914.0	20					
2913.0	21					
2912.0	22					
2911.0	23					
2910.0	24		***Sand - SP*** Fine to medium grained sands. Saturated, floating product. Strong odor.			
2909.0	25					
2908.0	26					
2907.0	27					
2906.0	28					
2905.0	29		***Sand - SP*** Very fine grained sands. Floating product, staining, strong odor. **Monitoring well KRY111A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 35 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2904.0	30					
2903.0	31					
2902.0	32					
2901.0	33					
2900.0	34					
2899.0	35		End of Log			
2898.0	36					
2897.0	37					



DRILLING DATE: 5-02-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.61
GROUND SURFACE ELEVATION (ft AMSL): 2934.43
DRILLING CO.: Cascade

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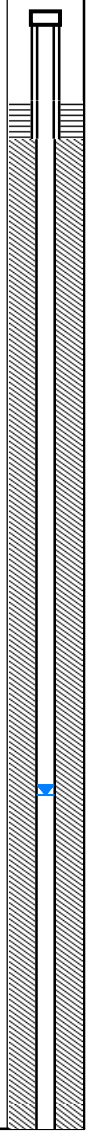
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY111B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2936.0	-2					
	-1					
2935.0	0		Ground Surface			
2934.0	1		***Silty Gravel - GC*** Brown, fine to coarse sub-rounded gravel, 35% silt, trace clayey, trace fine grained sand, dry, trace small cobbles.			
2933.0	2					
2932.0	3					
2931.0	4					
2930.0	5					
2929.0	6		***Gravelly Silty Clay - GC*** Brown, 20% gravel, medium to coarse, 20% clay, low to moderate plasticity, slightly moist, trace small cobbles.			
2928.0	7					
2927.0	8					
2926.0	9					
2925.0	10		***Silty Gravel - GM*** Silty Gravel as above with 35% silt, fine to coarse gravel, 5% cobbles.			
2924.0	11					
2923.0	12					
2922.0	13					
2921.0	14		***Gravelly Silt - GM*** Brown, 25% gravels, medium to coarse, 5% small cobbles, very slightly moist.			
2920.0	15					
2919.0	16		***Clay - CL*** Silty clay, olive-green, 30% silt, very moist to wet.			
2918.0	17					
2917.0	18		***Sand - SP*** Light brown, fine-grained, well-sorted, slightly moist.			
2916.0	19					
2915.0	20		***No Recovery*** Encountered water at approximately 23 feet.			
2914.0	21					
2913.0	22					
2912.0	23					
2911.0	24					
2910.0	25					
2909.0	26					
2908.0	27					
2907.0						



DRILLING DATE: 5/8/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 138
TOTAL WELL DEPTH (ft btoc): 138
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.96
GROUND SURFACE ELEVATION (ft AMSL): 2934.64
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY111B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	28, 29		***Gravelly Clayey Silt - GC*** Brown, dark gray to black at 29 feet, 10% fine to coarse gravels, moist.			
2905.0, 2904.0, 2903.0, 2902.0, 2901.0, 2900.0, 2899.0, 2898.0, 2897.0	30, 31, 32, 33, 34, 35, 36, 37		***Silty Gravel - GM*** Fine to coarse, 5% small cobbles, formation grades between silty gravel and gravelly silt, 30-55% silt, 10% clay, 25-50% gravel, dry to slightly moist. Silty gravel as above becoming sand from 35 to 36 feet, 20% fine-grained sand, slightly moist.			
2896.0, 2895.0, 2894.0, 2893.0, 2892.0, 2891.0, 2890.0, 2889.0, 2888.0, 2887.0	38, 39, 40, 41, 42, 43, 44, 45, 46, 47		***Silty Gravelly Sand - SW*** Grayish-brown, fine to coarse-grained, sub-rounded, poorly sorted, 25-30% silt, trace clayey, 25% gravel, fine to coarse, wet. Slight petroleum odor from 40 to 44 feet. Increasing large gravel content(30%) at 46 feet.			
2886.0, 2885.0, 2884.0, 2883.0, 2882.0	48, 49, 50, 51, 52		***Sand - SP*** Brown, fine to medium-grained, trace coarse-grained, moderately to well-sorted, 10% silt, wet.			
2881.0, 2880.0, 2879.0, 2878.0	53, 54, 55, 56, 57		***Silty Sandy Gravel - SW*** Brown, multi-colored gravels, fine to soarse gravels, fine to coarse sand, 30% silt, wet.			

DRILLING DATE: 5/8/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 138
TOTAL WELL DEPTH (ft btoc): 138
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.96
GROUND SURFACE ELEVATION (ft AMSL): 2934.64
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY111B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2876.0	58		***Sand - SP*** Brown to orange-brown, well-sorted, 5% medium to large gravel. wet.			
2875.0	59					
2874.0	60					
2873.0	61		***Silty Sand - SM*** Brown, fine to coarse-grained, poorly sorted, 10-15% coarse gravel, 5% cobbles.			
2872.0	62					
2871.0	63					
2870.0	64					
2869.0	65		***Sand - SP*** Brown to orange-brown, well-sorted, fine-grained, trace gravel, 5% silt.			
2868.0	66		***Sand - SW*** Brown to orange-brown, fine to coarse-grained, poorly sorted, 10% large gravels and cobbles, wet.			
2867.0	67					
2866.0	68		***Gravelly Clayey Silt*** Brown, 15-20% medium to coarse gravels, 5% cobbles, 15% clay, non-plastic to slightly plastic, wet.			
2865.0	69					
2864.0	70					
2863.0	71					
2862.0	72					
2861.0	73					
2860.0	74					
2859.0	75					
2858.0	76					
2857.0	77		***Sandy Silt - SM*** Brown, loose, runny, sloppy, 35% very fine to fine-grained sand, trace small gravel.			
2856.0	78					
2855.0	79					
2854.0	80					
2853.0	81					
2852.0	82					
2851.0	83					
2850.0	84					
2849.0	85					
2848.0	86					
	87					

DRILLING DATE: 5/8/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 138
TOTAL WELL DEPTH (ft btoc): 138
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.96
GROUND SURFACE ELEVATION (ft AMSL): 2934.64
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY111B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2846.0	88					
2845.0	89					
2844.0	90					
2843.0	91					
2842.0	92					
2841.0	93		***Sandy Silt - SM*** Grayish-brownto brown, 10% fine to very fine-grained sand, 15% fine to coarse subrounded gravel, firm, very moist to wet.			
2840.0	94					
2839.0	95					
2838.0	96					
2837.0	97					
2836.0	98		***No returns*** Sloppy heaving sands and silts run out of core barrel.			
2835.0	99					
2834.0	100		***Silty sand - SP/ML*** Brown, very fine grained, 35-40% silt, loose, sloppy, runny, well-sorted.			
2833.0	101					
2832.0	102					
2831.0	103					
2830.0	104					
2829.0	105					
2828.0	106					
2827.0	107					
2826.0	108					
2825.0	109					
2824.0	110					
2823.0	111					
2822.0	112					
2821.0	113					
2820.0	114					
2819.0	115		***Silty Sand - SM*** Brown, very fine to fine-grained, well-sorted, not sloppy and loose like above, 25-30% silt, very moist to wet, semi-consolidated.			
2818.0	116					
	117					

DRILLING DATE: 5/8/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 138
TOTAL WELL DEPTH (ft btoc): 138
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.96
GROUND SURFACE ELEVATION (ft AMSL): 2934.64
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY111B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2816.0	118					
2815.0	119					
2814.0	120		***Silty Sand - SM*** As above, brown, very fine to fine-grained, semi-firm to sloppy, very sloppy and loose to 131 feet. Formation grades between a very silty sand and sandy silt, trace fine gravel.			
2813.0	121					
2812.0	122					
2811.0	123					
2810.0	124					
2809.0	125					
2808.0	126					
2807.0	127					
2806.0	128					
2805.0	129					
2804.0	130					
2803.0	131					
2802.0	132					
2801.0	133		***Silty Clay - CL*** Brown, trace maroon, trace green, 30% silt, 10% gravel, numerous inclusions of small to medium-sized gravel, moderately plastic, stiff.			
2800.0	134					
2799.0	135					
2798.0	136					
2797.0	137					
2796.0	138		End of Log			
2795.0	139					
2794.0	140					
2793.0	141					
2792.0	142					
2791.0	143					
2790.0	144					
2789.0	145					
2788.0	146					
	147					

Monitoring well KRY111B was completed using 2-inch ID, schedule 40 PVC casing, screened from 123 to 133 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump (133-138' bgs) with #3 sand placed as sand pack. The sand pack was placed from 119 feet (2 feet above top of screen) to 138 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack from 114' to 119' and bentonite grout was placed to approximately 1 foot bgs. An above-ground surface completion was installed in the cement at the surface.

DRILLING DATE: 5/8/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 138
TOTAL WELL DEPTH (ft btoc): 138
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.96
GROUND SURFACE ELEVATION (ft AMSL): 2934.64
DRILLING CO.: Cascade

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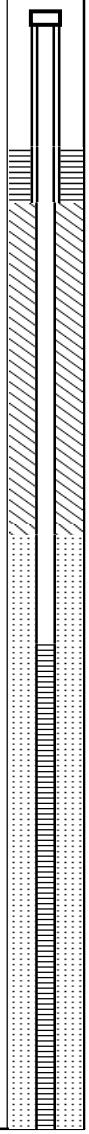
LOG OF BOREHOLE

Monitoring Well ID: KRY112A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
	-2				
2931.0	-1				
2930.0			Ground Surface		
2930.0	0		***Silty gravel - GM*** Brown silty gravel and cobbles. ***No Returns***	KRY112ASS001	1/3
2929.0	1				
2928.0	2				
2927.0	3				
2926.0	4				
2925.0	5		***Silty gravel - GM*** Sitly gravel as above. ***No Returns***		1/1
2924.0	6				
2923.0	7				
2922.0	8				
2921.0	9				
2920.0	10		***Silty gravel - GM*** Brown silty gravel and cobbles with sand and trace clay. ***No Returns***		1/5
2919.0	11				
2918.0	12				
2917.0	13				
2916.0	14				
2915.0	15		***Silty, sandy, gravel - GM*** Brown sility sandy gravel with cobbles. No odor or staining. ***No Returns***		3/14
2914.0	16				
2913.0	17				



DRILLING DATE: 5-03-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.59
GROUND SURFACE ELEVATION (ft AMSL): 2929.97
DRILLING CO.: Cascade

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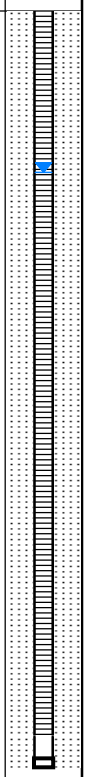
LOG OF BOREHOLE
Monitoring Well ID: KRY112A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2912.0	18					
2911.0	19					
2910.0	20		***Silty sand - SM*** Brown, silty, sand. Very fine grained.		2/8	
2909.0	21					
2908.0	22					
2907.0	23					
2906.0	24					
2905.0	25		***Silty sand - SM*** As above.		1/1	
2904.0	26					
2903.0	27		***No Returns***			
2902.0	28					
2901.0	29					
2900.0	30		***Silty sand - SM*** Brown, sility, sand, fine to medium grained.		1/1	
2899.0	31					
2898.0	32		***No Returns***			
2897.0	33					
2896.0	34					
2895.0	35		End of Log			
2894.0	36					
2893.0	37					



Monitoring well KRY112A was completed using 2-inch ID, schedule 40 PVC casing, screened from 9 to 29 feet bgs with 0.020-inch slotted PVC screen and a 0.5 foot sump from 29 to 29.5 feet, with #3 sand placed as sand pack. The sand pack was placed from 7 feet (2 feet above top of screen) to 29 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-03-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.59
GROUND SURFACE ELEVATION (ft AMSL): 2929.97
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY112B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2934.0	-1					
2933.1			Ground Surface			
2933.0	0		***Sand Silt and Gravel - SW/SM*** Brown, fine to medium sand, silt and gravel, gravel in fine to coarse, scattered cobbles, dry, no odors, no staining.		2.56/0.0	
2932.0	1					
2931.0	2					
2930.0	3					
2929.0	4					
2928.0	5					
2927.0	6					
2926.0	7					
2925.0	8					
2924.0	9					
2923.0	10					
2922.0	11					
2921.0	12					
2920.0	13		***No recovery***			
2919.0	14					
2918.0	15		***Gravel and Sand - GW*** Gravel and sand with some silt, loose, wet, no odors or staining.		2.4/0.21	
2917.0	16					
2916.0	17					
2915.0	18		***Sand - SP*** Brown, fine to medium-grained with trace gravel, gravel increasing with depth, loose and wet, no odors or staining.			
2914.0	19					
2913.0	20					
2912.0	21					
2911.0	22					
2910.0	23		***Sand - SP*** Brown, fine to medium-grained sand with trace to some silt, loose.			
2909.0	24					
2908.0	25		***Sand - SW*** Brown, fine to medium-grained sand with trace to some fine gravel. Some silt at 32.5 to 35 feet. Gravel content increases from 44 to 45 feet with fine to coarse gravel.		2.36/0.02	
2907.0	26					
2906.0	27					

DRILLING DATE: 5/3/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 125
TOTAL WELL DEPTH (ft btoc): 125
LOGGED BY: R Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.09
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY112B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2905.0	28					
2904.0	29					
2903.0	30					
2902.0	31					
2901.0	32					
2900.0	33					
2899.0	34					
2898.0	35					
2897.0	36					
2896.0	37					
2895.0	38					
2894.0	39					
2893.0	40					
2892.0	41					
2891.0	42					
2890.0	43					
2889.0	44					
2888.0	45		***Sand - SW*** Brown, medium to coarse sand with trace scattered fine gravel, very loose. Gravel is fine to medium-grained.			
2887.0	46					
2886.0	47					
2885.0	48		***Sand - SP*** Brown, compact, medium to coarse sand with trace fine to coarse gravel.			
2884.0	49					
2883.0	50		***Sand - SP*** Brown, loose, medium- to coarse-grained sand, trace fine gravel, loose.			
2882.0	51					
2881.0	52					
2880.0	53					
2879.0	54					
2878.0	55					
2877.0	56					
2876.0	57					

DRILLING DATE: 5/3/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 125
TOTAL WELL DEPTH (ft btoc): 125
LOGGED BY: R Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.09
DRILLING CO.: Cascade

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(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY112B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2875.0	58		***SAND - SP*** Brown, fine to medium-grained sand. Scattered layers that are silty sand, trace fine gravel.			
2874.0	59					
2873.0	60		Heaving sands			
2872.0	61					
2871.0	62					
2870.0	63					
2869.0	64					
2868.0	65		***SAND, silty - SM*** Brown, fine to medium sand and silt, trace fine gravel. Silt content varies from trace to abundant, moderately compact.			
2867.0	66					
2866.0	67					
2865.0	68					
2864.0	69					
2863.0	70					
2862.0	71					
2861.0	72					
2860.0	73					
2859.0	74					
2858.0	75					
2857.0	76					
2856.0	77					
2855.0	78					
2854.0	79					
2853.0	80					
2852.0	81					
2851.0	82					
2850.0	83					
2849.0	84					
2848.0	85		***Sand - SP*** Brown fine-grained sand with trace to some silt.			
2847.0	86					
2846.0	87					

DRILLING DATE: 5/3/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 125
TOTAL WELL DEPTH (ft btoc): 125
LOGGED BY: R Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.09
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY112B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2845.0	88					
2844.0	89					
2843.0	90					
2842.0	91					
2841.0	92					
2840.0	93					
2839.0	94					
2838.0	95		***Sand and Silt - SP/SM*** Brown, fine to medium sand and silt, silt content varies from some to abundant, moderately compact. (103 - 104 ft. clay and gravel)			
2837.0	96					
2836.0	97					
2835.0	98					
2834.0	99					
2833.0	100					
2832.0	101					
2831.0	102					
2830.0	103					
2829.0	104					
2828.0	105					
2827.0	106					
2826.0	107					
2825.0	108					
2824.0	109					
2823.0	110					
2822.0	111		***Gravel with Sand - GW*** Brown gravel with some to abundant sand and silt, very loose.			
2821.0	112					
2820.0	113					
2819.0	114					
2818.0	115					
2817.0	116					
2816.0	117					

DRILLING DATE: 5/3/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 125
TOTAL WELL DEPTH (ft btoc): 125
LOGGED BY: R Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.09
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY112B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2815.0	118					
2814.0	119		***CLAY with sand and silt - CL***			
2813.0	120		Brown clay and silt with fine to medium grained gravel.			
2812.0	121					
2811.0	122					
2810.0	123					
2809.0	124					
2808.0	125		End of Log			
2807.0	126					
2806.0	127		**Monitoring well KRY112B was completed using 2-inch ID, schedule 40 PVC casing screened from 110 to 120 feet bgs with 0.020-inch slot, PVC screen with # 3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 120' to 125'.The sand pack was placed from 106 feet (4 feet above top of screen) to 125 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout was placed from top of bentonite chip layer to surface. A six-inch diameter above-ground well monument was inserted in cement at surface.**			
2805.0	128					
2804.0	129					
2803.0	130					
2802.0	131					
2801.0	132					
2800.0	133					
2799.0	134					
2798.0	135					
2797.0	136					
2796.0	137					
2795.0	138					
2794.0	139					
2793.0	140					
2792.0	141					
2791.0	142					
2790.0	143					
2789.0	144					
2788.0	145					
2787.0	146					
2786.0	147					

DRILLING DATE: 5/3/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 125
TOTAL WELL DEPTH (ft btoc): 125
LOGGED BY: R Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.09
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY113A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2938.2			Ground Surface			
	0		***Gravel - GW*** Gravel fill.	KRY113ASS001	Ambient: PID=0.16 FID=-1.2	
2937.0	1		***No Returns***			
2936.0	2					
2935.0	3					
2934.0	4		***Gravel - GW*** Gravel fill with some surface staining. Varied colors.		40/13.2	
2933.0	5					
2932.0	6		***No Returns***			
2931.0	7					
2930.0	8		***Sand - SW*** Fine to medium grained sand with pebbles. Well graded.			
2929.0	9					
2928.0	10		***No Returns*** ***Sand - SW*** Sand as above.	Physical Sample		
2927.0	11		***No Returns***			
2926.0	12					
2925.0	13					
2924.0	14		***Sand - SW*** Sand as above.			
2923.0	15		***No Returns***		47.2/14.5	
2922.0	16		***Sand - SW*** Gravelly sand as above. Dry, loose.			
2921.0	17		***No Returns***			
2920.0	18		***Sand - SW*** Coarse sand with some pebbles. Well graded.	KRY113ASS002	52/161	
2919.0	19		***No Returns*** No returns from 18.5 - 20.0 feet. No sampling from 20 feet to 37 feet.			
	20					

DRILLING DATE: 5-23-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 37
TOTAL WELL DEPTH (ft btoc): 37
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.77
GROUND SURFACE ELEVATION (ft AMSL): 2938.17
DRILLING CO.: Cascade

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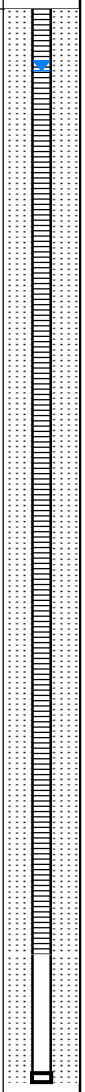
LOG OF BOREHOLE
Monitoring Well ID: KRY113A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2917.0	21					
2916.0	22					
2915.0	23					
2914.0	24					
2913.0	25					
2912.0	26					
2911.0	27					
2910.0	28					
2909.0	29					
2908.0	30					
2907.0	31					
2906.0	32		Monitoring well KRY113A was completed using 2-inch ID, schedule 40 PVC casing, screened from 15 to 35 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 35 to 37 feet, with #3 sand placed as sand pack. The sand pack was placed from 13 feet (2 feet above top of screen) to 37 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A flushmount protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.			
2905.0	33					
2904.0	34					
2903.0	35					
2902.0	36					
2901.0	37		End of Log			
2900.0	38					
2899.0	39					
	40					



DRILLING DATE: 5-23-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 37
TOTAL WELL DEPTH (ft btoc): 37
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.77
GROUND SURFACE ELEVATION (ft AMSL): 2938.17
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY113B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2939.0	-1					
2938.1			Ground Surface			
2938.0	0		***Sandy Gravels and Cobbles - GW*** Muliti-cp;pred grave;s, light olive-brown sand, fine to coarse gravels, cobbles to 7 inches, 35% fine to medium sand, black from 2 to 3 feet, no odor, slightly moist.	No Samples		
2937.0	1					
2936.0	2					
2935.0	3					
2934.0	4					
2933.0	5					
2932.0	6					
2931.0	7					
2930.0	8					
2929.0	9					
2928.0	10					
2927.0	11					
2926.0	12					
2925.0	13					
2924.0	14					
2923.0	15					
2922.0	16		***Sandy Gravels and Cobbles - GP*** As above, 45% fine to medium sand, moist.			
2921.0	17					
2920.0	18		***No returns*** Encountered water between 18 and 23 feet.			
2919.0	19					
2918.0	20					
2917.0	21					
2916.0	22					
2915.0	23		***Clayey Sand - SC*** Dark grayish-brown, very fine to fine grained, 30% clay, sticky, soft, wet. (2.5Y4/2)			
2914.0	24					
2913.0	25					
2912.0	26					
2911.0	27					

DRILLING DATE: 5/21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 120
TOTAL WELL DEPTH (ft btoc): 117
LOGGED BY: J Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.96
GROUND SURFACE ELEVATION (ft AMSL): 2938.07
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY113B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2910.0	28		***Clayey Sandy Gravel - GC*** Multi-colored gravels, dark brown clay and sand, 15% clay, 30% fine sand, wet. (2.5Y4/3)			
2909.0	29					
2908.0	30		***Gravelly Sand - SW*** Dark brown, fine to coarse-grained, poorly sorted, 20% fine to coarse gravel, trace cobbles, wet, very fine to fine-grained well-sorted sand at 37.5 to 38 feet. (2.5Y4/3)			
2907.0	31					
2906.0	32					
2905.0	33					
2904.0	34					
2903.0	35					
2902.0	36					
2901.0	37					
2900.0	38		***Sand - SP*** Brown, medium to coarse sand with trace scattered fine gravel, very loose. Gravel is fine to medium-grained.Light olive-brown, fine to medium grained, moderately to well-sorted, 15% fine gravel, loose, wet. (2.5Y5/3)			
2899.0	39					
2898.0	40					
2897.0	41					
2896.0	42					
2895.0	43					
2894.0	44		***Gravelly Sand - SW*** Light olive-brown, fine to coarse-grained, 25% fine gravel, unconsolidated, wet.			
2893.0	45					
2892.0	46		***Sand - SP*** Light olive-brown, fine grained, well-sorted, 5% fine to coarse gravels, loose, wet.			
2891.0	47					
2890.0	48		***Sandy Gravels - GW*** Multi-colored and light olive-brown sand, fine to coarse gravels, 10-20% fine to coarse sand, wet, loose.			
2889.0	49					
2888.0	50					
2887.0	51					
2886.0	52		***Sandy Gravels - GW*** As above - 35% fine to coarse sand, loose, wet.			
2885.0	53					
2884.0	54					
2883.0	55		***Sand - SP*** Light olive-brown, fine to medium-grained, moderately to well-sorted, 15% fine to coarse gravels, loose, unconsolidated, wet.			
2882.0	56					
2881.0	57					

DRILLING DATE: 5/21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 120
TOTAL WELL DEPTH (ft btoc): 117
LOGGED BY: J Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.96
GROUND SURFACE ELEVATION (ft AMSL): 2938.07
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY113B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2880.0	58		***Sandy Clayey Gravels - GW*** Multi-colored gravels, light olive-brown sand and clay, fine to medium sized gravels, trace coarse, 30% fien sand, 10% clay, mostly loose, wet.			
2879.0	59					
2878.0	60					
2877.0	61					
2876.0	62					
2875.0	63					
2874.0	64		***Sandy Gravel - GW*** As above - much cleaner, no clay, well-washed, fine to medium-grained gravel, 3% coarse gravel, 10-15% fine sand, loose, unconsolidated, permeable.			
2873.0	65					
2872.0	66					
2871.0	67					
2870.0	68					
2869.0	69					
2868.0	70					
2867.0	71					
2866.0	72					
2865.0	73					
2864.0	74					
2863.0	75					
2862.0	76					
2861.0	77					
2860.0	78		***No returns*** Drilling in sandy fine gravel.			
2859.0	79					
2858.0	80		***Sandy Gravel - GW*** Multi-colored light olive-brown sand, fine gravel, 20% fine to coarse sand, loose, wet.			
2857.0	81					
2856.0	82					
2855.0	83					
2854.0	84		***Sandy Gravel - GW*** As above - fine to coarse gravel, 5% cobbles from 93 to 95, intermittently slightly clayey, 25% fine to coarse sand, wet.			
2853.0	85					
2852.0	86					
2851.0	87					

DRILLING DATE: 5/21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 120
TOTAL WELL DEPTH (ft btoc): 117
LOGGED BY: J Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.96
GROUND SURFACE ELEVATION (ft AMSL): 2938.07
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY113B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2850.0	88					
2849.0	89					
2848.0	90					
2847.0	91					
2846.0	92					
2845.0	93					
2844.0	94					
2843.0	95		***Sand - SP*** Light olive-brown, fine-graiend, well-sorted, loose, wet.			
2842.0	96					
2841.0	97					
2840.0	98					
2839.0	99		***Sandy Gravel - GW*** Multi-colored light olive-brown, fine to coarse gravel, 20% fine sand, wet.			
2838.0	100		***Gravelly Sand - SP*** Light olive-brown, very fine to fine grained, 10% silt, trace clay, 15% fine to coarse gravel.			
2837.0	101					
2836.0	102					
2835.0	103					
2834.0	104		***Sandy Silty Gravel - GW*** Multi-colored gravels, light olive-brown sand, fine to coarse gravels, trace cobbles, 30% fine to very fine sand, 10% silt, trace clayey, wet.			
2833.0	105					
2832.0	106					
2831.0	107					
2830.0	108					
2829.0	109					
2828.0	110					
2827.0	111					
2826.0	112					
2825.0	113		***Clayey Silt - ML*** Light olive-brown, 35% clay, 10% fine to medium sized gravel, non-plastic, medium stiff to very stiff, very moist to moist.			
2824.0	114					
2823.0	115					
2822.0	116		***Silty Clay - CL*** Light olive-brown, 40% silt, 15% fine gravel, non-plastic, medium stiff to very stiff, moist to slightly moist.			
2821.0	117					

DRILLING DATE: 5/21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 120
TOTAL WELL DEPTH (ft btoc): 117
LOGGED BY: J Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.96
GROUND SURFACE ELEVATION (ft AMSL): 2938.07
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY113B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2820.0	118					
2819.0	119					
2818.0	120		End of Log			
2817.0	121					
2816.0	122					
2815.0	123		Monitoring well KRY113B was completed using 2-inch ID, schedule 40 PVC casing screened from 102 to 112 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 112' to 117'.The sand pack was placed from 98 feet (4 feet above top of screen) to 120 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout was placed from top of bentonite chip layer to surface. A six-inch diameter above-ground well monument was inserted in cement at surface.			
2814.0	124					
2813.0	125					
2812.0	126					
2811.0	127					
2810.0	128					
2809.0	129					
2808.0	130					
2807.0	131					
2806.0	132					
2805.0	133					
2804.0	134					
2803.0	135					
2802.0	136					
2801.0	137					
2800.0	138					
2799.0	139					
2798.0	140					
2797.0	141					
2796.0	142					
2795.0	143					
2794.0	144					
2793.0	145					
2792.0	146					
2791.0	147					

DRILLING DATE: 5/21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 120
TOTAL WELL DEPTH (ft btoc): 117
LOGGED BY: J Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2940.96
GROUND SURFACE ELEVATION (ft AMSL): 2938.07
DRILLING CO.: Cascade

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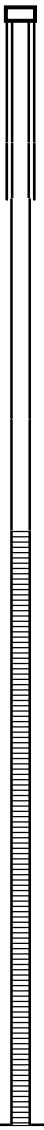
LOG OF BOREHOLE

Monitoring Well ID: KRY114A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2933.0	-2					
	-1					
2932.0						
2931.7	0		Ground Surface			
			Silt with gravel - ML Light brown to dark brown silt with fine to medium grained gravel and minor sand. ***No Returns***	No Samples	45/3	
2931.0	1					
2930.0	2					
2929.0	3					
2928.0	4		***Silt - ML*** Brown silt with sand and gravel. ***No Returns*** Grinding on gravels, no recovery.		47/5	
2927.0	5					
2926.0	6					
2925.0	7					
2924.0	8					
2923.0	9					
2922.0	10					
2921.0	11					
2920.0	12					
2919.0	13					
2918.0	14		***Sand - SW*** Trae amount of sand and gravel. Spoon had petroleum odor. ***No Returns***			
2917.0	15					
2916.0	16					
2915.0	17					



DRILLING DATE: 5-18-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

Tetra Tech EM Inc.
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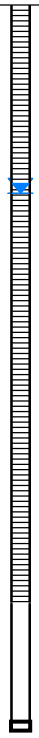
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY114A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
	18					
2913.0	19		***Sand - SP*** Brown fine to medium grained sand with trace gravel. Staining, sheen.		45/70	
2912.0	20		***No Returns***			
2911.0	21					
2910.0	22					
2909.0	23					
2908.0	24		***Sand - SP*** Brown fine to medium grained sand.		74/30	
2907.0	25		***No Returns***			
2906.0	26					
2905.0	27					
2904.0	28					
2903.0	29		End of Log			
2902.0	30					
2901.0	31					
2900.0	32					
2899.0	33					
2898.0	34					
2897.0	35					
2896.0	36					
2895.0	37					



Monitoring well KRY114A was completed using 2-inch ID, schedule 40 PVC casing, screened from 7 to 27 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 27 to 29 feet, with #3 sand placed as sand pack. The sand pack was placed from 5 feet (2 feet above top of screen) to 29 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-18-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY114B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2933.0	-2					
	-1					
2932.7	0		Ground Surface			
2931.0	1		***Silt - ML*** Dark brown silt with minor clay. (10R3/1)	KRY114BSS001		
2930.0	2					
2929.0	3		***Sand - SP*** Brown, medium to coarse win fine to medium gravel, gravel is angular to semi-rounded with trace cobbles. (7YR7/4)			
2928.0	4					
2927.0	5		***Sand - SP*** Brown, medium-coarse sand with fine- to medium-grained gravel, grades to medium sand with fine gravel, trace to some cobbles.			
2926.0	6					
2925.0	7					
2924.0	8		***Sand - SP*** Brown, medium to coarse-grained with fine to medium gravel; large cobble at 12 feet blocks returns from 12 to 15 feet. At 12 ft.,few gravel frags with moisture, light odor.			
2923.0	9					
2922.0	10					
2921.0	11					
2920.0	12		***No Returns***			
2919.0	13					
2918.0	14					
2917.0	15		***Sandy Gravel - SP*** Brown, damp - as above with more cobbles.		PID=1.6	
2916.0	16					
2915.0	17				PID=4.0	
2914.0	18		***Sand - SP*** As above - stronger odor.			
2913.0	19					
2912.0	20		***Sand with gravel - SP*** Brown, very moist, fine to medium sand with gravel as above, strong odor.		PID=0.5	
2911.0	21					
2910.0	22					
2909.0	23		***Sand with Gravel - SP*** As above - wet at 22.5; strong petro odor, gravel is fine to coarse. Driller indicates water at 24 feet.	KRY114BSB001		
2908.0	24					
2907.0	25		***Sand - SP*** Medium to coarse-grained, wet.			
2906.0	26					
2905.0	27					

DRILLING DATE: 4/18-19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY114B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2903.0	28		***Gravel with sand - GP*** Brown, fine to medium gravel with coarse sand, no odor, wet.			
2902.0	29					
2901.0	30		***Gravel with Sand - GP*** As above, minor odor.			
2900.0	31					
2899.0	32					
2898.0	33		***Gravel with Sand - GP*** Fine to coarse gravel with coarse sand, wet, no odor.			
2897.0	34					
2896.0	35					
2895.0	36					
2894.0	37					
2893.0	38					
2892.0	39					
2891.0	40		***Sand with Gravel - SP*** Brown, wet, sand with gravel and some silt, changes at 42 feet to medium to coarse sand with fine to medium gravel, no odors.			
2890.0	41					
2889.0	42					
2888.0	43		***Sand and Gravel - SW*** Brown sand and gravel with minor silt and clay. (7YR7/4)			
2887.0	44					
2886.0	45		***Sand with Gravel - SW*** Brow, fine to coarse sand with fine to medium gravel and trace to some silt.			
2885.0	46					
2884.0	47					
2883.0	48					
2882.0	49					
2881.0	50		***Sand with Gravel - SW*** Fine to coarse sand with fine gravel and some to moderate silt, very wet, grades to rounded coarse gravel with sand at 52 feet.			
2880.0	51					
2879.0	52					
2878.0	53		***Sand with Gravel - SW*** Brown, fine to coarse sand and gravel with some silt.			
2877.0	54					
2876.0	55					
2875.0	56					
	57					

DRILLING DATE: 4/18-19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY114B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2873.0	58, 59		***Sandy Gravel - GW*** As above - grades to silty sand with fine gravel and trace to some clay at 59 feet.			
2872.0, 2871.0	60, 61		***Silt with sand, gravels and clay - SC*** Brown clayey silt with some to abundant sand and fine to medium gravel and trace coarse gravel.			
2870.0, 2869.0	62, 63		***Clayey Silt - SM*** Brown, clayey silt as above, grades to silty sand and gravel with trace clay.			
2868.0, 2867.0, 2866.0	64, 65, 66		***Silt, Sand, and Gravel - SM*** Brown silt, sand, and gravel with trace clay. Slight increase in clay content at 67.5 feet.			
2865.0, 2864.0, 2863.0	67, 68, 69					
2862.0, 2861.0	70, 71		***Silt and Clay - ML*** Brown with trace to some gravel and sand.			
2860.0, 2859.0	72, 73		***Sand - SP*** Brown, medium to coarse-grained with some fine gravel, grades to coarse sand and fine gravel, grades sand and fine to coarse gravel with trace to some silt			
2858.0, 2857.0	74, 75		***Gravel with Sand - GP*** Fine to coarse rounded gravel with trace sand and silt.			
2856.0, 2855.0	76, 77					
2854.0, 2853.0	78, 79		***Gravel with Sand - GP*** Fine to coarse gravel with medium-grained sand, trace silt, scattered cobbles.			
2852.0, 2851.0	80, 81		***Sand - SP*** Brown, mediun to coarse-grained sand and gravel with trace to some silt.			
2850.0, 2849.0	82, 83		***Sand - SP*** As above - some silt.			
2848.0, 2847.0	84, 85					
2846.0, 2845.0	86, 87		***Gravel with Sand - GM*** Fine to coarse gravel with trace to some sand and silt.			

DRILLING DATE: 4/18-19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY114B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2843.0	88					
2842.0	89					
2841.0	90		***Silt, Sand, and Gravel - SM*** Brown silt sand and gravel, wet and loose, difficult recovery.			
2840.0	91					
2839.0	92					
2838.0	93					
2837.0	94					
2836.0	95					
2835.0	96					
2834.0	97					
2833.0	98					
2832.0	99					
2831.0	100		***Sand and Silt - SM*** Brown sand and silt, sand is fine to medium-grained, trace fine gravel, bottom 0.5 feet has abundant gravel.			
2830.0	101					
2829.0	102					
2828.0	103		***Silt, sand and Gravel - SM*** Brown gravelly silt with some sand and trace to some clay. Gravel ranges from fine to coarse.			
2827.0	104					
2826.0	105		***Silt, sand, and Gravel*** Brown silt and gravel with some sand, trace clay; becoming more compact and competent.			
2825.0	106					
2824.0	107					
2823.0	108					
2822.0	109					
2821.0	110		***Clayey silt and Gravel*** Brown silt, clay, and gravel with some sand.			
2820.0	111					
2819.0	112					
2818.0	113					
2817.0	114					
2816.0	115		***Clayey Silt and Gravel*** As above with frags of weathered rock, scattered small cobbles.			
2815.0	116					
	117					

DRILLING DATE: 4/18-19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY114B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2813.0	118		***Silt, Clay, and Gravel - ML/CL*** Very tightly compacted silt clay and gravel with frags of decomposed rock, slightly moist.			
2812.0	119					
2811.0	120		***Silt, Clay, and Gravel - ML/CL*** As above.			
2810.0	121					
2809.0	122		End of Log			
2808.0	123					
2807.0	124					
2806.0	125		**Monitoring well KRY114B was completed using 2-inch ID, schedule 40 PVC casing screened from 108 to 118 feet bgs with 0.020-inch slot, PVC screen with # 3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 118' to 122'.The sand pack was placed from 107.5 feet (0.5 feet above top of screen) to 122 feet bgs. Medium (<3/8") bentonite chips were placed from the top of the sand pack to 102.5 feet. Portland cement-grout was placed from top of bentonite chip layer to surface. A six-inch diameter above-ground well monument was inserted in cement at surface.**			
2805.0	126					
2804.0	127					
2803.0	128					
2802.0	129					
2801.0	130					
2800.0	131					
2799.0	132					
2798.0	133					
2797.0	134					
2796.0	135					
2795.0	136					
2794.0	137					
2793.0	138					
2792.0	139					
2791.0	140					
2790.0	141					
2789.0	142					
2788.0	143					
2787.0	144					
2786.0	145					
2785.0	146					
	147					

DRILLING DATE: 4/18-19/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.65
GROUND SURFACE ELEVATION (ft AMSL): 2931.65
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY115A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2935.0	-1					
2933.9			Ground Surface			
2934.0	0		***Clayey sand - SC to GC*** Brown clayey sand and gravel. ***No Returns***	No Samples		
2933.0	1					
2932.0	2					
2931.0	3					
2930.0	4					
2929.0	5		***Clayey silt - ML*** Brown clayey silt with trace fine sand. ***No Returns***			
2928.0	6					
2927.0	7					
2926.0	8					
2925.0	9					
2924.0	10		***Silt - ML*** Brown clayey silt. Slightly moist.			
2923.0	11					
2922.0	12					
2921.0	13					
2920.0	14		***Silty gravel - GM*** Brown silty gravel. Trace fine sand. ***No Returns***			
2919.0	15					
2918.0	16					
2917.0	17					

DRILLING DATE: 5-4-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 32.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.91
DRILLING CO.: Cascade

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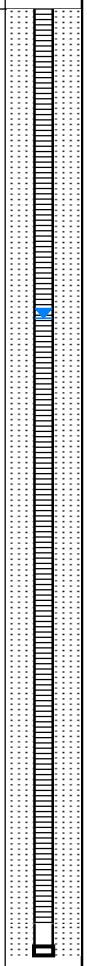
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY115A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2916.0	18		***Silty sand - SM*** Brown silty sand with minor gravel. Wet at 19 feet.			
2915.0	19					
2914.0	20					
2913.0	21					
2912.0	22					
2911.0	23		***Sand - SP*** Brown fine to medium grained sand with trace sility and gravel.			
2910.0	24					
2909.0	25		***Sand - SP*** Gravelly sand with trace silt.			
2908.0	26					
2907.0	27					
2906.0	28					
2905.0	29		***Sand - SP*** As above			
2904.0	30		***No Returns***			
2903.0	31					
2902.0	32		***Sand - SP*** Sand as above.			
2901.0	33		***No Returns***			
2900.0	34					
2899.0	35		End of Log			
2898.0	36					
2897.0	37					



Monitoring well KRY115A was completed using 2-inch ID, schedule 40 PVC casing, screened from 12 to 32 feet bgs with 0.020-inch slotted PVC screen and a 0.5 foot sump from 32 to 32.5 feet, with #3 sand placed as sand pack. The sand pack was placed from 10 feet (2 feet above top of screen) to 32.5 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-4-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 32.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.78
GROUND SURFACE ELEVATION (ft AMSL): 2933.91
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY115B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2935.0	-2					
	-1					
2933.8			Ground Surface			
2933.0	0		***Silt with Gravel - ML*** Silt, brown, 10% pebbles, sl. damp., slightly stiff. (5YR3/4)	KRY115BSS001	-19/-0.12	
2932.0	1					
2931.0	2		***Silt with Gravel - GM*** Silt with fine sand, light brown, 50% pebbles, loose, dry. (5YR5/2)			
2930.0	3					
2929.0	4		***Gravel with Silt - GM*** Light brown, gravels up to 1.5 inches, loose, dry.			
2928.0	5					
2927.0	6					
2926.0	7		***Gravel with Silt - GM*** As above with fine sand.			
2925.0	8					
2924.0	9		***Gravel with SIlt - GM*** Concretion or boulder at 10 feet, loose, dry, pebbles are sub-angular to sub-rounded.			
2923.0	10					
2922.0	11					
2921.0	12		***Gravels with Clay - GC*** Light yellowish-brown, moderately stiff, sl. damp. (10YR5/4)			
2920.0	13					
2919.0	14		***No Recovery***			
2918.0	15		***Gravel with Sand - GP*** Light yellowish-brown, sub-rounded gravels up to 6 inches, well-graded sands and gravels, loose, damp.			
2917.0	16					
2916.0	17					
2915.0	18					
2914.0	19					
2913.0	20					
2912.0	21					
2911.0	22					
2910.0	23					
2909.0	24					
2908.0	25		***Gravel with Clay - GC*** Light yellowish-brown, 50% gravel, moderately stiff, wet. Grades to gravels below distinctly.			
2907.0	26					
	27					

DRILLING DATE: 4-26-05
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122.5
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: D. Shaffer/R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.68
GROUND SURFACE ELEVATION (ft AMSL): 2933.85
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY115B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	28		***Gravel with Sand - GW*** Little to no fines, no clay, light yellowish-brown, loose, wet, gravels are rounded to sub-rounded, varied colors, pebbles are rounded.			
2905.0	29					
2904.0	30					
2903.0	31					
2902.0	32					
2901.0	33		***No Returns***			
2900.0	34					
2899.0	35					
2898.0	36					
2897.0	37					
2896.0	38					
2895.0	39					
2894.0	40		***Sand with Gravel - SW*** Brown, fine to medium-grained sand and fine to medium gravel with trace to some silt, very loose.			
2893.0	41					
2892.0	42					
2891.0	43					
2890.0	44					
2889.0	45		***Sand with Gravel - SW*** Brown, fine to medium-grained sand and silt and gravel, slightly more dense than material above.			
2888.0	46					
2887.0	47					
2886.0	48		***Sand with Gravel - SW*** Brown medium-grained gravel with silt and sand, very loose.			
2885.0	49					
2884.0	50		***Gravel with Sand - GW*** Brown gravel with fine to coarse sand, very loose.			
2883.0	51					
2882.0	52					
2881.0	53					
2880.0	54					
2879.0	55		***Sand - SW*** Brown fine to coarse-grained sand.			
2878.0	56					
2877.0	57					

DRILLING DATE: 4-26-05
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122.5
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: D. Shaffer/R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.68
GROUND SURFACE ELEVATION (ft AMSL): 2933.85
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY115B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2876.0	58					
2875.0	59					
2874.0	60					
2873.0	61		***Gravel with Sand - GW*** Fine to medium gravel with some coarse sand.			
2872.0	62					
2871.0	63		***Silt and Sand - ML*** Brown silt, sand, and fine to medium gravel. Trace to some clay.			
2870.0	64					
2869.0	65		***Sand with Gravel - SW*** Brown, fine to medium sand, grading to coarse sand and fine gravel.			
2868.0	66					
2867.0	67					
2866.0	68		***Sand with Gravel - SW*** Brown sand and fine to medium gravel, some silt.			
2865.0	69					
2864.0	70		***Sand with Gravel - SW*** Brown, fine to coarse sand, siltand gravel. Gravel is fine to coarse. Scattered cobbles.			
2863.0	71					
2862.0	72					
2861.0	73					
2860.0	74					
2859.0	75		***No returns***			
2858.0	76					
2857.0	77					
2856.0	78					
2855.0	79					
2854.0	80		***Sand with Gravel - SM*** Brown medium to coarse sand and fine to medium gravel, trace silt, loose.			
2853.0	81					
2852.0	82					
2851.0	83					
2850.0	84					
2849.0	85		***Sand with Gravel - SW*** Brown medium to coarse sand with fine to coarse gravel, loose.			
2848.0	86					
2847.0	87					

DRILLING DATE: 4-26-05
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122.5
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: D. Shaffer/R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.68
GROUND SURFACE ELEVATION (ft AMSL): 2933.85
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY115B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2846.0	88		***Gravel with Sand - GW/GM*** Fine to coarse gravel and sand with trace to come silt.			
2845.0	89					
2844.0	90		***Sand with Gravel - SW*** Brown, fine to medium-grained sand with fine to coarse gravel, rounded to angular.			
2843.0	91					
2842.0	92					
2841.0	93		***Silt, sand and Gravel - SM/SP*** Brown to fine sand with silt, grading to fine to medium sand.			
2840.0	94					
2839.0	95		***Gravel with Silt - GM*** Brown gravel with fine to coarse sand, some silt, some scattered cobbles.			
2838.0	96					
2837.0	97					
2836.0	98					
2835.0	99					
2834.0	100					
2833.0	101					
2832.0	102					
2831.0	103					
2830.0	104					
2829.0	105		***Sand with silt - SW/SM*** Brown, fine to coarse sand, silt and fine to coarse gravel.			
2828.0	106					
2827.0	107					
2826.0	108		***Gravel with Sand - GW*** Brown, fine to medium gravel with coarse sand.			
2825.0	109					
2824.0	110		***Gravel with Sand - GW*** Brown fine to coarse gravel with sand to fine gravels and sand, trace silt.			
2823.0	111					
2822.0	112					
2821.0	113					
2820.0	114					
2819.0	115		***Gravel with Sand - GP*** As above becoming fine to medium sand at 117.3 feet.			
2818.0	116					
2817.0	117					

DRILLING DATE: 4-26-05
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122.5
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: D. Shaffer/R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.68
GROUND SURFACE ELEVATION (ft AMSL): 2933.85
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY115B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2816.0	118		***Clayey Silt - CL*** Brown, dense, clayey silt with some fine to medium gravel and trace sand.			
2815.0	119					
2814.0	120					
2813.0	121					
2812.0	122					
2811.0	123		End of Log			
2810.0	124		**Monitoring well KRY115B was completed using 2-inch ID, schedule 40 PVC casing screened from 107 to 117 feet bgs with 0.020-inch slot, PVC screen with # 3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 117' to 122'.The sand pack was placed from 103 feet (4 feet above top of screen) to 122 feet bgs. Medium (<3/8") bentonite chips were placed from the top of the sand pack to 100 feet. Portland cement-grout was placed from top of bentonite chip layer to surface. A six-inch diameter above-ground well monument was inserted in cement at surface.**			
2809.0	125					
2808.0	126					
2807.0	127					
2806.0	128					
2805.0	129					
2804.0	130					
2803.0	131					
2802.0	132					
2801.0	133					
2800.0	134					
2799.0	135					
2798.0	136					
2797.0	137					
2796.0	138					
2795.0	139					
2794.0	140					
2793.0	141					
2792.0	142					
2791.0	143					
2790.0	144					
2789.0	145					
2788.0	146					
2787.0	147					

DRILLING DATE: 4-26-05
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 122.5
TOTAL WELL DEPTH (ft btoc): 122
LOGGED BY: D. Shaffer/R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2936.68
GROUND SURFACE ELEVATION (ft AMSL): 2933.85
DRILLING CO.: Cascade

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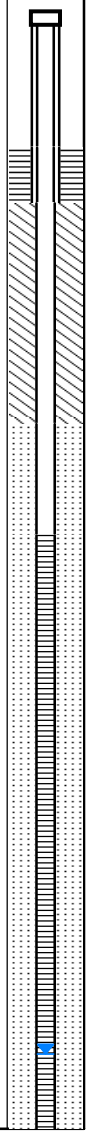
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY116A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2931.0	-2					
2930.0	-1					
2929.3			Ground Surface			
2929.0	0		***Silt*** Brown silt with very fine grained sand.	KRY116ASS001		
2928.0	1		***No Returns***			
2927.0	2					
2926.0	3					
2925.0	4		***Silty sand - SM*** Brown silty sand. Slighty moist.			
2924.0	5		***No returns.***			
2923.0	6					
2922.0	7					
2921.0	8					
2920.0	9					
2919.0	10		***Silty sand - SM*** Light brown silty sand. Soft, moist.			
2918.0	11					
2917.0	12		***Silty sand - SM to SP*** Sand as above, very fine.			
2916.0	13			KRY116ASB001		
2915.0	14		***Silty sand - SM*** As above.			
2914.0	15					
2913.0	16					
2912.0	17					



DRILLING DATE: 5-5-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 30
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.53
GROUND SURFACE ELEVATION (ft AMSL): 2929.33
DRILLING CO.: Cascade

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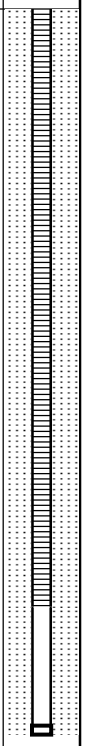
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY116A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2911.0	18					
2910.0	19					
2909.0	20		***Silty sand - SM*** As above			
2908.0	21		***No Returns***			
2907.0	22					
2906.0	23					
2905.0	24					
2904.0	25		***Silty sand - SM*** As above.			
2903.0	26					
2902.0	27		***No Returns***			
2901.0	28					
2900.0	29					
2899.0	30		End of Log			
2898.0	31					
2897.0	32					
2896.0	33					
2895.0	34					
2894.0	35					
2893.0	36					
2892.0	37					



Monitoring well KRY116A was completed using 2-inch ID, schedule 40 PVC casing, screened from 7 to 27 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 27 to 29 feet, with #3 sand placed as sand pack. The sand pack was placed from 5 feet (2 feet above top of screen) to 29 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-5-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 30
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.53
GROUND SURFACE ELEVATION (ft AMSL): 2929.33
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY116B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2935.0	-2					
2934.0	-1					
2933.8			Ground Surface			
2933.0	0		***Sand - SP*** Brown, fine grained, silty, 10-25% silt, well-sorted. loose, slightly moist grading to sandy silt from 5 to 6 feet. (7.5YR5/4)	No Samples		
2932.0	1					
2931.0	2					
2930.0	3					
2929.0	4					
2928.0	5					
2927.0	6					
2926.0	7					
2925.0	8		***Sandy Silt - ML*** Brown, very moist, 30% very fine grained sand. (7.5YR5/4)			
2924.0	9					
2923.0	10					
2922.0	11		***Silty Sand - SP*** Brown, very fine- to fine-grained, well-sorted, 15% silt, very moist. (7.5YR5/4)			
2921.0	12					
2920.0	13		***Sandy Silt - ML*** As above.			
2919.0	14					
2918.0	15		***Silty Sand - SP*** Brown, very fine to fine-grained, 10% silt, well-sorted, very moist, wet at 19 feet. (7.5YR5/4)			
2917.0	16					
2916.0	17					
2915.0	18					
2914.0	19		***Sandy Silt - SP*** As above. (7.5YR5/4)			
2913.0	20					
2912.0	21					
2911.0	22					
2910.0	23					
2909.0	24		***Silty Sand - SM*** Brown, very fine to fine-grained, well-sorted, 40% silt, very moist to wet. (7.5YR5/4)			
2908.0	25					
2907.0	26					
	27					

DRILLING DATE: 5/11/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 118
TOTAL WELL DEPTH (ft btoc): 110.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.97
GROUND SURFACE ELEVATION (ft AMSL): 2929.32
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY116B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	28					
2905.0	29					
2904.0	30		***Sandy Silt - ML*** As above, brown, 35% very fine-grained sand, semi-firm.			
2903.0	31					
2902.0	32					
2901.0	33					
2900.0	34					
2899.0	35					
2898.0	36					
2897.0	37		***Silty Sand - SM*** As above, brown, very fine to fine-grained, well-sorted, semi-firm to loose, 25% silt, very damp to wet.			
2896.0	38					
2895.0	39					
2894.0	40					
2893.0	41					
2892.0	42					
2891.0	43					
2890.0	44					
2889.0	45		***Sandy Silt - ML*** Brown, 30-40% very fine-grained sand, very moist, trace coarse gravel at 58 feet. (7.5YR5/4)			
2888.0	46					
2887.0	47					
2886.0	48					
2885.0	49					
2884.0	50					
2883.0	51					
2882.0	52					
2881.0	53					
2880.0	54					
2879.0	55					
2878.0	56					
2877.0	57					

DRILLING DATE: 5/11/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 118
TOTAL WELL DEPTH (ft btoc): 110.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.97
GROUND SURFACE ELEVATION (ft AMSL): 2929.32
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY116B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2876.0	58		***Silty Sand - SM*** Brown, very fine-grained, well-sorted, 30% silt, loose, runny, wet. (7.5YR5/4)			
2875.0	59					
2874.0	60		***Silty Clayey Gravel - GM*** Brown matrix, moslty fine gravel, trace coarse gravel, 30% silt, 15% clay, 15% fine sand, becoming 45% clay at 105 feet. (7.5YR6/6)			
2873.0	61					
2872.0	62					
2871.0	63					
2870.0	64					
2869.0	65					
2868.0	66					
2867.0	67		***Sandy Silt - ML*** Brown, 35% very fine grained sand, clayey in part, very moist.			
2866.0	68					
2865.0	69					
2864.0	70					
2863.0	71		***Silty Sand - SM*** Brown, fine-grained, 10% silt, moist to wet. (7.5YR5/4)			
2862.0	72					
2861.0	73		***Sandy Silt - ML*** Brown, 15% ver fine-grained sand, 10% clay, firm, well consolidated, very moist.			
2860.0	74					
2859.0	75					
2858.0	76					
2857.0	77					
2856.0	78					
2855.0	79					
2854.0	80					
2853.0	81					
2852.0	82					
2851.0	83					
2850.0	84					
2849.0	85					
2848.0	86					
2847.0	87					

DRILLING DATE: 5/11/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 118
TOTAL WELL DEPTH (ft btoc): 110.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.97
GROUND SURFACE ELEVATION (ft AMSL): 2929.32
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY116B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2846.0	88		***Sandy Silty Gravels and Cobbles - GW*** Variable colored gravels, fine to coarse gravels, sub-rounded, 10% cobbles to 4 inches, 25% sand, fine to coarse-grained, 20% silt, clayey in part, very damp to wet. (7.5YR4/4)			
2845.0	89					
2844.0	90					
2843.0	91					
2842.0	92					
2841.0	93					
2840.0	94					
2839.0	95					
2838.0	96					
2837.0	97					
2836.0	98		***Silty Sand - SM*** Brown, fine-grained, well-sorted, 35% silt, loose, runny, sloppy. (7.5YR5/4)			
2835.0	99					
2834.0	100					
2833.0	101					
2832.0	102					
2831.0	103					
2830.0	104					
2829.0	105					
2828.0	106					
2827.0	107					
2826.0	108		***Gravelly Clay - CL*** Tan, sticky, moderately plastic, 25% fine to coarse gravel. (7.5YR6/6)			
2825.0	109					
2824.0	110		***Gravelly Clay - CL*** Gravelly Clay, rust orange-brown, 5-15% fine gravels, very stiff, hard, slightly moist to moist, becoming maroon red and purple mottled at 116 feet. (7.5YR5/8)			
2823.0	111					
2822.0	112					
2821.0	113					
2820.0	114					
2819.0	115					
2818.0	116					
2817.0	117					

DRILLING DATE: 5/11/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 118
TOTAL WELL DEPTH (ft btoc): 110.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.97
GROUND SURFACE ELEVATION (ft AMSL): 2929.32
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY116B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2816.0	118		End of Log			
2815.0	119					
2814.0	120					
2813.0	121		Monitoring well KRY116B was completed using 2-inch ID, schedule 40 PVC casing screened from 95.5 to 105.5 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 105.5' to 110.5'.The sand pack was placed from 91 feet (4 feet above top of screen) to 110.5 feet bgs. Medium (<3/8") bentonite chips were placed from the top of the sand pack to 87 feet. Portland cement-grout was placed from top of bentonite chip layer to surface. A six-inch diameter above-ground well monument was inserted in cement at surface.			
2812.0	122					
2811.0	123					
2810.0	124					
2809.0	125					
2808.0	126					
2807.0	127					
2806.0	128					
2805.0	129					
2804.0	130					
2803.0	131					
2802.0	132					
2801.0	133					
2800.0	134					
2799.0	135					
2798.0	136					
2797.0	137					
2796.0	138					
2795.0	139					
2794.0	140					
2793.0	141					
2792.0	142					
2791.0	143					
2790.0	144					
2789.0	145					
2788.0	146					
2787.0	147					

DRILLING DATE: 5/11/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 118
TOTAL WELL DEPTH (ft btoc): 110.5
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.97
GROUND SURFACE ELEVATION (ft AMSL): 2929.32
DRILLING CO.: Cascade

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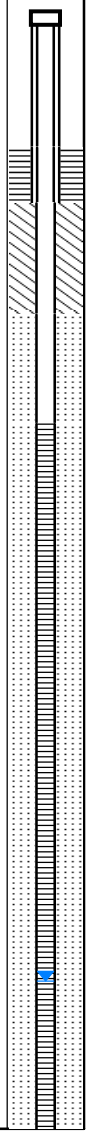
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY117A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2927.0	-1					
2926.1			Ground Surface			
2926.0	0		***No Returns***			
2925.0	1			No Samples		
2924.0	2					
2923.0	3					
2922.0	4					
2921.0	5					
2920.0	6					
2919.0	7					
2918.0	8					
2917.0	9					
2916.0	10		***Clay - CL*** Gray-green clay with local lenses of medium grained subangular snads.		171/27	
2915.0	11		***Sand - SP*** Well sorted medium grained sand.			
2914.0	12		***No Returns***			
2913.0	13					
2912.0	14					
2911.0	15		***Sand - SP*** Medijm grained well sorted sand. No staining. No odor.		14/66	
2910.0	16					
2909.0	17					



DRILLING DATE: 5-20-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.25
GROUND SURFACE ELEVATION (ft AMSL): 2926.08
DRILLING CO.: Cascade

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Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY117A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2908.0	18					
2907.0	19					
2906.0	20		***Sand - SP*** Medium grained well sorted sand.			
2905.0	21					
2904.0	22					
2903.0	23					
2902.0	24					
2901.0	25		End of Log			
2900.0	26					
2899.0	27					
2898.0	28					
2897.0	29					
2896.0	30					
2895.0	31					
2894.0	32					
2893.0	33					
2892.0	34					
2891.0	35					
2890.0	36					
2889.0	37					

Monitoring well KRY117A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-20-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.25
GROUND SURFACE ELEVATION (ft AMSL): 2926.08
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

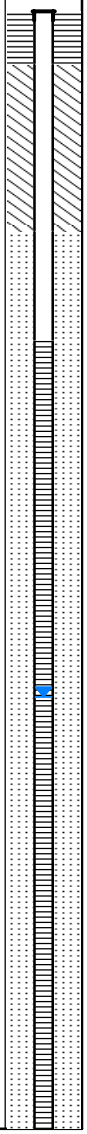
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY118A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2924.7			Ground Surface			
	0		***Gravelly Silt - ML*** Light brownish gray (2.5y6/2) gravelly silt intermixed with very dark grayish brown sand(10yr3/2). Damp, loose.	No Samples		
	1		***No Returns***			
2923.0	2					
2922.0	3					
2921.0	4					
2920.0	5					
2919.0	6					
2918.0	7					
2917.0	8					
2916.0	9		***No Returns***			
2915.0	10					
2914.0	11					
2913.0	12					
2912.0	13		***Gravelly Silt - ML*** Poor recovery from 9-14 feet. Gravelly silt with some clay and minor medium to coarse sand.			
2911.0	14		***No Returns***			
2910.0	15					
2909.0	16					
2908.0	17					
2907.0	18		***Sandy Clay - CL*** Brown sand clay. Coarse sand and trace gravel. Wet, slightly plastic.			
2906.0	19		***Clay - CH*** Brown (10yr5/3, dense, fat clay. Wet, very plastic.			
2905.0	20		***No Returns***			



DRILLING DATE: 6-01-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 28
TOTAL WELL DEPTH (ft btoc): 26
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2924.44
GROUND SURFACE ELEVATION (ft AMSL): 2924.67
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY118A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2904.0	21					
2903.0	22					
2902.0	23		***Sandy Clay - CL*** Sandy clay and clay. Very plastic.			
2901.0	24		***Sandy Gravel - GW*** Brown (10yr5/3) sandy gravel. Fine to coarse gravel. Wet, loose.			
2900.0	25		***Sandy Gravel - GW*** Light olive brown (2.5y5/3) sandy gravel. Fine gravels with some coarse gravel. Wet, loose.			
2899.0	26					
2898.0	27					
2897.0	28		***Sandy Clay - CL*** Sandy clay as above.			
2896.0	29		End of Log			
2895.0	30					
2894.0	31					
2893.0	32					
2892.0	33					
2891.0	34					
2890.0	35					
2889.0	36					
2888.0	37					
2887.0	38					
2886.0	39					
2885.0	40					

Monitoring well KRY118A was completed using 2-inch ID, schedule 40 PVC casing, screened from 6 to 26 feet bgs with 0.020-inch slotted PVC screen and a 2 foot sump from 26 to 28 feet, with #3 sand placed as sand pack. The sand pack was placed from 4 feet (2 feet above top of screen) to 28 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A flush mount protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 6-01-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 28
TOTAL WELL DEPTH (ft btoc): 26
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2924.44
GROUND SURFACE ELEVATION (ft AMSL): 2924.67
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY118B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2924.5			Ground Surface			
	0–1		***Silt with Clay - ML*** Light to dark brown silt with clay, no odors or staining. (10YR3/2)		4/5	
2923.0	2		***Sand Gravel and Silt - GM*** Light brown sand and gravel and silt, no odors or staining. (10YR7/2)		7/3	
2922.0	3					
2921.0	4					
2920.0	5				Ambient: PID=0 FID=3.5	
2919.0	6					
2918.0	7					
2917.0	8				11/9	
2916.0	9					
2915.0	10					
2914.0	11					
2913.0	12					
2912.0	13		***Clay - CL*** Brown plastic clay with some silt, moist to wer, no odors or staining. (10YR6/2)		23/7	
2911.0	14					
2910.0	15					
2909.0	16					
2908.0	17					
2907.0	18					
2906.0	19					
2905.0	20		***Clayey Gravel - GW*** Brown, silty and clayey gravel with variable sand, so odors or staining. (10YR7/2)		17/12	
2904.0	21					
2903.0	22					
2902.0	23					
2901.0	24					
2900.0	25					
2899.0	26		***Clay - CL*** Brown clay with silt. (10YR6/2)			
2898.0	27		***Sandy Clayey Gravel - GW*** Brown, silty sandy clayey gravel with some thin beds of clay. (10YR7/2)			
2897.0	28					
2896.0	29					
2895.0	30					

DRILLING DATE: 6/01/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 115
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2924.21
GROUND SURFACE ELEVATION (ft AMSL): 2924.50
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY118B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2894.0						
2893.0	31					
2892.0	32					
2891.0	33		***Clay - CL*** Brown, plastic clay, 3" layer of gravel at 36 feet. (10YR6/2)			
2890.0	34					
2889.0	35					
2888.0	36					
2887.0	37					
2886.0	38		***Silty Gravel - GW*** Brown silty gravel to gravelly silt with variable sand. (10YR5/4)			
2885.0	39					
2884.0	40					
2883.0	41					
2882.0	42					
2881.0	43					
2880.0	44					
2879.0	45					
2878.0	46					
2877.0	47					
2876.0	48					
2875.0	49					
2874.0	50					
2873.0	51					
2872.0	52					
2871.0	53		***Clay - CL*** Brown, tightly packed, silty with fine-grained gravel. (10YR6/2)			
2870.0	54					
2869.0	55					
2868.0	56					
2867.0	57					
2866.0	58		***No Recovery***			
2865.0	59					
	60					

DRILLING DATE: 6/01/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 115
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2924.21
GROUND SURFACE ELEVATION (ft AMSL): 2924.50
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY118B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2864.0			***Silty Sandy Gravel - GW*** Brown, silty, sandy. (10YR5/4)			
2863.0	61					
2862.0	62					
2861.0	63					
2860.0	64		***Sand - SP*** Brown, medium- to coarse-grained.			
2859.0	65		***Clay - CL*** Brown, tightly packed clay, with silt and gravel. (10YR5/4)			
2858.0	66					
2857.0	67		***Gravel - GW*** Brown, silty and sandy. (10YR5/4)			
2856.0	68					
2855.0	69		***Sand - SP*** Brown, coarse-grained. (10YR7/3)			
2854.0	70					
2853.0	71		***Gravels - GP*** Brown, silty, sandy; 77-78 feet mostly rounded gravel. (10YR5/4)			
2852.0	72					
2851.0	73					
2850.0	74					
2849.0	75					
2848.0	76					
2847.0	77					
2846.0	78		***Gravel - GP*** As above, silty, sandy gravel.			
2845.0	79					
2844.0	80					
2843.0	81					
2842.0	82					
2841.0	83					
2840.0	84					
2839.0	85					
2838.0	86					
2837.0	87					
2836.0	88					
2835.0	89					
	90					

DRILLING DATE: 6/01/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 115
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2924.21
GROUND SURFACE ELEVATION (ft AMSL): 2924.50
DRILLING CO.: Cascade

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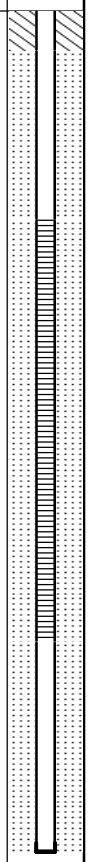
LOG OF BOREHOLE
Monitoring Well ID: KRY118B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2834.0						
2833.0	91					
2832.0	92					
2831.0	93					
2830.0	94		***Gravel with Clay and Silt - CL*** Dense, compact.			
2829.0	95					
2828.0	96					
2827.0	97					
2826.0	98		***Gravel with Silt - GP*** Silty gravel.			
2825.0	99					
2824.0	100		***Silt with Gravel - ML*** Brown gravelly silt.			
2823.0	101					
2822.0	102					
2821.0	103					
2820.0	104		***Clay with Silt - CL*** Brown, dense, compact silty clay with some gravel.			
2819.0	105					
2818.0	106					
2817.0	107					
2816.0	108		***Clay with Silt - CL*** As above. Driller indicates drilling much harder.			
2815.0	109					
2814.0	110		**Monitoring well KRY118B was completed using 2-inch ID, schedule 40 PVC casing screened from 95 to 105 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 110' to 115'.The sand pack was placed from 91 feet (4 feet above top of screen) to 115 feet bgs. Medium (<3/8") bentonite chips were placed from the top of the sand pack to 87 feet. Portland cement-grout was placed from the top of bentonite chip layer to the surface. A 10-inch diameter flush-mount well box was inserted in cement at surface.**			
2813.0	111					
2812.0	112					
2811.0	113					
2810.0	114					
2809.0	115		End of Log			
2808.0	116					
2807.0	117					
2806.0	118					
2805.0	119					
	120					



DRILLING DATE: 6/01/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 115
TOTAL WELL DEPTH (ft btoc): 110
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2924.21
GROUND SURFACE ELEVATION (ft AMSL): 2924.50
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY119A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2928.0	-2					
	-1					
2927.0						
2926.4			Ground Surface			
2926.0	0		***No Samples*** Drilling through gravels/sand/silt. Clay at collar.			
2925.0	1					
2924.0	2					
2923.0	3					
2922.0	4					
2921.0	5					
2920.0	6					
2919.0	7					
2918.0	8					
2917.0	9					
2916.0	10		***Clay - CL*** Cohisive homogeneous clays. No stain or odor. Moist at 10 feet.		12/58	
2915.0	11					
2914.0	12					
2913.0	13					
2912.0	14					
2911.0	15		***Clay - CL*** Clays as above with sharp transition to well sorted medium grained sands.		48/127	
2910.0	16		***Sand - SP*** Well sorted medium grained sands with cosrase gravel and sand from 16.0-16.2.			
2909.0	17				120/152	

DRILLING DATE: 4/19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.69
GROUND SURFACE ELEVATION (ft AMSL): 2926.45
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY119A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2908.0	18					
2907.0	19					
2906.0	20		***Sand - SP*** Well sorted medium to fine grained sands. Fining downward.		0/12	
2905.0	21					
2904.0	22		***No Returns***			
2903.0	23					
2902.0	24					
2901.0	25		End of Log			
2900.0	26		**Monitoring well KRY119A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with # 3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2899.0	27					
2898.0	28					
2897.0	29					
2896.0	30					
2895.0	31					
2894.0	32					
2893.0	33					
2892.0	34					
2891.0	35					
2890.0	36					
2889.0	37					

DRILLING DATE: 4/19-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.69
GROUND SURFACE ELEVATION (ft AMSL): 2926.45
DRILLING CO.: Cascade

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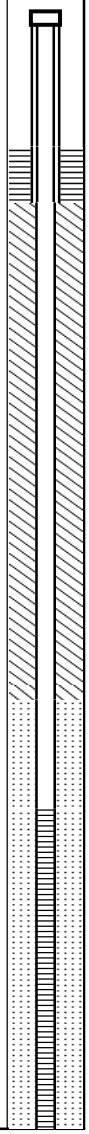
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY121A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2936.0	-2				
2935.0	-1				
2934.3			Ground Surface		
2934.0	0		***Clay and silt - CL*** Brown clay and silt with trace coarse gravel. Slightly plastic. Moist, moderately dense. ***No Returns***	No Samples	
2933.0	1				
2932.0	2				
2931.0	3				
2930.0	4				
2929.0	5		***Clay and silt - CL*** Clays as above. ***No Returns***		
2928.0	6				
2927.0	7				
2926.0	8				
2925.0	9				
2924.0	10		***Clay and silt - CL*** Brown clay and silt with 4 inch fine to medium sand lense at 11.5 feet. Slightly plastic to plastic toward 15 feet. Moist, dense with moderate cemetation. Trace to little gravel. ***No Returns***		12/58
2923.0	11				
2922.0	12				
2921.0	13				
2920.0	14				
2919.0	15		***Clay and silt - CL*** Brown clay and silt as above. Trace organic material at 19 feet. Few coarse gravels. Moist, slightly plastic. Water at 19 feet. ***No Returns***		48/127
2918.0	16				
2917.0	17				120/152



DRILLING DATE: 5/04-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 34
TOTAL WELL DEPTH (ft btoc): 32
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2937.39
GROUND SURFACE ELEVATION (ft AMSL): 2934.25
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY121A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2916.0	18					
2915.0	19		***Sandy Gravel - GW*** Gray-brown sand gravel with distinct petroleum odor and staining. Wet.			
2914.0	20		***No Returns***		0/12	
2913.0	21					
2912.0	22					
2911.0	23					
2910.0	24		***Sandy Gravel - GW*** Gravelly sand to sandy gravel. Gray with multi-colored coarse sands. Petroleum odor.			
2909.0	25		***No Recovery***			
2908.0	26					
2907.0	27		**Monitoring well KRY121A was completed using 2-inch ID, schedule 40 PVC casing, screened from 12 to 32 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 10 feet (2 feet above top of screen) to 32 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Native material from 32-34 feet from borehole collapse.**			
2906.0	28					
2905.0	29					
2904.0	30					
2903.0	31					
2902.0	32					
2901.0	33					
2900.0	34		End of Log			
2899.0	35					
2898.0	36					
2897.0	37					

DRILLING DATE: 5/04-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 34
TOTAL WELL DEPTH (ft btoc): 32
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2937.39
GROUND SURFACE ELEVATION (ft AMSL): 2934.25
DRILLING CO.: Cascade

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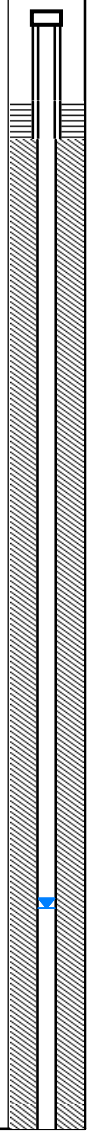
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY121B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
	-2				
2935.0	-1				
2934.0			Ground Surface		
2934.0	0		***Clay -CL*** Brown, moist, with somw silt, no odors or staining, trace scattered fine gravel, silt content varies - abundant near surface and decreases with depth. 2.5YR5/2	KRY121CSS001	-0.27 (PID)
2933.0	1				
2932.0	2				
2931.0	3				
2930.0	4				
2929.0	5		***No Returns***		
2928.0	6				
2927.0	7				
2926.0	8				
2925.0	9				
2924.0	10		***Clay - CL*** Brown, trace silt, moist, soft, very plastic.		
2923.0	11				
2922.0	12		coarse, orunded gravel layer at 14 to 15 feet.		
2921.0	13				-0.11(PID)
2920.0	14		No returns from 15 to 20 feet.	KRY121CSB001	
2919.0	15		Scattered zones of clay wiht fine to medium-grained rounded gravel. Material is wet at 25 feet.		
2918.0	16				
2917.0	17				
2916.0	18				
2915.0	19				
2914.0	20				
2913.0	21				
2912.0	22				
2911.0	23				
2910.0	24				
2909.0	25		***Gravels and Cobbles with Sand - GW*** Fine to coarse gravel and cobbles with trace to some sand, strong petroleum odor.		9/5
2908.0	26			KRY121CSB002	
2907.0	27				



DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

Tetra Tech EM Inc.
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Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	28					
2905.0	29					
2904.0	30		***Gravel with Sand - GW*** Gray to brown gravel and sand, strong odor, some staining, gravel is fine to coarse, some cobbles and coarse sand.			
2903.0	31					
2902.0	32					
2901.0	33					
2900.0	34					
2899.0	35		***Gravel - GP*** Brown gravel as above, sand is trace to some, odor decresing, no staining.			
2898.0	36					
2897.0	37					
2896.0	38		***Gravel with Sand - GP*** Gravel with sand and cobbles, still has petroleum odor.		3/-6	
2895.0	39					
2894.0	40		***Gravel with Sand - GP*** As above, less odor.			
2893.0	41					
2892.0	42					
2891.0	43		***Gravel with Sand - GP*** Brown sand and gravel with cobbles, no odor.			
2890.0	44					
2889.0	45		***No Recovery***			
2888.0	46					
2887.0	47					
2886.0	48					
2885.0	49					
2884.0	50					
2883.0	51					
2882.0	52					
2881.0	53					
2880.0	54					
2879.0	55					
2878.0	56					
2877.0	57					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2876.0	58					
2875.0	59					
2874.0	60		***Gravel with Sand - GP*** Trace silt and trace to some cobbles.			
2873.0	61					
2872.0	62					
2871.0	63					
2870.0	64					
2869.0	65					
2868.0	66					
2867.0	67					
2866.0	68					
2865.0	69					
2864.0	70		***Gravel with Sand - GP*** As above with increased silt.			
2863.0	71					
2862.0	72					
2861.0	73					
2860.0	74					
2859.0	75					
2858.0	76					
2857.0	77					
2856.0	78		***Gravel with Sand - GP*** As above changing to a brown silty clay and clayey silt and gravel at 79 feet. Scattered cobbles and trace to some sand.			
2855.0	79					
2854.0	80		***Silty Clay and Gravel - CL*** Brown silty clay and gravel, scattered cobbles.			
2853.0	81					
2852.0	82					
2851.0	83					
2850.0	84					
2849.0	85		***Silty Clay with Gravel - CL*** As above, grading to a sandy gravel with some stiff and scattered cobbles.			
2848.0	86					
2847.0	87					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2846.0	88					
2845.0	89					
2844.0	90		***Gravel with Sand - GW*** Brown sandy gravel with some silt and scattered cobbles.			
2843.0	91					
2842.0	92					
2841.0	93		***Gravel with Clay and Silt - CL*** As above with a few scattered layers with increasing silt and clay content. Good recovery.			
2840.0	94					
2839.0	95					
2838.0	96					
2837.0	97					
2836.0	98					
2835.0	99					
2834.0	100		***Gravel with Silt and Sand - GW*** Brown sandy, silty gravel, increased sand content from above, scattered cobbles.			
2833.0	101					
2832.0	102					
2831.0	103					
2830.0	104		***Sand - SP*** Brown, loose, soft, fine-medium-grained. (7.5YR5/4)			
2829.0	105					
2828.0	106		***Sand - SP*** As above with trace gravel grading to a fine-grained sand with silt. (10YR4/3)			
2827.0	107					
2826.0	108					
2825.0	109					
2824.0	110		***Sand - SP*** Brown, fine to medium-grained sand becoming coarser with depth. (2.5Y4/3)			
2823.0	111					
2822.0	112					
2821.0	113					
2820.0	114					
2819.0	115		***Sand - SP*** Brown, medium to coarse sand with trace to some gravel, gravel is fine to medium-grained.			
2818.0	116					
2817.0	117					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2816.0	118					
2815.0	119					
2814.0	120		***Gravel with Sand - GW*** Brwon sandy gravel with trace silt. (2YR6/6)			
2813.0	121					
2812.0	122					
2811.0	123					
2810.0	124		***Gravel with Sand - GW*** As above.			
2809.0	125		***Silty Clay -ML*** Brown silty clay with abindant coarse rounded gravel and some small cobbles, loose at top becoming tighter from 129 - 130. Also have speckled reddish-purple zones similar to tightly packed silty clay gravel at KRY114B (at 120'). Driller will drill to 131' to set outer casing and then bentonite the bottom 3 to 4 feet before putting down smaller diameter casing.			
2808.0	126					
2807.0	127					
2806.0	128					
2805.0	129					
2804.0	130		***Clayey Silt - CL*** Clayey silt with abundant fine to medium-grained gravel, hard, dense.			
2803.0	131					
2802.0	132					
2801.0	133					
2800.0	134					
2799.0	135					
2798.0	136					
2797.0	137					
2796.0	138					
2795.0	139					
2794.0	140		***Clayey Silt - CL*** As above. Zones of sample appear to have mottling and oxidation.			
2793.0	141					
2792.0	142					
2791.0	143					
2790.0	144					
2789.0	145		***Clayey Silt - CL*** As above. Also have 2 to 3-inch zones that are less compact, softer and more moist (152').			
2788.0	146					
2787.0	147					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2786.0	148					
2785.0	149					
2784.0	150					
2783.0	151					
2782.0	152					
2781.0	153					
2780.0	154					
2779.0	155					
2778.0	156					
2777.0	157					
2776.0	158					
2775.0	159					
2774.0	160					
2773.0	161					
2772.0	162					
2771.0	163					
2770.0	164					
2769.0	165		***Clayey Silt - CL*** As above, dark brown to light brown to reddish clay and silt with fine to coarse scattered gravel. Some zones are slightly damp while others are dry. Gravel is generally rounded but can be angular and fractured.			
2768.0	166					
2767.0	167					
2766.0	168					
2765.0	169					
2764.0	170					
2763.0	171					
2762.0	172					
2761.0	173					
2760.0	174					
2759.0	175		***Clayey Silt - CL*** As above.			
2758.0	176					
2757.0	177					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2756.0	178					
2755.0	179					
2754.0	180					
2753.0	181					
2752.0	182					
2751.0	183					
2750.0	184					
2749.0	185					
2748.0	186					
2747.0	187					
2746.0	188					
2745.0	189					
2744.0	190					
2743.0	191					
2742.0	192					
2741.0	193					
2740.0	194					
2739.0	195		***Clayey Silt - CL*** As above. Some mottling and clay weathered, hard, dry.			
2738.0	196					
2737.0	197					
2736.0	198		***Clayey Silt - CL*** As above, slightly damp. (Drilled through lost bit - able to retrieve OK)			
2735.0	199					
2734.0	200		***Clayey Silt - CL*** As above - varied colors in matrix. (10YR6/6)			
2733.0	201					
2732.0	202					
2731.0	203		***Clayey Silt - CL*** As above, drier than above.			
2730.0	204					
2729.0	205		***Clayey Silt - CL*** As above, slightly damp matrix has weathered gravels.			
2728.0	206					
2727.0	207		***Clayey Silt - CL*** As above. Clay with pebbles - some up to 1.5 inches.			

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2726.0	208					
2725.0	209		***Clayey Silt - CL*** As above, more weathered gravels.			
2724.0	210					
2723.0	211					
2722.0	212		***Clayey Silt - CL*** Clay with mottled coloring of pebbles and weathered pebbles, sl. damp (10YR5/4)			
2721.0	213					
2720.0	214		***Clayey Silt - CL*** Clay, sandy, blueish grades back to varied colors at 214.5 ft. hard, dry.			
2719.0	215					
2718.0	216					
2717.0	217		***Clayey Sand - CL*** Dense, clayey sand, weathered pebble gravel, varied colors, dry.			
2716.0	218					
2715.0	219		***Clayey Sand - CL*** As above, becoming denser, harder, and larger weathered rounded gravels to 2 inches. (10YR3/4)			
2714.0	220					
2713.0	221					
2712.0	222		***Clayey Sand - CL*** As above, becoming denser, differential weathering of rounded gravels, varied colors, matrix is medium to fine sand, dry.			
2711.0	223					
2710.0	224		***No Returns***			
2709.0	225		***Clayey Sand - CL*** Sand with rounded gravels/cobbles up to 3.5 inches, becoming loose at 226.5, brown, dry. (10YR5/4)			
2708.0	226					
2707.0	227					
2706.0	228		***Clayey Sand - CL*** Brown, medium-grained, slightly clayey, pebble gravel to cobbles, becomes denser at 229.5'.			
2705.0	229					
2704.0	230		***Clayey Sand - CL*** As above, slightly more clay than above, rounded pebbles to 1-inch, sl. dense, sl. damp.			
2703.0	231					
2702.0	232					
2701.0	233		***Clayey Sand - CL*** As above, mottled gray and light brown to orange, 10% rounded pebbles, less dense than above, sl. damp.			
2700.0	234					
2699.0	235		***Clayey Sand - CL*** Yellowish-brown, medium to fine-grained, sl. dense, sl. damp. Grades to purplish sand below, up 1.5-inch gravel. (10YR4/5)			
2698.0	236					
2697.0	237					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY121B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2696.0	238		***Clayey Sand - CL*** Light brownish-gray, fine-grained, very dense (5YR6/1)			
2695.0	239					
2694.0	240		***Clayey Sand - CL*** Yellowish-brown, fine-grained, dense, dry. (10YR4/5)			
2693.0	241					
2692.0	242		***Clayey Sand - CL*** Medium- to fine- grained, yellowish-brown to brownish-gray, sl. clayey, pebbles up to 1-inch(20%), loose, dry.			
2691.0	243					
2690.0	244		***Clayey Sand - CL*** As above, dense.			
2689.0	245		End of Log			
2688.0	246					
2687.0	247		**Monitoring well KRY121B was completed using 4-inch ID, schedule 40 PVC casing screened from 119 to 129 feet bgs with 0.020-inch slot PVC screen and #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 129' to 134'.The sand pack was placed from 117 feet (2 feet above top of screen) to 132 feet bgs. Medium (<3/8") bentonite chips were placed from the top of the sand pack to112 feet. Portland cement-grout was placed from the top of bentonite chip layer to near surface. A 10-inch diameter, above-ground well monument surface completion was inserted in cement at surface. The borehole was drilled to a total depth of 244 feet bgs.**			
2686.0	248					
2685.0	249					
2684.0	250					
2683.0	251					
2682.0	252					
2681.0	253					
2680.0	254					
2679.0	255					
2678.0	256					
2677.0	257					
2676.0	258					
2675.0	259					
2674.0	260					
2673.0	261					
2672.0	262					
2671.0	263					
2670.0	264					
2669.0	265					
2668.0	266					
2667.0	267					

DRILLING DATE: 4/20-21/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 244
TOTAL WELL DEPTH (ft btoc): 129
LOGGED BY: R. Laskowski/D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 4.0
TOC ELEVATION (ft AMSL): 2937.35
GROUND SURFACE ELEVATION (ft AMSL): 2934.02
DRILLING CO.: Cascade

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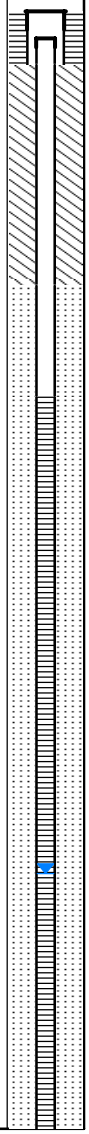
LOG OF BOREHOLE

Monitoring Well ID: KRY122A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2930.5			Ground Surface			
	0		***Gravelly sand - SW*** Dark grayish brown gravelly sand. Some silt. Fine to medium sand, sub-rounded gravel. Damp, moist, loose.	No Samples	No Readings	
2929.0	1		***No Returns***			
2928.0	2					
2927.0	3					
2926.0	4		***Gravelly Silt - OL*** Dark grayish, gravelly, silt. Slight plasticity, damp. Gravels are fine to coarse grained.			
2925.0	5		***No Returns***			
2924.0	6					
2923.0	7					
2922.0	8					
2921.0	9					
2920.0	10					
2919.0	11					
2918.0	12		***Sand - SP*** Very fine to fine sand, damp, loose. No evidence of contamination.			
2917.0	13					
2916.0	14		***Sand - SP*** Well sorted sand as above. Water at 14 feet.			
2915.0	15					
2914.0	16					
2913.0	17					
2912.0	18					
2911.0	19		***No Returns***			
	20					



DRILLING DATE: 5/31-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2930.07
GROUND SURFACE ELEVATION (ft AMSL): 2930.48
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY122A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2910.0	21		***Silty Sandy - SM*** Light, olive brown, silty/clayey, sand. Sightly plastic. Wet. 2.5YR 5/4.			
2909.0	22		***Sand - SP*** Well sorted sand.			
2908.0	23					
2907.0	24		***Sand - SP*** Sand as above.			
2906.0	25					
2905.0	26		***No Recovery***			
2904.0	27					
2903.0	28					
2902.0	29		End of Log			
2901.0	30					
2900.0	31		**Monitoring well KRY122A was completed using 2-inch ID, schedule 40 PVC casing, screened from 7 to 27 feet bgs with 0.020-inch slotted PVC screen with # 3 sand placed as sand pack. The sand pack was placed from 5 feet (2 feet above top of screen) to 27 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter flushmount protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Native material filled the borehole from 27 to 29 feet bgs.**			
2899.0	32					
2898.0	33					
2897.0	34					
2896.0	35					
2895.0	36					
2894.0	37					
2893.0	38					
2892.0	39					
2891.0	40					

DRILLING DATE: 5/31-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2930.07
GROUND SURFACE ELEVATION (ft AMSL): 2930.48
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY122B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2930.4			Ground Surface			
	0		***Sand with Gravel - SP*** Gravelly sand, very dark grayish-brown, fine to medium grained, 35% fine to coarse gravel, 6-inch dark to black clayey silt at 3 feet, dry to slightly moist. (10YR3/2)	No Samples		
2929.0	1					
2928.0	2					
2927.0	3					
2926.0	4					
2925.0	5					
2924.0	6		***Gravel with Sand - GW*** Sandy Gravel, multi-colored, dark grayish-brown snad, fine to coarse gravels, 15% cobbles, 35% fine sand, dry to slightly moist.			
2923.0	7					
2922.0	8		***Gravel with sand and silt - GM*** Gravelly, cobbly sand, olive-brown, very fine to fine-grained, well-sorted, 15% fine to coarse gravel, 15% small cobbels, dry to slightly moist.			
2921.0	9					
2920.0	10					
2919.0	11					
2918.0	12					
2917.0	13					
2916.0	14					
2915.0	15		***Sand - SP*** Olive-brown, fine-grained, well-sorted, loose, trace fine gravel, very slightly moist. (2.5Y5/4)			
2914.0	16					
2913.0	17					
2912.0	18					
2911.0	19					
2910.0	20		***Sand - SP*** Light olive-brown, very fine-grained, well-sorted, 10% silt, soft moist, wet at 23 feet.			
2909.0	21					
2908.0	22					
2907.0	23					
2906.0	24					
2905.0	25					
2904.0	26					
2903.0	27					
2902.0	28		***Sand - SP*** Similar to above, slightly coarser, olive-brown, fine-grained, well-sorted, damp to wet, trace silt.			
2901.0	29					
	30					

DRILLING DATE: 5/25/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 98
TOTAL WELL DEPTH (ft btoc): 98
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.80
GROUND SURFACE ELEVATION (ft AMSL): 2930.48
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY122B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2900.0						
2899.0	31					
2898.0	32					
2897.0	33					
2896.0	34					
2895.0	35					
2894.0	36					
2893.0	37					
2892.0	38		***Sand - SP*** Olive-brown, very fine- to fine-grained, very loose and sloppy.			
2891.0	39					
2890.0	40					
2889.0	41					
2888.0	42					
2887.0	43					
2886.0	44					
2885.0	45					
2884.0	46		***Sand - SP*** As above. Olive brown, very fine to fine-grained, well-sorted, wet. (2.5Y4/3)			
2883.0	47					
2882.0	48					
2881.0	49					
2880.0	50		***Sand - SP*** As above, firmer, not as loose, silty in part, damp to wet, not as wet and sloppy as above.			
2879.0	51					
2878.0	52					
2877.0	53					
2876.0	54					
2875.0	55					
2874.0	56					
2873.0	57					
2872.0	58		***Sand - SP*** Brown, silty, fine- to medium-grained sand with some gravel.			
2871.0	59					
	60					

DRILLING DATE: 5/25/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 98
TOTAL WELL DEPTH (ft btoc): 98
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.80
GROUND SURFACE ELEVATION (ft AMSL): 2930.48
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY122B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2870.0			***Sand - SP*** Brown, silty, fine to medium sand with some gravel and scattered cobbles.			
2869.0	61					
2868.0	62					
2867.0	63					
2866.0	64					
2865.0	65					
2864.0	66		***SAND with gravel - SW*** Brown sandy gravel, gravel is fine-grained.			
2863.0	67		***Sand with Gravel - SW*** Brown medium sand with scattered fine gravel.			
2862.0	68					
2861.0	69					
2860.0	70					
2859.0	71					
2858.0	72					
2857.0	73					
2856.0	74					
2855.0	75					
2854.0	76		***Gravel - GW*** Fine to coarse rounded gravel.			
2853.0	77		***Sand with Gravel - SW*** Brown medium sand with abundant fine to medium-grained gravel.			
2852.0	78					
2851.0	79					
2850.0	80		***Gravel with Sand - GW*** fine to coarse gravel with some to abundant sand.			
2849.0	81					
2848.0	82					
2847.0	83		***Sand Gravel to Gravelly Sand - GW/SW*** Brown sandy gravel to gravelly sand, very loose			
2846.0	84					
2845.0	85					
2844.0	86					
2843.0	87					
2842.0	88					
2841.0	89					
	90					

DRILLING DATE: 5/25/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 98
TOTAL WELL DEPTH (ft btoc): 98
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.80
GROUND SURFACE ELEVATION (ft AMSL): 2930.48
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY122B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2840.0						
2839.0	91		***Clay with Silt - CL*** Light brown, with scattered medium to fine grael, very tightly packed, dense, hard - confining unit.			
2838.0	92					
2837.0	93					
2836.0	94					
2835.0	95					
2834.0	96					
2833.0	97					
2832.0	98		End of Log			
2831.0	99					
2830.0	100					
2829.0	101					
2828.0	102					
2827.0	103					
2826.0	104					
2825.0	105					
2824.0	106					
2823.0	107					
2822.0	108					
2821.0	109					
2820.0	110					
2819.0	111					
2818.0	112					
2817.0	113					
2816.0	114					
2815.0	115					
2814.0	116					
2813.0	117					
2812.0	118					
2811.0	119					
	120					

Monitoring well KRY122B was completed using 2-inch ID, schedule 40 PVC casing screened from 83 to 93 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 93' to 98'.The sand pack was placed from 79 feet (4 feet above top of screen) to 98 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to 75 bgs. Portland cement-grout was placed from top of bentonite chip layer to near surface. A ten-inch diameter flush-mount well box was inserted in cement at the surface.

DRILLING DATE: 5/25/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 98
TOTAL WELL DEPTH (ft btoc): 98
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.80
GROUND SURFACE ELEVATION (ft AMSL): 2930.48
DRILLING CO.: Cascade

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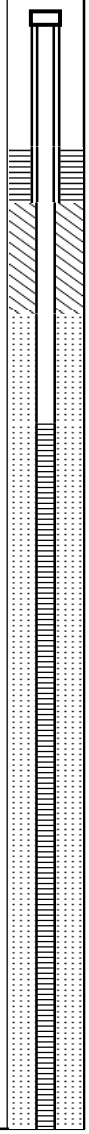
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY123A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
	-2				
2930.0	-1				
2928.9			Ground Surface		
2929.0	0		***Gravel - GW***	KRY123SS0001	
2928.0	1		Gravel fill		
			No Returns		
2927.0	2				
2926.0	3				
2925.0	4		***Gravels - GW***		
2924.0	5		Coarse gravels with sand and silt. No staining or odors.	KRY123SB001	
			No Returns		
2923.0	6				
2922.0	7				
2921.0	8		***Gravels and Sand - GW/SP***		
2920.0	9		Gravels and sand as above. No staining or odor. Wet at 9.5 feet.		
2919.0	10		***No Returns***		12/58
2918.0	11				
2917.0	12				
2916.0	13				
2915.0	14				
2914.0	15		***Clay - CL/CH***		48/127
2913.0	16		Gray green, cohisive clay. Trace odor, no staining. pick up trace of fine sands with depth.	KRY123SB002	
2912.0	17				120/152



DRILLING DATE: 4/21-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.93
GROUND SURFACE ELEVATION (ft AMSL): 2925.78
DRILLING CO.: Cascade

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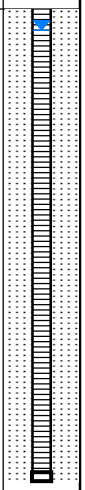
LOG OF BOREHOLE
Monitoring Well ID: KRY123A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2911.0	18					
2910.0	19		***No Returns***			
2909.0	20		***Sand - SP*** Very fine grained sand.		0/12	
2908.0	21					
2907.0	22		***No Returns***			
2906.0	23					
2905.0	24					
2904.0	25		End of Log			
2903.0	26					
2902.0	27					
2901.0	28					
2900.0	29					
2899.0	30					
2898.0	31					
2897.0	32					
2896.0	33					
2895.0	34					
2894.0	35					
2893.0	36					
2892.0	37					

Monitoring well KRY123A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.



DRILLING DATE: 4/21-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.93
GROUND SURFACE ELEVATION (ft AMSL): 2925.78
DRILLING CO.: Cascade

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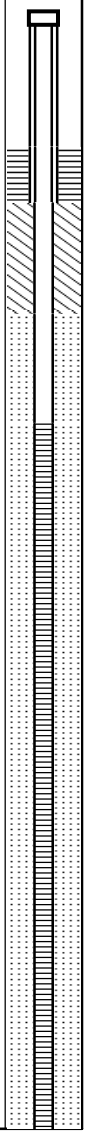
LOG OF BOREHOLE

Monitoring Well ID: KRY123A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
	-2				
2930.0	-1				
2929.0			Ground Surface		
2929.0	0		***Gravel - GW***	KRY123ASS001	
			Gravel fill		
2928.0	1		***No Returns***		
2927.0	2				
2926.0	3				
2925.0	4		***Gravels - GW***		0/0
			Coarse gravels with sand and silt. No staining or odors.	KRY123ASB001	
2924.0	5		***No Returns***		
2923.0	6				
2922.0	7				
2921.0	8		***Gravels and Sand - GW/SP***		0/0
			Gravels and sand as above. No staining or odor. Wet at 9.5 feet.		
2920.0	9				
2919.0	10		***No Returns***		8/0
2918.0	11				
2917.0	12				
2916.0	13				
2915.0	14				
2914.0	15		***Clay - CL/CH***		
			Gray green, cohisive clay. Trace odor, no staining. pick up trace of fine sands with depth.		
2913.0	16			KRY123ASB002	
2912.0	17				

Monitoring Well Completion



DRILLING DATE: 4/21-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.93
GROUND SURFACE ELEVATION (ft AMSL): 2925.78
DRILLING CO.: Cascade

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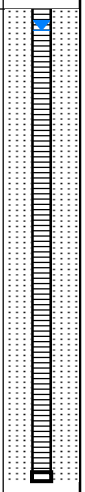
LOG OF BOREHOLE
Monitoring Well ID: KRY123A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2911.0	18		***No Returns***		0/0	
2910.0	19					
2909.0	20		***Sand - SP*** Very fine grained sand.			
2908.0	21					
2907.0	22		***No Returns***			
2906.0	23					
2905.0	24					
2904.0	25		End of Log			
2903.0	26					
2902.0	27		**Monitoring well KRY123A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2901.0	28					
2900.0	29					
2899.0	30					
2898.0	31					
2897.0	32					
2896.0	33					
2895.0	34					
2894.0	35					
2893.0	36					
2892.0	37					



DRILLING DATE: 4/21-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.93
GROUND SURFACE ELEVATION (ft AMSL): 2925.78
DRILLING CO.: Cascade

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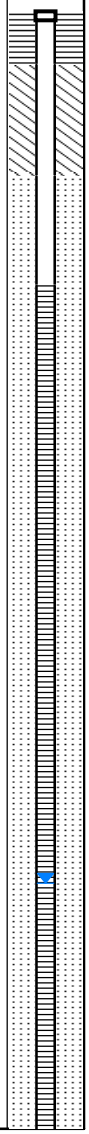
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY125A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2935.1			Ground Surface		
	0		No Returns		
2934.0	1				
2933.0	2				
2932.0	3				
2931.0	4		***SAND - SM to SC*** Sand with silty, clayey, loamy soil. No staining, no odors.		4/0
2930.0	5				
2929.0	6		No Returns		
2928.0	7				
2927.0	8		***Gravel - GP*** Coarse, limited recovery, no stain or odoe, sub-rounded to sub-angular		1/0
2926.0	9				
2925.0	10		No Returns		
2924.0	11			KRY125ASS001	
2923.0	12				
2922.0	13		***CLAY - CL*** Gray/green, cohesive, wet but not saturated, no stain or odor (10YR5/1)		13/0
2921.0	14				
2920.0	15		No returns		
2919.0	16				
2918.0	17				
2917.0	18		***CLAY - CL*** As above; trace of very fine-grained sand (19' - 20'), no stain or odor. (10YR5/1)		21/0
2916.0	19				
2915.0	20				



DRILLING DATE: 4-26-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.75
GROUND SURFACE ELEVATION (ft AMSL): 2935.07
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY125A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2914.0	21		***CLAY with sand - CL/SP*** Gray/green cohesive clay with thin (1") lenses of medium-grained, subangular silica sand. No returns			
2913.0	22					
2912.0	23					
2911.0	24					
2910.0	25		End of Log			
2909.0	26					
2908.0	27					
2907.0	28					
2906.0	29					
2905.0	30					
2904.0	31					
2903.0	32					
2902.0	33					
2901.0	34					
2900.0	35					
2899.0	36					
2898.0	37					
2897.0	38					
2896.0	39					
2895.0	40					

Monitoring well KRY125A was completed using 2-inch ID, schedule 40 PVC casing screened from 5 to 25 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout placed from top of bentonite chip layer to surface. Ten-inch diameter well box inserted in cement at surface.

DRILLING DATE: 4-26-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.75
GROUND SURFACE ELEVATION (ft AMSL): 2935.07
DRILLING CO.: Cascade

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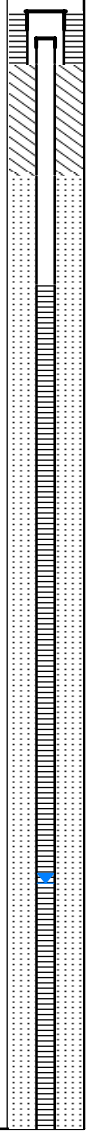
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY125A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2935.1			Ground Surface		
	0		No Returns		
2934.0	1			No Samples	
2933.0	2				
2932.0	3				
2931.0	4		***SAND - SM to SC*** Sand with silty, clayey, loamy soil. No staining, no odors.		4/0
2930.0	5				
2929.0	6		No Returns		
2928.0	7				
2927.0	8		***Gravel - GP*** Coarse, limited recovery, no stain or odoe, sub-rounded to sub-angular		1/0
2926.0	9				
2925.0	10		No Returns		
2924.0	11				
2923.0	12				
2922.0	13		***CLAY - CL*** Gray/green, cohesive, wet but not saturated, no stain or odor (10YR5/1)		13/0
2921.0	14				
2920.0	15		No returns		
2919.0	16				
2918.0	17				
2917.0	18		***CLAY - CL*** As above; trace of very fine-grained sand (19' - 20'), no stain or odor. (10YR5/1)		21/0
2916.0	19				
2915.0	20				



DRILLING DATE: 4-26-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.75
GROUND SURFACE ELEVATION (ft AMSL): 2935.07
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY125A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2914.0	21		***CLAY with sand - CL/SP*** Gray/green cohesive clay with thin (1") lenses of medium-grained, subangular silica sand. No returns			
2913.0	22					
2912.0	23					
2911.0	24					
2910.0	25		End of Log			
2909.0	26					
2908.0	27					
2907.0	28					
2906.0	29					
2905.0	30					
2904.0	31					
2903.0	32					
2902.0	33					
2901.0	34					
2900.0	35					
2899.0	36					
2898.0	37					
2897.0	38					
2896.0	39					
2895.0	40					

Monitoring well KRY125A was completed using 2-inch ID, schedule 40 PVC casing screened from 5 to 25 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. Portland cement-grout placed from top of bentonite chip layer to surface. Ten-inch diameter well box inserted in cement at surface.

DRILLING DATE: 4-26-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.75
GROUND SURFACE ELEVATION (ft AMSL): 2935.07
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY125B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2934.9			Ground Surface			
	0		***No Recovery***			
	1			No Samples		
2933.0	2					
2932.0	3					
2931.0	4					
2930.0	5		***Silt and Clay - ML***		0.58 (PID)	
2929.0	6		Brown, damp, silt and clay, some root material. (10YR5/3)			
2928.0	7					
2927.0	8		***Sand with Gravel - SM*** Light brown, sand and gravel with some silt. (10YR6/4)			
2926.0	9					
2925.0	10		***Silt - ML*** Dark brown silt. (10YR6/4)			
2924.0	11					
2923.0	12		***No Recovery***		2.56 (PID)	
2922.0	13		***Silt - ML*** Dark brown silt changing to sand and gravel at 11 feet.			
2921.0	14		***Sand and Gravel with Silt - SM*** Olive-brown, very fine- to fine-grained, very loose and sloppy.			
2920.0	15					
2919.0	16					
2918.0	17					
2917.0	18		***No Recovery***			
2916.0	19					
2915.0	20					
2914.0	21					
2913.0	22					
2912.0	23		***Silty Gravel - GW/ML*** Silty gravel to gravelly silt, wet.			
2911.0	24					
2910.0	25					
2909.0	26		***Silt with Clay - ML/CL*** Brown, wet, compact clayey silt to silty clay with trace to some fine sand and scattered thin fine sand layers. (10YR5/3)		13 (PID)	
2908.0	27					
2907.0	28					
2906.0	29					
2905.0	30					

DRILLING DATE: 5/31/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 137
TOTAL WELL DEPTH (ft btoc): 126
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.40
GROUND SURFACE ELEVATION (ft AMSL): 2934.90
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY125B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2904.0	31					
2903.0	32					
2902.0	33					
2901.0	34					
2900.0	35		***Sand - SP*** Brown fine sand. (10YR5/3)			
2899.0	36					
2898.0	37		***Clayey Silt - ML*** Brown clayey silt. (10YR5/2)			
2897.0	38				9 (PID)	
2896.0	39		***Clayey Silt to Silty Clay - ML/CL*** Brown clayey silt to silty clay, thin layers of gravelly silt.			
2895.0	40					
2894.0	41					
2893.0	42					
2892.0	43					
2891.0	44					
2890.0	45					
2889.0	46					
2888.0	47					
2887.0	48		***Sand with Silt - SM*** Brown fine sand with some silt. (10YR5/3)			
2886.0	49					
2885.0	50		***Clayey Silt to Silty Clay - ML/CL*** Brown to grayish-brown clayey silt to silty clay, some fine sand.			
2884.0	51					
2883.0	52					
2882.0	53					
2881.0	54					
2880.0	55		***Clay - CL*** .Light brown, very dense, plastic. (10YR6/3)			
2879.0	56					
2878.0	57					
2877.0	58		***Gravel with Sand - GW*** Brown sandy gravel.			
2876.0	59					
2875.0	60					

DRILLING DATE: 5/31/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 137
TOTAL WELL DEPTH (ft btoc): 126
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.40
GROUND SURFACE ELEVATION (ft AMSL): 2934.90
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY125B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2874.0	61		***Sand - SP*** Brown, loose, fine to medium-grained sand. (10YR5/3)			
2873.0	62					
2872.0	63					
2871.0	64					
2870.0	65					
2869.0	66		***Gravel with Sand - GW*** Brown sandy gravel. (10YR5/3)			
2868.0	67					
2867.0	68					
2866.0	69					
2865.0	70					
2864.0	71					
2863.0	72		***Sand - SP*** Brown fine to medium-grained. (10YR5/3)			
2862.0	73					
2861.0	74					
2860.0	75					
2859.0	76					
2858.0	77					
2857.0	78					
2856.0	79					
2855.0	80					
2854.0	81					
2853.0	82		***Sand - SP*** Greenish, medium- to coarse-grained sand grading to fine to medium sand, trace scattered fine to medium gravel throughout, very loose.			
2852.0	83					
2851.0	84					
2850.0	85					
2849.0	86					
2848.0	87					
2847.0	88					
2846.0	89					
2845.0	90					

DRILLING DATE: 5/31/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 137
TOTAL WELL DEPTH (ft btoc): 126
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.40
GROUND SURFACE ELEVATION (ft AMSL): 2934.90
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY125B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2844.0	91					
2843.0	92					
2842.0	93					
2841.0	94					
2840.0	95					
2839.0	96					
2838.0	97					
2837.0	98					
2836.0	99					
2835.0	100					
2834.0	101					
2833.0	102		***Gravel with Sand - GW*** Brown sandy gravel, medium- to coarse-grained sand, fine to coarse gravel, very loose. (10YR5/4)			
2832.0	103					
2831.0	104					
2830.0	105					
2829.0	106					
2828.0	107					
2827.0	108		***Sand with Gravel -SW*** Brown gravelly sand. (10YR5/3)			
2826.0	109					
2825.0	110					
2824.0	111		***Gravel with Sand - GW*** Brown sandy gravel, med to coarse sand, fine to medium gravel. (10YR5/4)			
2823.0	112					
2822.0	113					
2821.0	114					
2820.0	115					
2819.0	116					
2818.0	117		***Sand - SP*** Brown, medium-grained. (10YR5/3)			
2817.0	118					
2816.0	119		***Gravel with Sand - GW*** Brown sandy gravel, fine to coarse gravels and cobbles.			
2815.0	120					

DRILLING DATE: 5/31/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 137
TOTAL WELL DEPTH (ft btoc): 126
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.40
GROUND SURFACE ELEVATION (ft AMSL): 2934.90
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY125B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2814.0	121					
2813.0	122					
2812.0	123					
2811.0	124					
2810.0	125		***Sand - SP*** Brown, medium to coarse-grained. (10YR5/4)			
2809.0	126					
2808.0	127		***Gravel with Sand - GW*** Brown sandy gravel, trace to some silt. (10YR5/3)			
2807.0	128					
2806.0	129					
2805.0	130					
2804.0	131		***Clayey Silt - CL*** Brown clayey silt with fine to medium gravel, compact, dense. (2.5YR5/3)			
2803.0	132					
2802.0	133					
2801.0	134					
2800.0	135					
2799.0	136					
2798.0	137		End of Log			
2797.0	138					
2796.0	139		**Monitoring well KRY125B was completed using 2-inch ID, schedule 40 PVC casing screened from 116 to 126 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. The sand pack was placed from 112 feet (4 feet above top of screen) to 127 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to 107 bgs. Portland cement-grout was placed from top of bentonite chip layer to near surface. A ten-inch diameter flush-mount well box was inserted in cement at the surface.**			
2795.0	140					
2794.0	141					
2793.0	142					
2792.0	143					
2791.0	144					
2790.0	145					
2789.0	146					
2788.0	147					
2787.0	148					
2786.0	149					
2785.0	150					

DRILLING DATE: 5/31/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 137
TOTAL WELL DEPTH (ft btoc): 126
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2934.40
GROUND SURFACE ELEVATION (ft AMSL): 2934.90
DRILLING CO.: Cascade

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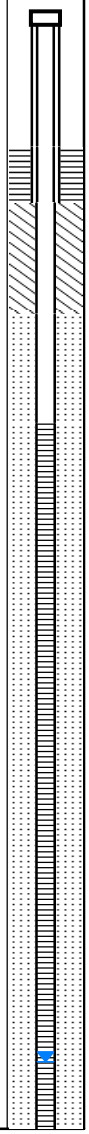
LOG OF BOREHOLE

Monitoring Well ID: KRY126A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2925.0	-2				No Readings	
	-1					
2924.2			Ground Surface			
2924.0	0		***Sandy Silt -ML*** Sandy silt with some fine gravel. Dry, loose.	KRY126ASS001		
2923.0	1		***No Recovery***			
2922.0	2					
2921.0	3					
2920.0	4		***Gravelly Sandy - SW*** Olive brown, gravelly, sand. Fine to coarse gravel. Sands are fine to coarse. Dry, loose.	KRY126ASB001		
2919.0	5		***Gravelly Sand - SW*** As above.			
2918.0	6		***No Recovery***			
2917.0	7					
2916.0	8					
2915.0	9		***Gravelly Sandy - SW*** Medium to coarse sand and fine to coarse gravel. Water at 8.5 feet. Last 4 inches in shoe is fat clay.	KRY126ASB002		
2914.0	10		***No Recovery***			
2913.0	11					
2912.0	12					
2911.0	13					
2910.0	14					
2909.0	15					
2908.0	16		***Clay - CH*** Extremely thick, dense, fat, clay. Wet, very plastic. Olive brown. 2.5YR 5/3.			
2907.0	17					



DRILLING DATE: 5-25-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2927.54
GROUND SURFACE ELEVATION (ft AMSL): 2924.20
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY126A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2906.0	18					
2905.0	19		***Gravelly Sand - SW*** Medium to coarse sand and fine gravels. Loose, wet. 2.5YR 5/3.			
2904.0	20		***No Recovery***			
2903.0	21					
2902.0	22					
2901.0	23					
2900.0	24		***Gravelly Sand - SW*** As above.			
2899.0	25		***No Recovery***			
2898.0	26					
2897.0	27		End of Log			
2896.0	28					
2895.0	29					
2894.0	30					
2893.0	31					
2892.0	32					
2891.0	33					
2890.0	34					
2889.0	35					
2888.0	36					
2887.0	37					

Monitoring well KRY126A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 25 to 27 feet bgs. The sand pack was placed from 3 feet (2 feet above top of screen) to 27 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-25-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2927.54
GROUND SURFACE ELEVATION (ft AMSL): 2924.20
DRILLING CO.: Cascade

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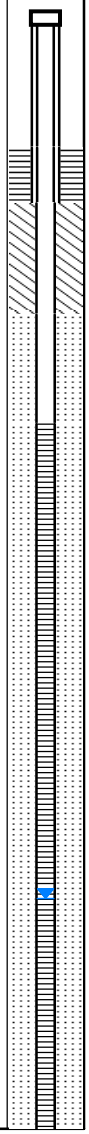
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY127A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2922.0	-2				No Readings
2921.0	-1				
2920.3			Ground Surface		
2920.0	0		***No Description***	KRY127ASS001	
2919.0	1		***No Recovery***		
2918.0	2				
2917.0	3				
2916.0	4		***Gravelly Sandy - SW*** Olive brown, gravelly, sand. Fine to coarse gravel. Sands are fine to coarse. Slightly damp, loose. Some cobbles.	KRY127ASB001	
2915.0	5		***No Recovery***		
2914.0	6				
2913.0	7				
2912.0	8		***Sandy Gravel - GW*** Olive brown, sandy gravel. 2.5YR 5/4. Sands are medium to coarse. Gravels are medium to coarse. Wet, loose. No odor or sign of contamination.	KRY127ASB002	
2911.0	9				
2910.0	10		***Minimal Recovery*** What is recovered is sandy gravel.		
2909.0	11				
2908.0	12				
2907.0	13				
2906.0	14		***Gravelly Sandy - SW*** Gravelly, sandy. Wet, loose. Less coarse gravel than previous SW sections.		
2905.0	15		***No Recovery***		
2904.0	16				
2903.0	17				



DRILLING DATE: 5-31-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2923.05
GROUND SURFACE ELEVATION (ft AMSL): 2920.35
DRILLING CO.: Cascade

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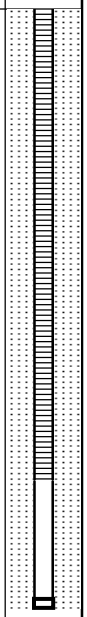
LOG OF BOREHOLE
Monitoring Well ID: KRY127A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2902.0	18					
2901.0	19		***Gravelly Sand - SW*** Gravelly sand as above. No odors or signs of contamination. ***No Recovery***			
2900.0	20					
2899.0	21					
2898.0	22					
2897.0	23					
2896.0	24		***Gravelly Sand - SW*** As above. ***No Recovery***			
2895.0	25					
2894.0	26					
2893.0	27		End of Log			
2892.0	28					
2891.0	29					
2890.0	30					
2889.0	31					
2888.0	32					
2887.0	33					
2886.0	34					
2885.0	35					
2884.0	36					
2883.0	37					



Monitoring well KRY127A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 25 to 27 feet bgs. The sand pack was placed from 3 feet (2 feet above top of screen) to 27 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-31-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 27
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2923.05
GROUND SURFACE ELEVATION (ft AMSL): 2920.35
DRILLING CO.: Cascade

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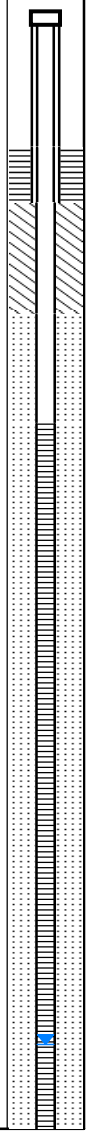
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY128A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2930.0	-2					
2929.0	-1					
2928.3			Ground Surface			
2928.0	0		***Gravel fill - GW*** Asphalt surface seal over sandy gravel.			
2927.0	1		***No Recovery***	No Samples	No Readings	
2926.0	2					
2925.0	3					
2924.0	4					
2923.0	5		***Sandy Gravel - GW*** Brown, sandy, gravel. 10% silt, 30 % fine to coarse sand, trace cobbles.			
2922.0	6		***No Recovery***			
2921.0	7					
2920.0	8					
2919.0	9					
2918.0	10		***Sandy Gravel - GW*** Multicolored sandy, gravel. 5% cobbles. Wet, loose. Water at 12.6 feet.			
2917.0	11					
2916.0	12					
2915.0	13		***No Recovery***			
2914.0	14					
2913.0	15					
2912.0	16					
2911.0	17					



DRILLING DATE: 5-5-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.07
GROUND SURFACE ELEVATION (ft AMSL): 2928.25
DRILLING CO.: Cascade

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Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY128A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2910.0	18					
2909.0	19					
2908.0	20		***Gravelly Sandy - SW*** Multicolored gravelly, sand to sandy, gravelly.			
2907.0	21					
2906.0	22		***No Recovery***			
2905.0	23					
2904.0	24					
2903.0	25					
2902.0	26					
2901.0	27					
2900.0	28					
2899.0	29		End of Log			
2898.0	30		**Monitoring well KRY128A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 25 to 27 feet bgs. The sand pack was placed from 3 feet (2 feet above top of screen) to 27 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Native backfill filled borehole from 27 to 29 feet.**			
2897.0	31					
2896.0	32					
2895.0	33					
2894.0	34					
2893.0	35					
2892.0	36					
2891.0	37					

DRILLING DATE: 5-5-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 27
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.07
GROUND SURFACE ELEVATION (ft AMSL): 2928.25
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY128B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2928.3			Ground Surface			
	0–3		***Sand and Gravel - SP*** Gravelly sand, olive-brown, fine-grained, 10% silt, 35% gravel, dry, gravel fine to coarse. (2.5Y4/3)	No Samples		
	3–5		***Silty Clay - CL*** Dark greenish gray to black(Gley 4/1), 40% silt, trace gravel, moist.			
	5–8		***Sand with Gravel - SP*** Gravelly sand as above, 10% cobbles.			
	8–12		***No Returns***			
	12–13		***Clay with Silt - CL*** Dark olive-brown (2.5Y3/3), soft, slightly plastic, moist.			
	13–18		***Sand with Gravel - GM*** Gravelly sand as above, light olive-brown, fine to very fine-grained, 10% silt, 35% fine to coarse gravel, very moist at 15 feet, 10% cobbles.			
	18–30		***No Returns*** Driller states that water is about 20'; drilling in loose gravelly sands.			

Elevation (ft AMSL): 2927.0, 2926.0, 2925.0, 2924.0, 2923.0, 2922.0, 2921.0, 2920.0, 2919.0, 2918.0, 2917.0, 2916.0, 2915.0, 2914.0, 2913.0, 2912.0, 2911.0, 2910.0, 2909.0, 2908.0, 2907.0, 2906.0, 2905.0, 2904.0, 2903.0, 2902.0, 2901.0, 2900.0, 2899.0

DRILLING DATE: 5/23/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 160
TOTAL WELL DEPTH (ft btoc): 160
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.05
GROUND SURFACE ELEVATION (ft AMSL): 2928.34
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY128B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2898.0						
2897.0	31					
2896.0	32					
2895.0	33					
2894.0	34					
2893.0	35		***Sand with Gravel - SP*** Fine to medium-grained, olive-brown, moderately to well-sorted, 15% fine to coarse gravel, very loose, wet.			
2892.0	36					
2891.0	37					
2890.0	38		***Clayey Silt to Silty Clay - ML/CL*** Brown clayey silt to silty clay, thin layers of gravelly silt.			
2889.0	39					
2888.0	40		***Gravel with Sand - GW*** Multi-colored gravel, fine to coarse, 15% fine to coarse poorly sorted sand, loose, wet.			
2887.0	41					
2886.0	42		***Sand - SP*** Light olive-brown (2.5Y5/4), fine to medium-grained, moderately to well-sorted, 10% silt, wet.			
2885.0	43					
2884.0	44		***Clayey Silt - ML*** Light olive-brown, 20% clay, soft, very moist.			
2883.0	45		***Sand - SP*** Light olive-brown, fine-grained, very silty in part, well-sorted, soft, trace coarse gravel, wet.			
2882.0	46					
2881.0	47					
2880.0	48					
2879.0	49					
2878.0	50		***No Returns***			
2877.0	51					
2876.0	52		***Gravel with Sand - GW*** Multi-colored gravels, olive-brown sand, fine to coarse gravels, 25% fine sand, 5% silt, loose, wet.			
2875.0	53					
2874.0	54					
2873.0	55					
2872.0	56					
2871.0	57					
2870.0	58		***No Returns***			
2869.0	59					
	60					

DRILLING DATE: 5/23/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 160
TOTAL WELL DEPTH (ft btoc): 160
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.05
GROUND SURFACE ELEVATION (ft AMSL): 2928.34
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY128B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2868.0						
2867.0	61					
2866.0	62		***Clayey Silt with Cobbles - GC*** Light olive-brown (2.5Y5/4), 30% clay, 5% cobbles, wet.			
2865.0	63					
2864.0	64		***Gravel with Sand - GW*** Sandy Gravel, multi-colored gravels, light olive-brown sand, fine to coarse gravel, 20-30% fine sand, 10% silt, trace clayey, wet, 10% cobbles			
2863.0	65					
2862.0	66					
2861.0	67					
2860.0	68					
2859.0	69					
2858.0	70					
2857.0	71					
2856.0	72					
2855.0	73					
2854.0	74					
2853.0	75					
2852.0	76					
2851.0	77					
2850.0	78		***Sand - SP*** Multi-colored, light olive-brown, medium to coarse-grained, moderately to well-sorted, 10% fine-grained, unconsolidated, wet.			
2849.0	79					
2848.0	80					
2847.0	81					
2846.0	82					
2845.0	83		***Gravel with Sand - GW*** Multi-colored, light olive-brown sand, fine to coarse gravel, 20% fine sand, becoming clayey and silty from 86 to 88 feet, wet, 5% cobbles.			
2844.0	84					
2843.0	85					
2842.0	86					
2841.0	87					
2840.0	88		***Gravel with Sand - GW*** Sandy gravel as above, 35% very fine to fine sand, 10% silt, wet.			
2839.0	89					
	90					

DRILLING DATE: 5/23/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 160
TOTAL WELL DEPTH (ft btoc): 160
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.05
GROUND SURFACE ELEVATION (ft AMSL): 2928.34
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY128B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2838.0						
2837.0	91					
2836.0	92					
2835.0	93					
2834.0	94					
2833.0	95					
2832.0	96					
2831.0	97					
2830.0	98					
2829.0	99					
2828.0	100		***Sand - SP*** Brown, gravelly, medium to coarse sand, very loose. (10YR5/3)Light olive-brown (2.5Y5/4), fine to medium-grained, well-sorted, loose, sloppy.			
2827.0	101					
2826.0	102		***Gravel with Sand - GW*** Sandy gravel as above, fine to coarse gravels, 25% fine sand, 10% silt, slightly clayey from 107 - 108, wet, 10% cobbles up to 4 inches.			
2825.0	103					
2824.0	104					
2823.0	105					
2822.0	106					
2821.0	107					
2820.0	108		***Sand with Gravel - SP*** Light olive-brown, very fine to fine-grained, 10-25% silt, slightly clayey, 25% fine to coarse gravel; 6-inch gravelly silt seam at 109 feet.			
2819.0	109					
2818.0	110					
2817.0	111					
2816.0	112		***Gravel with Sand - GW*** Multi-colored gravels, light olive-brown sand, fine to coarse gravel, 10% cobbles, 35% fine sand and silt, clayey in part, wet.			
2815.0	113					
2814.0	114					
2813.0	115					
2812.0	116					
2811.0	117					
2810.0	118					
2809.0	119					
	120					

DRILLING DATE: 5/23/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 160
TOTAL WELL DEPTH (ft btoc): 160
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.05
GROUND SURFACE ELEVATION (ft AMSL): 2928.34
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY128B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2808.0						
2807.0	121					
2806.0	122		***Clayey Silt - ML*** CLayey silt, light olive-brown, 15% clay, gravelly, moist.			
2805.0	123		***Gravel with Sand - GW*** Sandy gravel as above, slightly clayey, 15% silt, 30 very fine to fine sand, wet.			
2804.0	124					
2803.0	125					
2802.0	126					
2801.0	127					
2800.0	128					
2799.0	129					
2798.0	130					
2797.0	131					
2796.0	132					
2795.0	133					
2794.0	134					
2793.0	135					
2792.0	136					
2791.0	137					
2790.0	138		***Sand with Gravel*** Light olive-brown (2.5Y5/4), fine grained, 10% medium-grained, well-sorted, 35% fine to coarse gravels, 10% cobbles.			
2789.0	139					
2788.0	140					
2787.0	141					
2786.0	142					
2785.0	143					
2784.0	144					
2783.0	145					
2782.0	146					
2781.0	147					
2780.0	148					
2779.0	149					
	150					

DRILLING DATE: 5/23/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 160
TOTAL WELL DEPTH (ft btoc): 160
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.05
GROUND SURFACE ELEVATION (ft AMSL): 2928.34
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY128B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2778.0						
2777.0	151					
2776.0	152		***Sand - SP*** Olive-brown (2.5Y4/3), very fine to fine-grained, well-sorted, 10% silt, trace cobbles, wet, trace coarse gravel.			
2775.0	153					
2774.0	154					
2773.0	155					
2772.0	156		***Sand - SP*** Sand as above, very clayey 25%, silt and clay, wet.			
2771.0	157					
2770.0	158		***Clayey Silt - ML*** Light olive-brown (2.5Y5/4), mottled, yellowish-red (5YR5/4) and red (10R4/8), 15% clay, 10% small gravel, dry, non-plastic, medium stiff to very stiff.			
2769.0	159					
2768.0	160		End of Log			
2767.0	161					
2766.0	162		**Monitoring well KRY128B was completed using 2-inch ID, schedule 40 PVC casing screened from 145 to155 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. The sand pack was placed from 141 feet (4 feet above top of screen) to 160 feet bgs. Bentonite chips (3/8-inch minus) were placed from the top of the sand pack to 137 feet. Portland cement-grout was tremied from top of bentonite chips to near surface. A ten-inch diameter flush-mount well box was inserted in cement at the surface.**			
2765.0	163					
2764.0	164					
2763.0	165					
2762.0	166					
2761.0	167					
2760.0	168					
2759.0	169					
2758.0	170					
2757.0	171					
2756.0	172					
2755.0	173					
2754.0	174					
2753.0	175					
2752.0	176					
2751.0	177					
2750.0	178					
2749.0	179					
	180					

DRILLING DATE: 5/23/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 160
TOTAL WELL DEPTH (ft btoc): 160
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2928.05
GROUND SURFACE ELEVATION (ft AMSL): 2928.34
DRILLING CO.: Cascade

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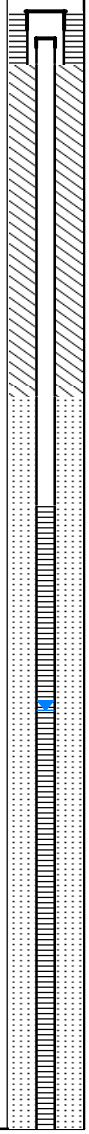
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY129A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2932.2			Ground Surface			
	0		***Soil*** Soil and grass.		41/2.07	
2931.0	1		***No Recovery***			
2930.0	2					
2929.0	3					
2928.0	4					
2927.0	5		***Sandy Gravel - GM*** Olive brown, sandy, gravel. Fine to medium grained sand. Gravels are fine to coarse. Damp, loose.		47/6.4	
2926.0	6		***No Recovery***			
2925.0	7					
2924.0	8					
2923.0	9					
2922.0	10		***Sandy Gravel - GM*** Sandy gravel as above.		35.1/5.4	
2921.0	11		***No Recovery***			
2920.0	12					
2919.0	13					
2918.0	14					
2917.0	15		***Silty Sand - SM*** Brown, fine sand with some silt and clay. Slight plasiticity, wet. Water at 16 feet.			
2916.0	16			KRY129ASB001	50.5/6.5	
2915.0	17					
2914.0	18		***No Recovery***			
2913.0	19				52.1/18.8	
	20					



DRILLING DATE: 5-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.84
GROUND SURFACE ELEVATION (ft AMSL): 2932.23
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY129A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2912.0			***Silty Sand - SM*** Olive brown, sility, sand. 2.5YR 4/3. Very fine sand, some silt. Nonplastic and wet.			
2911.0	21					
2910.0	22					
2909.0	23		***No Recovery***			
2908.0	24					
2907.0	25		***Sandy Silt - ML*** Dark gray, sandy, silt. 2.5YR3/1. Slightly plastic, wet. Small clay fraction.			
2906.0	26					
2905.0	27		***No Recovery***			
2904.0	28					
2903.0	29					
2902.0	30		***Sandy Silt - ML*** Silt as above.			
2901.0	31					
2900.0	32		End of Log			
2899.0	33					
2898.0	34					
2897.0	35					
2896.0	36					
2895.0	37					
2894.0	38					
2893.0	39					
	40					

Monitoring well KRY129A was completed using 2-inch ID, schedule 40 PVC casing, screened from 9 to 29 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 29 to 31 feet bgs. The sand pack was placed from 7 feet (2 feet above top of screen) to 31 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter flushmount protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Native material backfilled borehole from 31 to 31.5 feet.

DRILLING DATE: 5-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.84
GROUND SURFACE ELEVATION (ft AMSL): 2932.23
DRILLING CO.: Cascade

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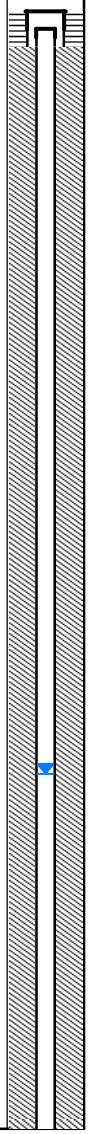
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY129B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2931.5			Ground Surface			
	0–14		***Sand with Gravel - GM*** Grayish-brown (2.5Y5/2), very fine to fine-grained, 25% fine to coarse gravel, 5% cobbles, dry to slightly moist, becoming moist at 14 feet.	No Samples		
	14–18		***Sand with Gravel - GM/SM*** Grayish-brown gravelly sand as above becoming silty, 15% silt, very moist, wet at about 18 feet, trace clay.			
	18–24		***Sand with Silt - SM*** Olive-brown (2.5Y4/3), very fine-grained, well-sorted, 20% silt, 5% cobbles and coarse gravel, very moist to wet.			
	24–28		***Clayey Silt - ML*** Dark Gray (2.5Y4/1), 15% clay, 10% very fine sand, soft, cohesive, low permeability, wet.			
	28–30		***Clayey Silt - ML*** As above, dark gray, increasing clay (25%), soft to medium stiff.			



DRILLING DATE: 6/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 142
TOTAL WELL DEPTH (ft btoc): 142
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.10
GROUND SURFACE ELEVATION (ft AMSL): 2931.47
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY129B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2901.0						
2900.0	31					
2899.0	32		***Silty Clay - CL*** Dark gray, medium-stiff, slightly plastic to plastic, very moist to wet, 30% silt.			
2898.0	33					
2897.0	34		***Clayey Silt - ML*** Clayey silt as above, dark gray, medium stiff.			
2896.0	35					
2895.0	36		***Silty Clay - CL*** Silty clay as above, dark gray, medium stiff, low plasticity, moist to very moist.			
2894.0	37					
2893.0	38		***Clayey Silt - ML*** Gray (2.5Y5/1), 20% clay, soft.			
2892.0	39					
2891.0	40					
2890.0	41					
2889.0	42					
2888.0	43					
2887.0	44		***Clayey Silt - ML*** Clayey silt as above, medium stiff, very moist to wet, intermittent thin stringers of very fine-grained sand, 25-30% clay.			
2886.0	45					
2885.0	46					
2884.0	47					
2883.0	48					
2882.0	49					
2881.0	50					
2880.0	51					
2879.0	52					
2878.0	53					
2877.0	54					
2876.0	55					
2875.0	56					
2874.0	57					
2873.0	58					
2872.0	59					
	60					

DRILLING DATE: 6/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 142
TOTAL WELL DEPTH (ft btoc): 142
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.10
GROUND SURFACE ELEVATION (ft AMSL): 2931.47
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY129B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2871.0						
2870.0	61					
2869.0	62					
2868.0	63					
2867.0	64					
2866.0	65					
2865.0	66					
2864.0	67					
2863.0	68					
2862.0	69					
2861.0	70					
2860.0	71					
2859.0	72					
2858.0	73					
2857.0	74					
2856.0	75					
2855.0	76		***Sand with Silt - SM*** Gray, very fine to fine-grained, 35% silt,well-sorted, 15% clay, soft, moist.			
2854.0	77		***Clayey Silt - ML*** Gray, 25-30% clay, 15% very fine-grained sand, soft, wet.			
2853.0	78					
2852.0	79					
2851.0	80					
2850.0	81					
2849.0	82					
2848.0	83					
2847.0	84		***Silty Clay - CL*** Gray (2.5Y5/1), 15-20% silt, slightly plastic to plastic, moderately stiff, moist to very moist.			
2846.0	85					
2845.0	86					
2844.0	87		Color change to light olive-brown at 116 feet (2.5Y5/3); 6-inch sand and gravel seam at 116 feet.			
2843.0	88					
2842.0	89					
	90					

DRILLING DATE: 6/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 142
TOTAL WELL DEPTH (ft btoc): 142
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.10
GROUND SURFACE ELEVATION (ft AMSL): 2931.47
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY129B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2841.0						
2840.0	91					
2839.0	92					
2838.0	93					
2837.0	94					
2836.0	95					
2835.0	96					
2834.0	97					
2833.0	98					
2832.0	99					
2831.0	100					
2830.0	101					
2829.0	102					
2828.0	103					
2827.0	104					
2826.0	105					
2825.0	106					
2824.0	107					
2823.0	108					
2822.0	109					
2821.0	110					
2820.0	111					
2819.0	112					
2818.0	113					
2817.0	114					
2816.0	115					
2815.0	116					
2814.0	117					
2813.0	118					
2812.0	119					
	120					

DRILLING DATE: 6/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 142
TOTAL WELL DEPTH (ft btoc): 142
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.10
GROUND SURFACE ELEVATION (ft AMSL): 2931.47
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY129B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2811.0						
2810.0	121		***Sand - SP*** Sand, olive-brown (2.5Y4/3), fien to medium-grained, moderately to well-sorted, trace fine to coarse gravel, thin clay seam at 121 feet, 10% coarse gravel at 126 feet, wet.			
2809.0	122					
2808.0	123					
2807.0	124					
2806.0	125					
2805.0	126		***Sand - SP*** Olive-brownm very fine to fine-grained, 10% silt, 10% clay, 10% gravels and cobbles, clayey silt at 129.5 - 130 feet, wet.			
2804.0	127					
2803.0	128					
2802.0	129					
2801.0	130		***Sand - SP*** Sand as above, 15-20% fine to coarse gravels.			
2800.0	131					
2799.0	132					
2798.0	133					
2797.0	134					
2796.0	135					
2795.0	136					
2794.0	137					
2793.0	138		***Clayey Silt - ML*** Clayey silt, brown (10YR5/3), yellowish-brown (10YR5/6), and red (10R4/4) at 141-142 ft., 10% coarse gravels and cobbles, 15-20% clay, stiff, moist; dry at 141-142.			
2792.0	139					
2791.0	140					
2790.0	141					
2789.0	142		End of Log			
2788.0	143					
2787.0	144					
2786.0	145					
2785.0	146					
2784.0	147					
2783.0	148					
2782.0	149					
	150					

Monitoring well KRY129B was completed using 2-inch ID, schedule 40 PVC casing screened from 127 to137 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. The sand pack was placed from 122 feet (5 feet above top of screen) to 140 feet bgs. A 5-foot sump was placed from 137 to 142 feet. Bentonite chips (3/8-inch minus) were placed from the top of the sand pack to 118 feet. Portland cement-grout was tremied from top of bentonite chips to near surface. A ten-inch diameter flush-mount well box was inserted in cement at the surface.

DRILLING DATE: 6/5/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 142
TOTAL WELL DEPTH (ft btoc): 142
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.10
GROUND SURFACE ELEVATION (ft AMSL): 2931.47
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY130A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2927.0	0		Ground Surface			
2926.0	1		***Silt and surface soil***	No Samples		
			No Recovery Difficult drilling. Drilling through boulders/gravels most likely.			
2925.0	2					
2924.0	3					
2923.0	4					
2922.0	5					
2921.0	6					
2920.0	7					
2919.0	8					
2918.0	9					
2917.0	10					
2916.0	11					
2915.0	12					
2914.0	13		***No Recovery*** Softer drilling but no recovery.			
2913.0	14					
2912.0	15		***Clay - CL*** Pale yellowish-brown, clay. No pebbles, high plasticity, moderately dense. 10YR6/2.		0/0	
2911.0	16					
2910.0	17					
2909.0	18					
2908.0	19					
2907.0	20				0/0	

DRILLING DATE: 4-27-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.68
GROUND SURFACE ELEVATION (ft AMSL): 2927.02
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY130A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
			Clay - CL Clay, silty, as above. Wet at 24 feet.			
2906.0	21					
2905.0	22					
2904.0	23					
2903.0	24					
2902.0	25		***Clay - CL*** Clay as above. Bottom of drive is softer.		0/0	
2901.0	26					
2900.0	27					
2899.0	28					
2898.0	29					
2897.0	30		***Sand - SP*** Medium to coarse varied colored sand.		0/0	
2896.0	31		***No Recovery***			
2895.0	32					
2894.0	33					
2893.0	34					
2892.0	35		***Sand - SP*** Sand as above. Few pebbles.		0/0	
2891.0	36		***No Recovery***			
2890.0	37					
2889.0	38					
2888.0	39					
2887.0	40					

DRILLING DATE: 4-27-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.68
GROUND SURFACE ELEVATION (ft AMSL): 2927.02
DRILLING CO.: Cascade

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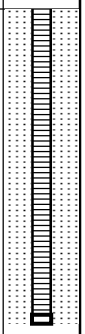
LOG OF BOREHOLE
Monitoring Well ID: KRY130A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
			Sand - SP Yellowish brown, medium grained sand. Loose, wet.			
2886.0	41		***Gravel - SW*** Gravel with sand.			
2885.0	42					
2884.0	43					
2883.0	44					
2882.0	45		End of Log			
2881.0	46		**Monitoring well KRY130A was completed using 2-inch ID, schedule 40 PVC casing, screened from 25 to 45 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 23 feet (2 feet above top of screen) to 45 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter flushmount protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.**			
2880.0	47					
2879.0	48					
2878.0	49					
2877.0	50					
2876.0	51					
2875.0	52					
2874.0	53					
2873.0	54					
2872.0	55					
2871.0	56					
2870.0	57					
2869.0	58					
2868.0	59					
2867.0	60					



DRILLING DATE: 4-27-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 31
TOTAL WELL DEPTH (ft btoc): 31
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.68
GROUND SURFACE ELEVATION (ft AMSL): 2927.02
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

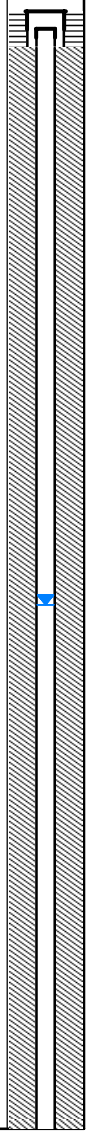
LOG OF BOREHOLE

Monitoring Well ID: KRY130B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2927.2			Ground Surface		
	0–1		***No Recovery*** Large cobbles and gravel fill at surface	No Samples	
2923.0–2922.0	4–5		***Cobble Gravel and Sand*** Large cobbles in rounded alluvial gravel, brown silt (10%), interstitial matrix (10YR5/3)		0.0/6.6
2921.0–2919.0	6–8		***Sand with Gravel*** Tan to light brown, sub-rounded silica sand (80%) and unsorted, sub-rounded medium gravel		0.0/3.5
2918.0–2910.0	9–17		***No Recovery***		
2909.0–2908.0	18–19		***Sand with Silt - SM*** Tan to buff, sub-rounded silica sand and mixed gravels, 5-7% silt (10YR5/4)		
2907.0–2906.0	20–21		***Gravel with Silt - GM*** Saturated silty gravels and silt, no stain or odors/sheen (10YR5/3)		
2905.0–2904.0	22–23		***Clayey Silt - CL/ML*** Medium-brown clayey silt, trace very fine-grained sand. (10YR5/2)		
2903.0–2902.0	24–25		***Clayey Silt - CL/ML*** As above, trace (1-2%) very fine-grained, sub-angular silica sands (10YR5/3)		
2901.0–2900.0	26–27		***Clayey Silt - CL/ML*** As above		
2899.0–2898.0	28–30		***Clay with Fine Sand*** Cohesive clay with 3-5% ver fine-grained subangular silica sand intercelated as thin stringers along relict bedding planes (10YR5/2)		

Monitoring Well Completion



DRILLING DATE: 6/2-4/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 169
TOTAL WELL DEPTH (ft btoc): 169
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.85
GROUND SURFACE ELEVATION (ft AMSL): 2927.19
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY130B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2896.0	31		***No Recovery*** (hydraulic breakdown)			
2895.0	32					
2894.0	33					
2893.0	34					
2892.0	35		***Silty Clay - ML/CL*** Tan to dark brown silty clay with intercalated thin stringers, very fine-grained subangular silica sands on relict surfaces			
2891.0	36					
2890.0	37					
2889.0	38					
2888.0	39					
2887.0	40		***Silty Clay - ML/CL*** Tan to brown silty clay; clay is saturated, cohesive. Sands dropping out after 42 feet, thin, intercalated stringers dispersing to interstitial, fining downward to 48 feet (10YR5/2)			
2886.0	41					
2885.0	42					
2884.0	43					
2883.0	44					
2882.0	45					
2881.0	46					
2880.0	47					
2879.0	48		***Silty Clays - ML/SM*** Silty clays, sands picking up, coarsening (10YR5/2)			
2878.0	49					
2877.0	50		***Sand - SP*** Fine-grained, sturated, well-sorted, clean sub-angular silica sand, compact. (10YR5/3)			
2876.0	51					
2875.0	52					
2874.0	53					
2873.0	54					
2872.0	55					
2871.0	56					
2870.0	57					
2869.0	58		***Clay - CH*** Transition to clay, tan cohesive, plastic, no sands or silts, homogeneous in color			
2868.0	59					
	60					

DRILLING DATE: 6/2-4/06
DRILLING METHOD: Sonic
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TOTAL WELL DEPTH (ft btoc): 169
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CLIENT: MDEQ
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BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.85
GROUND SURFACE ELEVATION (ft AMSL): 2927.19
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Monitoring Well ID: KRY130B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2866.0	61					
2865.0	62					
2864.0	63					
2863.0	64		***Gravel with sand - GW*** At 64 feet- sharp transition from clay/silt to insorted sand and medium gravel (10YR5/3)			
2862.0	65					
2861.0	66					
2860.0	67					
2859.0	68					
2858.0	69					
2857.0	70					
2856.0	71					
2855.0	72					
2854.0	73					
2853.0	74					
2852.0	75		***Sand - SP*** thick lens of fine to medium-grained sub-angular silica sand (10YR5/3)			
2851.0	76					
2850.0	77					
2849.0	78					
2848.0	79		***No Recovery***			
2847.0	80		***Gravel with Sand - GW*** Transition to sandy gravels as in 64 to 75 feet. Homogeneous, unsorted, coarse, sub-rounded to sub-angular, medium gravels in coarse to medium-grained sub-angular sand matrix (10YR5/2)			
2846.0	81					
2845.0	82					
2844.0	83					
2843.0	84					
2842.0	85					
2841.0	86					
2840.0	87		***Gravel with Sand - GP*** Mixed sand and gravel transition to gravel with sand, sand percentages increasing to 70% at 94 feet (10YR5/3)			
2839.0	88					
2838.0	89					
	90					

DRILLING DATE: 6/2-4/06
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TOTAL WELL DEPTH (ft btoc): 169
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LOG OF BOREHOLE
Monitoring Well ID: KRY130B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2836.0	91					
2835.0	92					
2834.0	93					
2833.0	94		***Gravelly Sand - SW*** Gravelly sands, gravels are medium, sub-angular to sub-rounded, loose mixed with sand, trace of layering. (10YR5/2)			
2832.0	95					
2831.0	96					
2830.0	97					
2829.0	98					
2828.0	99					
2827.0	100					
2826.0	101					
2825.0	102					
2824.0	103					
2823.0	104					
2822.0	105		***Gravel with Sand - GW*** Sandy gravels and coarse sub-angular, silica sands 50% sand, saturated. loose, no fines (10YR5/3)			
2821.0	106					
2820.0	107					
2819.0	108					
2818.0	109					
2817.0	110					
2816.0	111					
2815.0	112		***Sand with Gravel - SW*** Gravelly sand, wet, unsorted, gravels are homogeneous, up to 1" diameter; subangular, coarse to medium-grained sands (10YR5/4)			
2814.0	113					
2813.0	114					
2812.0	115					
2811.0	116					
2810.0	117					
2809.0	118					
2808.0	119					
	120					

DRILLING DATE: 6/2-4/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 169
TOTAL WELL DEPTH (ft btoc): 169
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.85
GROUND SURFACE ELEVATION (ft AMSL): 2927.19
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY130B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2806.0	121					
2805.0	122		***Sand - SP*** Well sorted, tan to brown, medium-grained silica sand (10YR5/2).			
2804.0	123					
2803.0	124		***Gravel with Sand - GW*** Light brown sandy gravelss and medium to coarse, sub-angular to sub-rounded silica sand, loose (10YR5/3)			
2802.0	125					
2801.0	126					
2800.0	127					
2799.0	128					
2798.0	129					
2797.0	130					
2796.0	131					
2795.0	132					
2794.0	133		***Clay - CL*** Weathered clay zone as hardpan in sandy gravel.			
2793.0	134					
2792.0	135		***Gravel with Sand - GW*** Sandy gravel, sub-angular to sub-rounded gravels throughout layer. (10YR5/3)			
2791.0	136					
2790.0	137					
2789.0	138					
2788.0	139					
2787.0	140					
2786.0	141					
2785.0	142					
2784.0	143					
2783.0	144					
2782.0	145					
2781.0	146					
2780.0	147					
2779.0	148					
2778.0	149					
	150					

DRILLING DATE: 6/2-4/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 169
TOTAL WELL DEPTH (ft btoc): 169
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.85
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DRILLING CO.: Cascade

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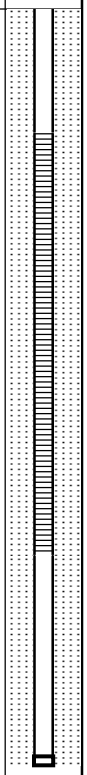
LOG OF BOREHOLE
Monitoring Well ID: KRY130B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2776.0	151					
2775.0	152					
2774.0	153					
2773.0	154					
2772.0	155					
2771.0	156					
2770.0	157					
2769.0	158					
2768.0	159					
2767.0	160					
2766.0	161					
2765.0	162					
2764.0	163		***Clay with Silt and Gravel - CL*** Contact with hardpan clay/gravel; confining unit.			
2763.0	164					
2762.0	165					
2761.0	166					
2760.0	167					
2759.0	168					
2758.0	169		End of Log			
2757.0	170					
2756.0	171					
2755.0	172					
2754.0	173					
2753.0	174					
2752.0	175					
2751.0	176					
2750.0	177					
2749.0	178					
2748.0	179					
	180					



Monitoring well KRY130B was completed using 2-inch ID, schedule 40 PVC casing screened from 153 to 163 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 163' to 168'.The sand pack was placed from 150 feet (3 feet above top of screen) to 169 feet bgs. Medium (<3/8") bentonite chips were placed above the sand pack from 145 to 150 feet. Portland cement-grout was placed from top of bentonite chip layer to near surface. A ten-inch diameter flush-mount well box inserted in cement at surface.

DRILLING DATE: 6/2-4/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 169
TOTAL WELL DEPTH (ft btoc): 169
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2926.85
GROUND SURFACE ELEVATION (ft AMSL): 2927.19
DRILLING CO.: Cascade

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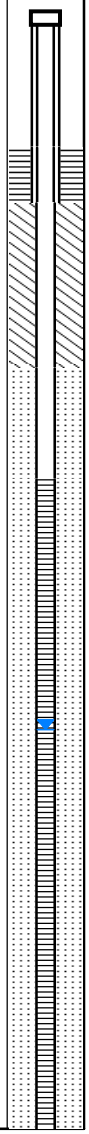
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY132A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2929.0	-2					
	-1					
2928.0 / 2927.7	0		Ground Surface		No Readings	
2927.0	1		***Gravelly Sand - SP*** Dark brown, gravelly sand. 7.5YR3/3. Abundant woody fragments. Fine to coarse gravel slightly moist, earthy, organic rich.	No Samples		
2926.0	2					
2925.0	3					
2924.0	4		***Sandy - SP*** Dark brown, sand as above. Less gravels.			
2923.0	5					
2922.0	6		***Clayey Silt - ML*** Grey, dark, clayey silt. Abundant organic fragments, burnt wood fragments.			
2921.0	7					
2920.0	8					
2919.0	9		***No Recovery***			
2918.0	10					
2917.0	11					
2916.0	12					
2915.0	13		***Silty Sand - SP*** Clay, silty, sand. Bluish grey. Fine to medium sand lenses interbedded with ML as above.			
2914.0	14					
2913.0	15		***No Recovery***			
2912.0	16					
2911.0	17					



DRILLING DATE: 5-17-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2930.75
GROUND SURFACE ELEVATION (ft AMSL): 2927.70
DRILLING CO.: Cascade

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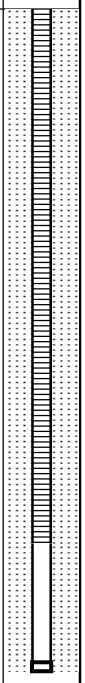
LOG OF BOREHOLE
Monitoring Well ID: KRY132A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2909.0	18		***Sand - SP*** Sandy as above, trace silt and clay.			
2908.0	19		***Silty Sandy - SM*** Dark grey, silty, sand. 7.5YR4/1. Very fine to fine grained. Intermittently clayey.			
2907.0	20					
2906.0	21					
2905.0	22					
2904.0	23					
2903.0	24					
2902.0	25					
2901.0	26					
2900.0	27					
2899.0	28		***No Recovery***			
2898.0	29		End of Log			
2897.0	30					
2896.0	31					
2895.0	32					
2894.0	33					
2893.0	34					
2892.0	35					
2891.0	36					
	37					



Monitoring well KRY130A was completed using 2-inch ID, schedule 40 PVC casing, screened from 25 to 45 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 23 feet (2 feet above top of screen) to 45 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter flushmount protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-17-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 28
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2930.75
GROUND SURFACE ELEVATION (ft AMSL): 2927.70
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY133A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2937.0	-1					
2936.0			Ground Surface			
2936.0	0		***Sand _Gravel - GW*** Sand with gravels. Dark brown to olive brown. Loose, dry. 10YR2/2.		No Readings	
2935.0	1		***No Recovery***	No Samples		
2934.0	2					
2933.0	3					
2932.0	4					
2931.0	5		***Sand - SW*** Sand with gravel. Varied colors in sand matrix and gravels. Sand is medium to coarse, loose, damp. Gravels are pebble sized up to 1 inch.			
2930.0	6					
2929.0	7		***No Recovery***			
2928.0	8					
2927.0	9					
2926.0	10		***Sand _Gravel - SW*** Sand with gravel. Gravels becoming larger. Sand is medium to coarse grained. Some fines, grayish green. Loose, damp.			
2925.0	11		***No Recovery***			
2924.0	12					
2923.0	13					
2922.0	14					
2921.0	15		***Gravel - GP*** Gravel with coarse sand. 80% gravel, 20% sand. Very loose, wet.			
2920.0	16					
2919.0	17		***No Recovery***			

DRILLING DATE: 5-9-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 30
TOTAL WELL DEPTH (ft btoc): 30
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2939.44
GROUND SURFACE ELEVATION (ft AMSL): 2936.01
DRILLING CO.: Cascade

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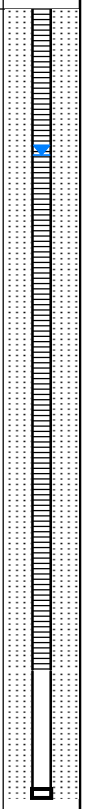
LOG OF BOREHOLE
Monitoring Well ID: KRY133A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2918.0	18					
2917.0	19					
2916.0	20					
2915.0	21					
2914.0	22					
2913.0	23					
2912.0	24					
2911.0	25		***Gravel - GP*** Gravel with sand. Very loose, wet.			
2910.0	26					
2909.0	27		***No Recovery***			
2908.0	28					
2907.0	29					
2906.0	30		End of Log			
2905.0	31					
2904.0	32					
2903.0	33					
2902.0	34					
2901.0	35					
2900.0	36					
2899.0	37					



Monitoring well KRY133A was completed using 2-inch ID, schedule 40 PVC casing, screened from 8 to 28 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 28 to 30 feet bgs. The sand pack was placed from 6 feet (2 feet above top of screen) to 30 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-9-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 30
TOTAL WELL DEPTH (ft btoc): 30
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2939.44
GROUND SURFACE ELEVATION (ft AMSL): 2936.01
DRILLING CO.: Cascade

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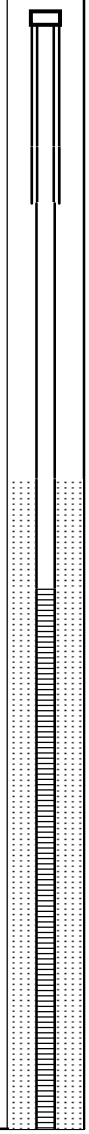
LOG OF BOREHOLE

Monitoring Well ID: KRY134A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
	-2					
2933.0	-1					
2932.2			Ground Surface			
2932.0	0		***Gravel - GW*** Gravels - very little recovery. ***No Recovery***	No Samples	No Readings	
2931.0	1					
2930.0	2					
2929.0	3					
2928.0	4					
2927.0	5					
2926.0	6					
2925.0	7					
2924.0	8					
2923.0	9					
2922.0	10		***Gravel - GW*** Light brown, sandy, silty, gravels. Dry, loose. ***No Recovery***			
2921.0	11					
2920.0	12					
2919.0	13					
2918.0	14					
2917.0	15		***Sandy Gravel - GW*** Sandy gravel. Loose, wet, slightly clayey.			
2916.0	16		***No Recovery***			
2915.0	17					



DRILLING DATE: 5-8-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 30
TOTAL WELL DEPTH (ft btoc): 30
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.11
GROUND SURFACE ELEVATION (ft AMSL): 2932.15
DRILLING CO.: Cascade

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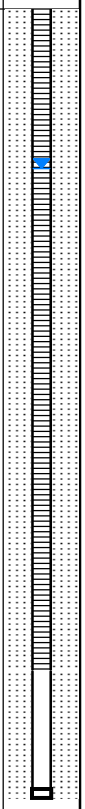
LOG OF BOREHOLE
Monitoring Well ID: KRY134A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2914.0	18					
2913.0	19					
2912.0	20		***Sandy - SP*** Sand with 10% pebbles. Loose, wet, grades to gravel.			
2911.0	21		***Gravel - GW*** Sandy gravel. Sand is coarse. Very loose, wet.			
2910.0	22		***No Recovery***			
2909.0	23					
2908.0	24					
2907.0	25		***Gravel - GW*** Gravel as above.			
2906.0	26		***Sand - SP*** Yellowish brown, medium to coarse, sand. Wet, loose.			
2905.0	27		***No Recovery***			
2904.0	28					
2903.0	29					
2902.0	30		End of Log			
2901.0	31					
2900.0	32					
2899.0	33					
2898.0	34					
2897.0	35					
2896.0	36					
2895.0	37					



Monitoring well KRY134A was completed using 2-inch ID, schedule 40 PVC casing, screened from 8 to 28 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 28 to 30 feet bgs. The sand pack was placed from 6 feet (2 feet above top of screen) to 30 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-8-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 30
TOTAL WELL DEPTH (ft btoc): 30
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.11
GROUND SURFACE ELEVATION (ft AMSL): 2932.15
DRILLING CO.: Cascade

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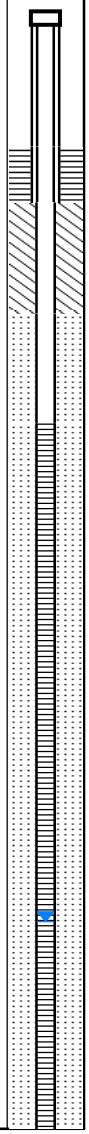
LOG OF BOREHOLE

Monitoring Well ID: KRY135A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2929.0	-2				
	-1				
2928.0			Ground Surface		
2927.7	0		***Gravel - GW*** Limited recovery. Rounded to subangular gravels and silty clay loam. Petroleum staining.	No Samples	69/17
2927.0	1		***No Recovery***		
2926.0	2				
2925.0	3				
2924.0	4				
2923.0	5				
2922.0	6				
2921.0	7				
2920.0	8				
2919.0	9		***Clay - CH*** Cohisive petroluem stained clays. Water at 9.7 feet.		
2918.0	10				
2917.0	11		***Clay - CH*** Stong petroleum odor and stain (saturated). Floating product.		69/17
2916.0	12				42/29
2915.0	13				47/3
2914.0	14				40/7
2913.0	15		***No Recovery***		
2912.0	16		***Clay - CH*** Petroleum stained cohisive clays. Trace lenses of sand.		44/77
2911.0	17				



Monitoring Well Completion

DRILLING DATE: 4-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.22
GROUND SURFACE ELEVATION (ft AMSL): 2927.67
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY135A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
	18				47/144	
2909.0	19					
2908.0	20		***Clay - CH*** As above. Saturated, stained clays.			
2907.0	21					
2906.0	22					
2905.0	23					
2904.0	24					
2903.0	25		End of Log			
2902.0	26					
2901.0	27					
2900.0	28					
2899.0	29					
2898.0	30					
2897.0	31					
2896.0	32					
2895.0	33					
2894.0	34					
2893.0	35					
2892.0	36					
2891.0	37					

Monitoring well KRY135A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 4-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2931.22
GROUND SURFACE ELEVATION (ft AMSL): 2927.67
DRILLING CO.: Cascade

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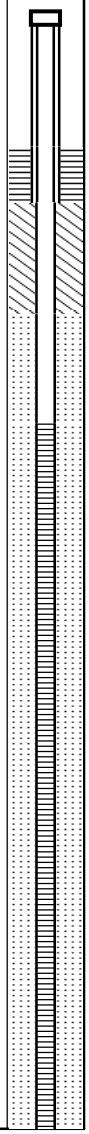
LOG OF BOREHOLE

Monitoring Well ID: KRY136A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2934.0	-2				
2933.0	-1				
2932.4			Ground Surface		
2932.0	0		***No Recovery***		
2931.0	1				
2930.0	2				
2929.0	3				
2928.0	4		***Gravel - GW*** Coarse, subangular to subrounded gravel (fill).	KRY136SB001	.37/0
2927.0	5				
2926.0	6		***No Recovery***		
2925.0	7				
2924.0	8		***Gravel - GW*** Gravel fill.		
2923.0	9		***Gravel - GW*** Gray-black original surface gravels.		0/0
2922.0	10		***No Recovery***		
2921.0	11		***Clay - CL*** Gray to green cohisive clays.		
2920.0	12				0/0
2919.0	13		***No Recovery***		
2918.0	14				
2917.0	15				
2916.0	16				
2915.0	17				

Monitoring Well Completion



DRILLING DATE: 4-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.39
GROUND SURFACE ELEVATION (ft AMSL): 2932.42
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY136A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2914.0	18		***Clay - CL*** As above with pervasive petroleum stain.			
2913.0	19				16/34	
2912.0	20		***No Recovery***			
2911.0	21					
2910.0	22					
2909.0	23		***Clay - CL*** Gray-green petoleum stained cohesive clay.			
2908.0	24		***No Recovery***			
2907.0	25		***Clay and Sand - SC*** Cohesive clay and well sorted sand.			
2906.0	26		***No Recovery***			
2905.0	27					
2904.0	28					
2903.0	29					
2902.0	30		***Sand - SP*** Well sorted medium grained sand.			
2901.0	31					
2900.0	32		***No Recovery***			
2899.0	33					
2898.0	34					
2897.0	35		End of Log			
2896.0	36					
2895.0	37					

Monitoring well KRY136A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Native material backfilled the borehole from 25-35 feet.

DRILLING DATE: 4-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.39
GROUND SURFACE ELEVATION (ft AMSL): 2932.42
DRILLING CO.: Cascade

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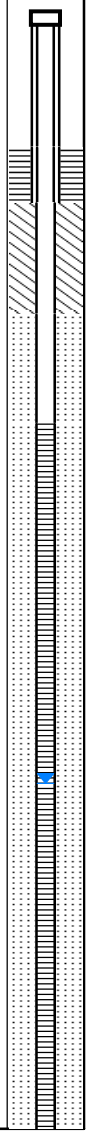
LOG OF BOREHOLE

Monitoring Well ID: KRY137A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
	-2				
2928.0	-1				
2926.8			Ground Surface		
2927.0	0		***Silt and Clay*** Silty clay loam soil and gray-green cohisive clay. Clay is moist. Local blebs of petroleum staining in clay.		25/0
2926.0	1				
2925.0	2		***No Recovery***		
2924.0	3				
2923.0	4				
2922.0	5		***Clay - CL*** Clay as above.		28/0
2921.0	6				
2920.0	7		***No Recovery***		
2919.0	8			No Samples	
2918.0	9				
2917.0	10		***Clay - CH*** Gray-green clay. Local staining and odor.		30/53
2916.0	11				
2915.0	12		***No Recovery***		
2914.0	13				
2913.0	14				
2912.0	15		***Clay - CH*** Cohesive clay with interstitial sand. Moderate petroleum staining.		33/62
2911.0	16		***No Recovery***		
2910.0	17				



DRILLING DATE: 4-25-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.90
GROUND SURFACE ELEVATION (ft AMSL): 2926.84
DRILLING CO.: Cascade

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Helena, Montana
(406)442-5588

Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY137A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2909.0	18					
2908.0	19					
2907.0	20		***Sand - SP*** Well sorted sand.	No Samples		
2906.0	21					
2905.0	22		***No Recovery***			
2904.0	23					
2903.0	24					
2902.0	25		End of Log			
2901.0	26					
2900.0	27					
2899.0	28					
2898.0	29					
2897.0	30					
2896.0	31					
2895.0	32					
2894.0	33					
2893.0	34					
2892.0	35					
2891.0	36					
2890.0	37					

Monitoring well KRY137A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 4-25-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 25
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2929.90
GROUND SURFACE ELEVATION (ft AMSL): 2926.84
DRILLING CO.: Cascade

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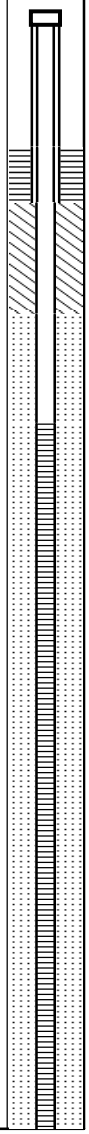
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY138A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2934.0	-2				
2933.0	-1				
2932.4			Ground Surface		
2932.0	0		***Gravel - GW*** Coarse subrounded gravels in medium grained sand matrix. Dry, loose. No staining or odors.		14/0
2931.0	1		***No Recovery***		
2930.0	2				
2929.0	3				
2928.0	4				
2927.0	5				
2926.0	6				
2925.0	7				
2924.0	8		***Gravels - GC*** Green-gray petroleum stained gravel with sand/clay matrix. Pervasive stain and odor.	No Samples	
2923.0	9				1/0
2922.0	10				
2921.0	11				
2920.0	12		***No Recovery***		
2919.0	13				
2918.0	14				
2917.0	15		***Gravel - GW*** Green-gray petroleum stained gravel in sand matrix. Pervasive stain and odor. Floating product.		43/97
2916.0	16		***No Recovery***		
2915.0	17				



DRILLING DATE: 4-25-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.14
GROUND SURFACE ELEVATION (ft AMSL): 2930.74
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY138A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2914.0	18					
2913.0	19					
2912.0	20		***Clay - CH*** Extremely petroleum stained satuarated gray-green cohesive clay. Dark black staining in clay. Floating product.		115/440	
2911.0	21		***No Recovery***			
2910.0	22					
2909.0	23					
2908.0	24					
2907.0	25		***Clay - CH*** Clays as above changing over to medium grained sand. Strong odor and staining.	No Samples	23/38	
2906.0	26		***No Recovery***			
2905.0	27					
2904.0	28					
2903.0	29					
2902.0	30		***Sand - SP*** Well sorted subangular medium grained sand. Strong odor and stain. Product on water.		27/49	
2901.0	31		***No Recovery***			
2900.0	32		**Monitoring well KRY138A was completed using 2-inch ID, schedule 40 PVC casing, screened from 5 to 25 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The sand pack was placed from 3 feet (2 feet above top of screen) to 25 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs. Native material backfilled the borehole from 25-35 feet.**			
2899.0	33					
2898.0	34					
2897.0	35		End of Log			
2896.0	36					
2895.0	37					

DRILLING DATE: 4-25-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 35
TOTAL WELL DEPTH (ft btoc): 25
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2935.14
GROUND SURFACE ELEVATION (ft AMSL): 2930.74
DRILLING CO.: Cascade

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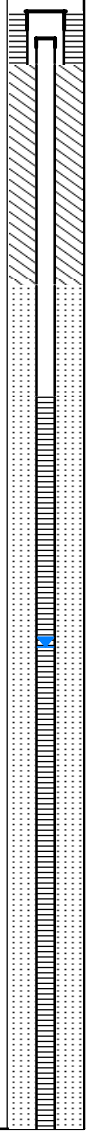
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE

Monitoring Well ID: KRY139A

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
2919.8	0		Ground Surface		
			No Recovery		
2919.0	1				
2918.0	2				
2917.0	3				
2916.0	4				
2915.0	5				
2914.0	6				
2913.0	7				
2912.0	8				
2911.0	9				
2910.0	10				
2909.0	11				
2908.0	12		***Sandy Silt - ML***		
2907.0	13		Dark gray, sandy, silt. 2.5YR4/1. Sand is very fine. Some clay. Slightly plastic, damp. Trace organics.		47.7/4380
2906.0	14		***Silty Sand - SM***		
2905.0	15		Dark gray, sility sand. Very fine sand. Some fine gravels. Trace wood bits. Very slight petroleum odor.	KRY139ASB001	44.7/1188
			No Recovery		
2904.0	16				
2903.0	17				
2902.0	18				
2901.0	19				
2900.0	20				



DRILLING DATE: 5-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.51
GROUND SURFACE ELEVATION (ft AMSL): 2919.83
DRILLING CO.: Cascade

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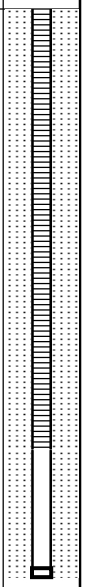
Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY139A

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2899.0	21					
2898.0	22					
2897.0	23					
2896.0	24					
2895.0	25					
2894.0	26					
2893.0	27					
2892.0	28					
2891.0	29		End of Log			
2890.0	30					
2889.0	31					
2888.0	32					
2887.0	33					
2886.0	34					
2885.0	35					
2884.0	36					
2883.0	37					
2882.0	38					
2881.0	39					
2880.0	40					



Monitoring well KRY139A was completed using 2-inch ID, schedule 40 PVC casing, screened from 7 to 27 feet bgs with 0.020-inch slotted PVC screen with #3 sand placed as sand pack. The well sump was cased from 27 to 29 feet. The sand pack was placed from 5 feet (2 feet above top of screen) to 29 feet bgs. Medium (<3/8") bentonite chips were placed above sand pack to approximately 1 foot bgs. A six inch diameter protective casing was installed for the surface completion with cement from the surface to 1 foot bgs.

DRILLING DATE: 5-24-06
DRILLING METHOD: HSA
BOREHOLE DEPTH (ft bgs): 29
TOTAL WELL DEPTH (ft btoc): 29
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.51
GROUND SURFACE ELEVATION (ft AMSL): 2919.83
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Monitoring Well ID: KRY139B

Flathead County
Montana

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading	Monitoring Well Completion
2919.6			Ground Surface			
	0		***Sand - SP*** Gravelly sand, brown, (10YR4/3), very fine-grained to fine-grained, well-sorted, 10-15% fine to coarse gravel, dry.			
2918.0	1					
	2					
2917.0	3					
2916.0	4		***Clayey Silt - ML*** Very dark grayish-brown (10YR4/2), 15% clay, soft to medium stiff, 5% fine gravel, dry to moist, blackdry staining from 6 to 7 feet, abundant staining and odor from 13 to 18 feet, wet at 18 feet.			
2915.0	5					
2914.0	6					
2913.0	7					
2912.0	8					
2911.0	9					
2910.0	10					
2909.0	11					
2908.0	12					
2907.0	13					
2906.0	14					
2905.0	15					
2904.0	16					
2903.0	17					
2902.0	18		***Silty Sand - SM*** Very dark gray (10YR3/1), very fine to fine-grained, 15-20% silt, trace fine gravel, slight odor, loose, sloppy, wet.			
2901.0	19					
2900.0	20					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2899.0	21					
2898.0	22					
2897.0	23					
2896.0	24		***Sand - SP*** Very dark grayish-brown (10YR3/2), fine-grained, well-sorted, wet.			
2895.0	25					
2894.0	26		***GRAVEL with sand - GW*** Sandy gravels, multi-colored, fine to coarse, sub-rounded to rounded, 25% fine sand, 10% cobbles, wet.			
2893.0	27					
2892.0	28					
2891.0	29					
2890.0	30					
2889.0	31					
2888.0	32					
2887.0	33					
2886.0	34					
2885.0	35					
2884.0	36					
2883.0	37		***Silt - ML*** Silt, yellowish-brown (10YR5/4), trace clayey, soft, moist to very moist.			
2882.0	38		***Silt - ML*** Gray (10YR5/1), mottled greenish-gray (Gley2 6/1), 10-15% clay, varied, moist, increasing clay from 42-44 feet, medium stiff to stiff.			
2881.0	39					
2880.0	40					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2879.0	41					
2878.0	42					
2877.0	43					
2876.0	44					
2875.0	45					
2874.0	46					
2873.0	47					
2872.0	48		***Silty Clay - CL*** Silty clay, gray, slightly plastic to plastic, soft to medium stiff, moist.			
2871.0	49					
2870.0	50		***Clayey Silt - ML*** Gray, medium stiff to stiff, 15% clay, slightly plastic, moist.			
2869.0	51					
2868.0	52					
2867.0	53					
2866.0	54					
2865.0	55					
2864.0	56					
2863.0	57					
2862.0	58		***Clayey Silt - ML*** Clayey silt, as above, soft, wet.			
2861.0	59					
2860.0	60					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2859.0	61					
2858.0	62					
2857.0	63					
2856.0	64					
2855.0	65					
2854.0	66		***No recovery.***			
2853.0	67					
2852.0	68					
2851.0	69					
2850.0	70		***Clayey Silt - ML*** Clayey silt, gray (10YR5/1), 15-20% clay, loose and runny from 70-74 feet, then soft and sticky below 74 feet, very moist to wet.			
2849.0	71					
2848.0	72					
2847.0	73					
2846.0	74					
2845.0	75					
2844.0	76					
2843.0	77					
2842.0	78					
2841.0	79					
2840.0	80					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2839.0						
	81					
2838.0						
	82					
2837.0						
	83					
2836.0						
	84					
2835.0						
	85					
2834.0						
	86					
2833.0						
	87					
2832.0						
	88		***Silty Clay - CL*** Gray (10YR5/1), mottled in part weak red (10YR5/3), 15-20% silt, soft to medium stiff, slightly plastic to plastic, very moist.			
2831.0						
	89					
2830.0						
	90					
2829.0						
	91					
2828.0						
	92					
2827.0						
	93					
2826.0						
	94					
2825.0						
	95					
2824.0						
	96					
2823.0						
	97					
2822.0						
	98					
2821.0						
	99					
2820.0						
	100					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2819.0	101		***Clayey Silt - ML*** Gray, 25-35% clay, soft, sloppy in part, slightly plastic, sticky, very moist to wet.			
2818.0	102					
2817.0	103					
2816.0	104					
2815.0	105					
2814.0	106					
2813.0	107					
2812.0	108					
2811.0	109					
2810.0	110					
2809.0	111					
2808.0	112					
2807.0	113					
2806.0	114		***CLAY with sand and silt - CL*** Gray, 25% silt, soft, sticky, very moist to wet.			
2805.0	115					
2804.0	116					
2803.0	117					
2802.0	118		***Clay with Silt - CL*** Silty Clay, gray (10YR5/1), 10-15% silt, medium stiff to stiff, plastic, moist.			
2801.0	119					
2800.0	120					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2799.0	121					
2798.0	122					
2797.0	123					
2796.0	124					
2795.0	125					
2794.0	126					
2793.0	127					
2792.0	128					
2791.0	129					
2790.0	130					
2789.0	131					
2788.0	132					
2787.0	133					
2786.0	134					
2785.0	135					
2784.0	136					
2783.0	137					
2782.0	138		***Clay with Silt - CL*** As above, gray, soft, moist to wet. Becoming very stiff at 150 to 154. very moist.			
2781.0	139					
2780.0	140					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2779.0	141					
2778.0	142					
2777.0	143					
2776.0	144					
2775.0	145					
2774.0	146					
2773.0	147					
2772.0	148					
2771.0	149					
2770.0	150					
2769.0	151					
2768.0	152					
2767.0	153					
2766.0	154		***Silty Clay - CL*** Grayish-brown (10YR5/2), soft to medium-stiff, moist, wet at 156'.			
2765.0	155					
2764.0	156					
2763.0	157		***Silty Gravelly Clay - CL*** Grayish-brown, becoming gravelly at 157 feet, 15-20% fine to coarse gravels, dark reddish-brown (2.5YR3/3), wethered fragments, moist.			
2762.0	158		***No Returns***			
2761.0	159					
2760.0	160					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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Kalispell Pole and Treating, Reliance Refinery, And Yale Oil Company Facilities

LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2759.0	161					
2758.0	162		***Clayey Sand - SC*** Dark grayish-brown (10YR4/2), fine to medium-grained, moderately sorted, 15% clay, wet.			
2757.0	163		***Gravelly Sand - SW*** Dark grayish-brown, fine to coarse-grained, poorly sorted, 20% gravels, fine to coarse, trace cobbles, loose, wet, trace clayey.			
2756.0	164					
2755.0	165					
2754.0	166					
2753.0	167					
2752.0	168		***Gravelly Sand with Clay - SC*** As above, very clayey, 40% clay, wet, sticky.			
2751.0	169					
2750.0	170		***Sandy Clay - CL*** Darck grayish-brown, 15% fine to medium sand, sticky, medium-stiff, very moist.			
2749.0	171					
2748.0	172		***Gravelly Sand with Clay - SC*** Dark grayish-brown, fine to coarse-grained, poorly sorted, 15% clay, 15% gravels, wet.			
2747.0	173					
2746.0	174		***Gravelly Sand - SW*** Dark grayish-brown, fine to coarse-grained, poorly sorted, 15-20% fine to coarse gravels, 5% clay, wet.			
2745.0	175					
2744.0	176					
2743.0	177					
2742.0	178					
2741.0	179					
2740.0	180					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Monitoring Well ID: KRY139B

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading	Monitoring Well Completion
2739.0	181		***Clayey Gravelly Sand - SW*** Dark grayish-brown, fine grained, 15% medium to coarse-grained, 15% gravels, 25% clay, sticky, wet.			
2738.0	182					
2737.0	183					
2736.0	184					
2735.0	185					
2734.0	186					
2733.0	187					
2732.0	188		***Silty Gravelly Clay - CL*** Dark grayish-brown, 15% fine to coarse gravel, stiff, non-plastic, slightly moist.			
2731.0	189		End of Log			
2730.0	190		**Monitoring well KRY139B was completed using 2-inch ID, schedule 40 PVC casing screened from 166 to 176 feet bgs with 0.020-inch slot, PVC screen with #3 sand placed as sand pack. A 5-foot PVC blank pipe sump was placed from 176' to 181'.The sand pack was placed from 162 feet (4 feet above top of screen) to 181 feet bgs. Medium (<3/8") bentonite chips were placed from 158' to 162'above the sand pack. Portland cement-grout was placed from top of bentonite chip layer to the surface. A ten-inch diameter well box inserted in cement at surface.**			
2729.0	191					
2728.0	192					
2727.0	193					
2726.0	194					
2725.0	195					
2724.0	196					
2723.0	197					
2722.0	198					
2721.0	199					
2720.0	200					

DRILLING DATE: 6/6/06
DRILLING METHOD: Sonic
BOREHOLE DEPTH (ft bgs): 188
TOTAL WELL DEPTH (ft btoc): 181
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DIAMETER (in.): 7 7/8
WELL CASING DIAMETER (in.): 2.0
TOC ELEVATION (ft AMSL): 2919.24
GROUND SURFACE ELEVATION (ft AMSL): 2919.63
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY601

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Cobbles with Sand - GP***		0/0
	1		(Surface fill) Cobbles with sand and silt, loose, dry.	KRY601SS01	
	2		***No returns***		
	3				
	4		***Silt - ML***		0/0
	5		Dark brown (10YR2/2), no gravels, soft, dry.	KRY601SB01	
	6		***Silt - ML*** Yellowish-gray(5YR7/2), no pebbles or gravels, soft, sl. damp.		
	7		***No Returns***		
	8		***Gravel with Sand - GW***		19/0
	9		Light brownish-gray, loose, gravels are sub-rounded to sub-angular, sl. damp.	KRY601SB02	
	10		***No Returns***		
	11				
	12		***Gravel with Sand - GW***		8/0
	13		Gravels (as above).		
	14		***Clay - CL*** Light yellowish-brown, no pebbles or gravels, moderately dense, wet.		
	15		***Clay - CL***		
	16		Clay, as above.		
	17				1/0
	18			KRY601SB03	
	19		***Gravel with Sand - GW***		
	20		Sandy gravels, as above.		5.4/170
	21		End of Log		
	22				
	23				
	24				
	25				

DRILLING DATE: 4-27-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY603

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
	1		***No Returns***	KRY603SS01	
	2				
	3				
	4		***Sand with Gravel - GP/ML*** Dark brown, loose sand/silt mix with 25% rounded gravels, cobbles up to 1" diameter, no staining.	KRYSB001	0.75/0
	5				
	6		***No Returns***		
	7				
	8		***Sand with Gravel - SP*** Course, rounded gravels (30%) in loose sand matrix (70%), no stain or odor.	KRYSB002	.44/0
	9				
	10		***Gravels with Sand - GM*** Coarse gravels in fine- to medium sand matrix, sub-rounded cobble gravels to 1.5", loose, sand is slightly moist, so stain or odor.		4.8/3.8
	11				
	12				
	13				
	14				
	15		***No Recovery***		
	16				
	17				
	18				
	19		***Sand with Gravel - SP*** Sand with rounded gravel, wet. pervasive odor.	KRYSB003	6400/502
	20		End of Log		
	21				
	22				
	23				
	24				
	25				

DRILLING DATE: 4-26-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY604

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Sand with Gravel - SW*** Olive-brown (2.5Y4/4), some silt (5-10%), fine to coarse sand and fine gravels-rounded, some coarse gravel, sl. damp, loose.		Ambient: PID=0.47 FID=1.3
	1				
	2				36.1/9.6
	3				
	4		***Silt with Sand - ML*** Olive-brown (2.5Y4/3), sand is very fine(20%), sl. plastic, moist.		49.4/10.1
	5				
	6				
	7				
	8				
	9		***Clay with Sand - SC*** Brown (10YR5/3), med. to coarse-grained sand (10%), dispersed throughout clay, moist, sl. plastic.		58.4/10.3
	10				
	11		***No Recovery***		
	12				
	13				
	14		***Sand with Gravel - SW*** Olive-brown (2.5Y4/3), fine to coarse sand, fine to coarse gravel (30%), sub-rounded gravels, some coblles.		60/11
	15				
	16		***Sand with Gravel - SW*** As above, but with med- to coarse sand (fewer fines), very damp at 17'.		54/16
	17		***Sand with Gravel - SP*** As above, damp.		
	18				
	19				
	20				

DRILLING DATE: 6-2-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 26.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Borehole ID: KRY604

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading
	21				
	22		***Gravel with Sand - GW*** Olive-brown (2.5Y5/4), some silt (20-35%) and clay, very pervasive odor.		
	23			KRY604SB001	408/2.37%**
	24				
	25		***Gravel with Sand - GW*** Multi-colored coarse sand and fine to coarse rounded gravel, wet, loose, odor noted.		** At 25 feet bgs, FID reading was so high that meter was reading in percentages.
	26				
	27		End of Log		
	28				
	29				
	30				
	31				
	32				
	33				
	34				
	35				
	36				
	37				
	38				
	39				
	40				

DRILLING DATE: 6-2-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 26.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY605

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Coarse Gravel - Fill(?)*** Limited recovery in coarse gravel - soil mixed throughout (Fill?) - no stain or odor.	KRY605SS001	5/0
					7/5
	1				
					8/16
	2				
	3				
	4		***Poor Recovery - SW*** Poor recovery - mostly rock pulverized with sand.		2/0
	5				
	6		***Gravels with Sand - GW/SM*** Coarse sub-rounded to sub-angular fravels, loose, soial and sand matrix.	KRY605SS002	
	7				
	8				13/0
	9				
	10		***No Recovery*** No recovery 10 to 15 feet; refusal of split spoon at 11 feet.		
	11				
	12				
	13			KRY605SS03	
	14				
	15		End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 4-26-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY606

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Coarse Gravel - Fill(?)*** Soil samples obtained 0-6" beneath asphalt (6") and 12" of gravel asphalt base, coarse.		3/0
	1				
	2				
	3		***No Recovery***		1/0
	4		***Gravels with Sand - GW/SM*** Coarse sub-rounded to sub-angular gravelsin sand matrix (fill?).	KRY606SB001	32/135
	5				
	6		***No Recovery***		
	7				
	8		***Gravels with Sand - GW/SW*** Gravels with sand as above, trace stain and odor, loose, uncompacted.	KRY606SB002	26/97
	9				
	10		***No Recovery***		
	11				
	12				
	13		***Clay - CL/CH*** Extremely stained cohesive clays. Smear zone sample collected.	KRY606SB03	222/1365
	14				35/425
	15		End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 4-26-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY607

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Coarse Gravel with Sand*** Very limited recovery; rounded surface cobbles above well-sorted med-grained clayey sand, dark black stain, strong gasoline/diesel odor.	KRY607SS001	0/0
	1			KRY607SS002	
	2			KRY607SS003	
	3				
	4		***No Recovery***		0/0
	5		***Gravels with Sand - GW*** Coarse angular to sub-angular gravels 10% medium to coarse sand matrix.	KRY607SB001	
	6		***No Recovery***		
	7				
	8		***Gravels with Sand - GW/SP*** As above, coarse sand increasing.		0/0
	9				
	10		***No Recovery***		
	11		***Clayey Sand - SC/CL*** Coarse to medium clayey sands, transition to cohesive clays at 13 feet.		0/0
	12				
	13			KRY607SB002	
	14		***No Recovery***		
	15		***Clay - CL/CH*** Cohesive clay with local lenses of medium-grained snad; trace odor/no staining.		
	16				
	17				
	18				2.5/7
	19				
	20		End of Log		
	21				
	22				
	23				
	24				
	25				

DRILLING DATE: 4-21-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Montana

LOG OF BOREHOLE

Borehole ID: KRY608

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt with Clay - ML*** Clayey sil, dark grayish-brown (2.5Y4/2), sl. plastic, moist.	KRY608SS001	Ambient: PID=0.2 FID=-2.6
	1				
	2				
	3				
	4		***Silt with Sand - ML*** Sandy silt, grayish-brown (2.5Y5/2), sl. plastic, moist, vf sand (20-30%).	KRY608SB001	
	5		***Siltwith Sand - ML*** As above, poor recovery.		
	6				
	7				
	8				
	9		***Sand with Gravel - SW*** Gravelly sand, grayish-brown (2.5Y5/2), fine to coarse sub-angular sand, fine, rounded gravels, loose, damp.	KRY608SB002	
	10		***Sand with Gravel - SW*** As above, poor recovery		
	11				
	12				
	13				
	14		***Sand with Gravel - SW*** Dark grayish-brown (2.5Y4/2), fn to coarse sand, fine to coarse gravel, sub-rounded, trace cobbles, wet at 15.5 feet.	KRY608SB003	41.8/12.2
	15				
	16		***Sand with Gravel - SW*** As above, wet, contact with sandy gravel at 16.5'.		47/17
	17		***Gravel with Sand - GW*** Gravel with sand, coarse sand, fine to coarse, rounded gravel.		
	18		End of Log		
	19				
	20				

DRILLING DATE: 5-25-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY609

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
	1 2 3		***Poor recovery*** Some soil and asphalt material.	KRY609SS001	Ambient: PID=0.22 FID=4.84
	4 5 6 7 8		***Clay with Silt - CL*** Silty clay, light olive-bjrown(2.5Y5/3), some fine to medium sand, sl. plastic, damp. Coarse gravel stuck in shoe 4.5 to 5.0 feet. ***Silty Clay - CL/SW*** Silty Clay as above but with more mottled color, some light gray (5Y7/2), grades to SW at 8 ft. bgs.	KRY609SB001	
	9 10 11 12 13 14 15		***Sand with Gravel - SW*** Light olive-brown (2.5Y5/3), fine to coarse sand, sub-angular. Gravels are fn to coarse with trace cobbles, loose, slightly damp. ***Sand with Gravel - SW*** Poor recovery, material recovered was gravelly sand as above.	KRY609SB002	
	16 17 18		***Sand with Gravel - SW*** Gravelly sand, multi-colored grains, wet, loose. ***Gravel with Sand - GW*** Multi-colored grains, gravel is fine to coarse, sub-rounded to rounded, sands are fine to medium. Petroleum odor. ***Gravel with Sand - GW*** Sandy gravel as above.	KRY609SB003	52/13
	19 20		End of Log		

DRILLING DATE: 5-24-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 18.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY610

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No Recovery	No Samples	
	4		***Gravels with Sand - GW/SW*** Coarse sub-angular gravels, sand and silt - strong odor and staining.		32/290
	6		***No Returns***		
	8		***Gravels with Silt - GM*** Coarse gravels (20%) in sand/clay/silt matrix, pervasive stain and odor Refusal at 11 feet.		135/860
	10		End of Log		

DRILLING DATE: 4-24-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 10
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY612

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No Recovery		
	4		***Gravels with Sand - GW*** Coarse, angualr gravel in medium-grained sand matrix, dry, no staining or odor.	KRY612SB001	0/0
	6		***No Returns***		
	8		***Gravels with Sand - GM/SP*** As above, picking up interstitial cal in sands, no stains or odor.	KRY612SB002	0/0
	10		***No Returns*** Attempted 10-15 foot auger flight - no recovery in spoon.		
	15		End of Log		

DRILLING DATE: 4-21-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY616

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No Recovery		
	4		***Sand with Gravel - SW*** Rounded, fine- to medium-grained, angular sand supported rounded cobbles, clay absent.	KRY616SB001	7/0
	6		***No Returns***		
	8		***Gravels with Sand - GW*** Rounded cobbles and coarse sand; 10 feet - end of coarse cobbles.	KRY616SB002	24/18
	10		End of Log		

DRILLING DATE: 4-19-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY617

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silty Clay - ML***		
	1		Limited recovery in silty clay, loam soil, cohesive clay and silt, trace root mottles, organics, no stain or odor.		0/0
	2				0/0
	3				
	4		***Silty Clay - ML***		0/0
	5		5% revoery is silty clay with interstitial rounded cobbles, large square cobbles blocked cutting shoe - no volume for sample, no stain or odor.		
	6		***No Returns***		
	7				
	8				
	9		***Clay - CH***	KRY617SB001	90/12
	10		Grayish-green, cohesive glacial clay; 8.5 - 9.5 - fn grained well-sorted silica sand; 9.5-13.5 - trace Fe-oxidation in sands; trace interstitial clay in 13.0-13.5 recovery, saturated at 9.2 feet bgs - strong odor.		
	11				
	12				
	13				
	14		***Sand - SP***		245/212
	15		Rounded cobbles and coarse sand;		
	16		10 feet - end of coarse cobbles.Grayish-green to gray, very fine-grained, well-sorted, sub-angular silica sand, homogeneous sorted sands throughout, strong odor and stain.		
	17				
	18				
	19		***Sand - SP***		135/105
	20		Gray, very fine-grained, well-sorted silica sand as above - to TD.		
	21				
	22				
	23				
	24				
	25		End of Log		
	26				
	27				
	28				
	29				
	30				

DRILLING DATE: 4-19-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 25
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Kalispell Pole, Reliance Refinery, And Yale Oil Facilities

Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY618

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
	1		***No returns***	KRY618SS001	0/0
	2–3		***Silty Clay - ML*** Tan to black silty clay loam and rounded gravels to 2.5", coarse-grained round silica snads, petro-stained and odor at 3-4'.		13/0
	4–5		***Sand with Gravel - SW*** Coarse, rounded cobbles and gravel (30%) in med. to coarse-grained sub-angular sands, cobbles up to 3", no stain or odor.	KRY618SB001	32/0
	6–7		***Sand with Gravel - SW*** As above, becoming moist, trace interstitial clay in sand.		31/0
	8–9		***Sand with Clay - SC*** As above with increasing clay at approximately 7 feet.	KRY618SB002	32/0
	10–14		***Gravels with Sand - GW*** Coarse gravels and medium sand, cobble gravel to 2.5", interstitial clays, wet.		34/4
	15–19		***Sand with Gravel - SW*** Little to no recovery in sand.		
	20		End of Log		
	21–25				

DRILLING DATE: 4-25-06
DRILLING METHOD:
LOGGED BY: J. Faubion
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY622

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silty Sands - ML*** Surface soil; silty sand, poor recover.		Ambient: PID=0.02 FID=7.0
-1.0	1		***No Recovery***	No Samples	
-2.0	2				
-3.0	3				
-4.0	4		***Gravel with Sand*** Gravel with sand, gravel ranges in size up to 2.5", sand is medium-grained to coarse.		
-5.0	5		***No Returns***		
-6.0	6		***Gravel with Sand - GW*** Well-rounded pebbles up to 1", vaied in color, sand (30%) is coarse-grained, loose, damp.		
-7.0	7		***No Returns***		
-8.0	8				38/16
-9.0	9		***Sand - SP*** Well-sorted, light olive-brown (2.5Y5/4), loose, wet.		
-10.0	10		***Sand - SP*** Medium-grained, well-sorted, light olive-brown (2.5Y5/4), very loose, wet.		16/24
-11.0	11				
-12.0	12		***No Returns***		
-13.0	13				24/20
-14.0	14		***Sand - SP*** Medium-grained, well-sorted (as above).		
-15.0	15		***No Returns*** No samples collected.		
-16.0	16		End of Log		
-17.0	17				
-18.0	18				
-19.0	19				
-20.0	20				

DRILLING DATE: 5-11-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY623

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***No Returns*** Surface fill	No Samples	Ambient: PID=-0.01 FID=4.99
	1		***No Recovery***		
	2				
	3				
	4		***Sand with Gravel - SW*** Sand, gravelly, light olive-brown (2.5Y5/3), medium-grained, pebbles are angular to sub-angular.		19/2.5
	5		***Sand with Gravel- SW*** Sand color as above, dry to damp.		
	6		***No Returns***		
	7				
	8				
	9		***Sand with Gravel - SW*** Gravelly sand, light olive-brown (2.5Y5/3), well-graded, pebbles up to 1", occasionally larger.		10.2/12.2
	10		***No Returns***		
	11		***Sand - SP*** Medium-grained, well-sorted (2.5Y5/4).		
	12		***No Returns***		
	13				
	14		***Sand - SP*** Medium-grained, well-sorted (as above).		
	15		***Gravel - GP*** Gravel with few fines, pebbles up to 1.5", rounded to sub-rounded.		
	16		***No Returns*** No samples collected		
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-11-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY624

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Cayey Silt - OL*** Very darkgrayish-brown(10YR3/2), sl. damp, very fine to fine-grained sand (10%), brown color possibly from organics, low plasticity, loose.		Ambient: PID=0.36 FID=6.75 3.25/9.24
	1		***No Recovery***		
	2				
	3				
	4		***Silt with Sand - ML*** Sandy silt, light bronish-gray (2.5Y6/2), sl. damp, loose, sl. plastic.		16.97/10.58
	5				
	6		***Silt with Sand - ML*** As above, sands are very fine, clayey fine sands.		3.73/9.61
	7				
	8		***Sand with Gravel - SW*** Gravelly sand, light yellowish-brown (2.5Y6/3), 30% fine gravels, trace cobbles and coarse gravel, sub-angular to sub-rounded, sl. damp, loose, non-plastic.		3.58/11.23
	9				
	10		***Sand, Gravel and Silt - SM*** Light yellowish-brown (2.5Y6/3), damp, sl. plastic, fine to coarse sand, 10% silt-clay, fine gravels, few coarse gravels, grains are angular to sub-rounded, odor detected.		
	11				
	12				
	13				
	14		***Gravel with Sand - GW*** Sandy gravel, (2.5Y6/3), 30% coarse sands, wet, very loose, some silt (15%).		2.24/24.3
	15				
	16		***Gravel with Sand - GW*** Sandy gravel as above.	KRY624SB001	8.5/62.5
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-15-06
DRILLING METHOD:
LOGGED BY: J Allewalt/R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY625

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No returns Surface fill - snad, dark brown. ***No Recovery***		Ambient: PID=0.1 FID=-3.6
	1				
	2				
	3				
	4		***Sand with Clay - SC*** Sand with clay and gravels, light yellowish-brown (2.5Y5/3). ***No Returns***		
	5				
	6				
	7				
	8				
	9		***Sand - SP*** Medium-grained, light olive-brown, well-sorted, loose, wet. ***No Returns***		1.5/16.7
	10		***Gravel with Sand - GP*** Gravel with sand, well-rounded to sub-rounded pebbles up to 1.5", 20% medium to coarse-grained sand, grades to well-sorted, medium-grained SP sand below. ***No returns***		
	11				
	12				
	13				
	14		***Sand with Pebble Gravel - SP*** Pebbles are varied in color, rounded to sub-rounded, up to 0.5", 80% sand, 20% pebbles, wet.	KRY625SB001	1.7/2000 17/1300
	15		***No Returns***		
	16				
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-11-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY626

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt with Sand - ML*** Silt wiht sand and gravel (2.5Y5/2), grayish-brown, dark brown staining at surface with sl. petro odor, fine sands, gravels are fien with a few coarse grains, angular to sub-angular.		Ambient: PID=0.06 FID=1.5
	1		***No Recovery***		
	2				
	3				
	4		***Sand with Gravel - SW*** Gravelly sands, light olive-brown (2.5Y5/3), sands are fine to coarse with silt 25% gravels, sl. damp, loose.		34.2/10.8
	5				
	6		***Gravel with Silt and Sand - SM*** Light olive-brown (2.5Y5/3), fine to coarse sand, sl. plastic, sl. damp, loose. Few coarse gravels that are sub-angular.		
	7				27.9/13.2
	8		***Sand with Gravel - SW*** Multi-colored grains in (2.5Y5/1) matrix, fine to coarse sand, angular to sub--angular, 15% gravels fine to coarse, angular, sl. damp.		
	9				
	10		***Sand with Gravel - SW*** Gravelly sand as above, with some silt, sl. odor.		
	11				
	12				22.6/37.4
	13				
	14		***Sand with Gravel - SW*** Gravelly sand (2.5Y4/2), dark grayish-brown, wet, medium to coarse sand, sub-angular to sub-rounded, 10% gravels, sub-rounded.	KRY626SB001	14.8/55.1
	15				
	16		End of Log		
	17				
	18				
	19				
	20				

DRILLING DATE:
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY627

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silty Sand - ML*** fine-grained, silty, olive-brown, damp, clayey (2.5Y4/3) No Returns		Ambient: PID=0.01 FID=6.15
	1				
	2				
	3				
	4		***SAND, Gravelly - GP*** Light olive-brown, pebbles are rounded to sub-rounded (2.5Y4/3) No Returns		
	5		***GRAVEL with sand - GW*** Olive-brown, sand is medium- to fine-grained, loose, damp. (2.5Y4/3) No Returns		
	6				
	7				
	8				
	9		***GRAVEL with sand and silt - GW*** Light yellowish brown, fine sand to coarse-grained gravel, 20% silt, 20% fine sand, very slightly moist (2.5Y6/3) No Returns		
	10				
	11				
	12				
	13				
	14		***SAND with gravel - SP*** greyish-brown, fine-grained, well-sorted, 10% fine rounded gravels, wet. (2.5Y5/2) No Returns		15/6.15
	15				
	16		***Sand with Gravel - SP*** Olive-yellow sand, fine to coarse, poorly sorted, 15% fine gravel. Distinct petroleum contamination, wet at 18.5 to 19.5 (2.5Y6/6) No returns	KRY627SB001	
	17				
	18				
	19		***GRAVEL with sand - GW*** Olive-brown, fine pebbly gravel, 30% coarse sand, loose, contamination noted (2.5Y6/6)	KRY627SB002	
	20				

DRILLING DATE: 5-12-06
DRILLING METHOD:
LOGGED BY: J. Ruth, D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 39
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE
Borehole ID: KRY627

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	FID/PID Reading
			No Returns		
	21		***GRAVEL with sand - GW*** (as above); contamination noted		
			No Returns		
	22				
	23				
	24		***GRAVEL with sand - GW*** (as above)		
	25		No returns. Driller reports sand near bottom of drive		
	26				
	27				
	28				
	29		***SAND - SP*** Fine to medium- grained, moderately to well-sorted, light olive-brown (2.5Y5/4)		
	30				
	31		***GRAVEL with sand - GW*** coarse grave with sand		
	32		***SAND - SP*** Olive-brown, medium to coarse-grained, moderately sorted, unconsolidated		
			No returns		
	33				
	34		***SAND - SP*** Fine-grained, well-sorted, light olive-brown; becoming slightly clayey from 35.5 to 36. (2.5Y5/4)		
	35				
	36		***No returns***		
	37				
	38				
	39		End of Log		
	40				

DRILLING DATE: 5-12-06
DRILLING METHOD:
LOGGED BY: J. Ruth, D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 39
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY628

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
	1		***No Returns***		Ambient: PID=0.05 FID=0.05
	2				
	3				
	4		***No Returns*** Cobble in core shoe - no recovery.		
	5				
	6		***Clay - CL*** Sandy clay, light olive-brown (2.5Y5/3), mottled throughout with very dark gray (10YR3/1) material - posiibly organics, sands are fine-grianed, sub-angular to sub-rounded and arkosic. Medium plasticity, damp with slight FeO-staining around sand grains.		5.9/8.4
	7			KRY628SB001	
	8				
	9		***Sand with Gravel - SW*** Light yellowish-brown (2.5Y6/3), 20% gravels-sub-rounded to rounded, medium to coarse gravels.	KRY628SB002	
	10				
	11		***Sand with Gravel - SW*** As above, trace cobbles, water encountered at 13.5'.		
	12				
	13				
	14		***Sand - SP*** Sub-rounded to sub-angular, olive-brown (2.5Y4/3),fine to medium-grained sands, few mafics, distinct chemical odor, wet, loose.		8/9300
	15			KRY628SB003	
	16		***Sand - SP*** Sands, as above, but with greater percentage of coarse sands, color difiicult to distinguish due to significant staining from floating chemical product, wet, loose.		
	17				66/280
	18				
	19		***Sand - SP*** Sands, as above, becoming coarser with depth to GW; medium to coarse sand, sub-angular, gravels are sub-angular, wet, and loose. Distinct chemical odor.		60/1030
	20				
	21		End of Log		
	22				
	23				
	24				
	25				

DRILLING DATE: 5-12-06
DRILLING METHOD:
LOGGED BY: J. Allewalt; D. Donohue
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY629

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Surface fill - Gravel and sand*** Loose, dry.		Ambient: PID=0.08 FID=6.4
	1		***No Returns***		
	2				
	3				
	4		***Gravel with Sand - GP*** Varied colors in sand grains and gravels, up to 2" gravel size, very loose, dry, some fine sands.		
	5		***No returns***		
	6		***Sand with Gravel - SW*** Sand is fine to medium-grained, gravel up to 2", loose, dry, light yellowish-brown (2.5Y6/6)		
	7		***No returns***		
	8				
	9		***Sand with Gravel - SW*** As above, fine to medium-grained sand, light yellowish-brown.		
	10		***No Returns***		25.3/10.01
			Sand with Gravel - SW As above.		
	11		***No returns***		
	12				
	13				
	14				46.8/8.6
	15		***Sand with Gravel - SW*** MEdium-grained sand, light yellowish-brown (2.5Y6/6), gravel is pebble-sized and varied in colors, some well-rounded to sub-angular, loose, damp.	KRY629SB001	
	16		***No Returns***		44.9/9.5
	17		***Gravel with Sand - GP*** Pebble-gravel, well-rounded to sub-rounded, little to no fines, varied colors in gravels, loose, wet. No odor detected.		
	18		***Gravel with Sand - GP*** As above, with very few fines.		41/18.1
	19		End of Log		
	20				

DRILLING DATE: 5-10-06
DRILLING METHOD:
LOGGED BY: J. Allewalt; D. Donohue
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 18.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY630

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Surface fill - Gravel and sand*** Loose, dry.	No Samples	Ambient: PID=0.07 FID=3.45
	1		***No Returns***		
	2				
	3				
	4		***Sand with Gravel - SW*** Light olive-yellow (2.5Y5/4), pebble gravel up to 1.5", loose, dr, sands are fine to medium-grained.		
	5		***No returns***		
	6		***Sand with Gravel - SW*** As above.		
	7		***No returns***		
	8				
	9		***Sand with Gravel - SW*** Sand with gravel and trace cobbles, light olive-brown (2.5Y5/4), sands are fine to coarse-grained, dry, loose, grains are sub-rounded.		
	10		***No Returns***		
	11		***Sand with Gravel - SW*** As above.		
	12		***No returns***		
	13				
	14		***No recovery***		
	15		***Sand with Gravel - SW*** As above.		46/19
	16		***No recovery***		
	17				
	18				
	19		***Sand with Gravel - SW*** Coarse to very coarse-grained - increasing coarseness with depth, few fines, wet, loose, sub-rounded. light olive-brown (2.5Y5/4)		18/10.7
	20		***No Returns***		
	21		End of Log		
	22				
	23				
	24				
	25				

DRILLING DATE: 5-10-06
DRILLING METHOD:
LOGGED BY: J. Allewalt; D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY631

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Surface fill - Gravel and sand*** Loose, dry.		Ambient: PID=0.04 FID=10.8
	1		***No Returns***		
	2				
	3				
	4		***Gravel with Sand - GW*** 80% rounded to sub-rounded pebble gravels, colors vary but mostly light olive-gray (2.5Y5/2) sand is medium-grained, sl, clayey.		
	5		***Sand - SM*** Medium to fine-grained, light olive-brown, sl, clayey, 10% pebble gravel, sub-rounded, varied colors, sl. dense, damp.		
	6				
	7		***No returns***		
	8				
	9		***Sand with Gravel - SW*** sand with gravel, light light olive-brown, gravels up to 3", sub-angular to sub-rounded, varied colors, loose, dry.		
	10		***No Returns***		
	11		***Sand with Gravel - SW*** Sand with gravel, light yellowish-brown, medium to fine grained, 30% pebbles are angular to sub-angular, loose, sl. damp.		
	12				
	13		***No recovery*** As above.Drilling to 15 feet could not get recovery through this interval, not in water yet, drill to 19' to drive for sample.		
	14				
	15				
	16				
	17				
	18				
	19		***Sand with Gravel - SW*** Coarse-grained sand with pebble gravel, olive-brown, very loose, wet, 20% medium sand.	KRY631SB001	10/382
	20				
	21		End of Log		
	22				
	23				
	24				
	25				

DRILLING DATE: 5-10-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana
(406)442-5588

Kalispell Pole, Reliance Refinery, And Yale Oil Facilities

Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY632

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Sand with Gravel - SP*** Olive-brown (2.5Y4/3), fine to medium-grained, predominantly fine-grained, 25% fine to coarse gravel. 4-5.5' - Gravelly sand as above - increasing gravel content	KRY632SB001	Ambient: PID=0.07 FID=12
	6		***No Returns***		
	8		***Gravel with Sand - GW*** Light yellowish-brown (2.5Y6/3), fine to coarse-grained, abundant cobbles to 5 inches, 35% fine sand, dry.		
	10		***No returns***		1/20
	15		***Gravel with Sand - GW*** Sandy gravels, light yellowish-brown, fine to coarse gravels, 40% fine sand, strong odor.		3/37
	16		***No Returns*** Drills like GW		
	19		***Gravel with Sand - GW*** As above, visual oily contamination.	KRY632SB001	
	21		End of Log		

DRILLING DATE: 5-17-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County
Montana

LOG OF BOREHOLE

Borehole ID: KRY633

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Gravel with Sand - GW*** Sandy gravels, olive-brown (2.5Y4/3), fine to coarse gravels and cobbles, 30-40% fine sand, sl. moist.	KRY633SS001	Ambient: PID=0.05 FID=8
	1				
	2				
	3				
	4				5/41
	5			KRY633SB001	
	6		***No Returns***		
	7				
	8		***Gravel with Sand - GW*** Sandy gravels as above, moderate odor.		4/45
	9			KRY633SB002	
	10		***No returns***		
	11				
	12				
	13				
	14				
	15		***Gravel with Sand - GW*** Gravels and cobbles, fine to coarse gravels, 15% sand, strong odor, visual contamination, wet.		
	16			KRY633SB003	
	17				
	18		***No Returns*** Drills like gravels and cobbles.		
	19				
	20		End of Log		

DRILLING DATE: 5-17-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 19.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY634

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Gravel with Silt - GM*** Poor recovery, gravelly silt, very dark grayish-brown (2.5Y3/2), sl. damp, some fine sand (5%), fine to medium-grained, sub-angular gravel, loose, non-plastic.	KRY634SS001	Ambient: PID=0.25 FID=0.5
	1		***No Returns***		6/5
	2				
	3				
	4		***Gravel with Silt - GM*** Gravelly silt as above but with more clay.	KRY634SB001	4/6
	5		***Silt - ML*** Weathered and oxidized, yellow (2.5Y7/6) and light bluish-gray (Gley2 7/6), sl. damp.		
	6		***Silty Gravel with Clay - CL/GC*** Gravelly silt and clay, olive-brown (2.5Y4/3), sl. plastic, gravels are fine to coarse, rounded, damp.		8/7
	7				
	8		***Sand with Gravel - SW*** Light olive-brown (2.5Y5/3), sands are fine to medium, gravels are fine to coarse, angular, damp, loose.	KRY634SB002	7/8
	9				
	10		***Sand with Gravel - SW*** As above. Very poor recovery.		
	11		***No recovery***		8/13
	12				
	13				
	14		***Sand with Gravel - SW*** Gravelly sand, light olive-brown (2.5Y5/3), fine to coarse gravel, sub-angular to sub-rounded, sand is fine to medium-grained, loose, wet at bottom.		19/47
	15				
	16		***Gravel with Sand - GW*** Sandy gravel, brown (2.5Y4/3), wet, coarse gravel, angular to rounded, distinct chemical odor and sheen, few fines.	KRY634SB003	
	17		***Gravel with Sand - GW*** As above, contamination observed in this interval as well		16/46
	18				
	19		End of Log		
	20				

DRILLING DATE: 5-18-06
DRILLING METHOD:
LOGGED BY: J. Allewalt, R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 18.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY635

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			Surface		
	1		***Clayey Sand - SC*** Sand, clayey, silty, brown to dark yellowish-brown (10YR4/2), damp.		
	2		***No returns***		
	3				
	4		***Sand - SP*** Sand, medium-grained, well-sorted, yellowish-brown, damp. loose, gravels up to 3" at beginning of drive.	KRY635SB001	
	5				
	6		***No Returns***		
	7		***Gravel with Sand - GW*** Gravels, sand, light brown (10YR6/2), sand is med-fine-grained, very loose, very dry, pebbles up to 1.5"		
	8		***No Returns***		
	9		***Gravel with Sand - GW*** Gravel, sand, light yellowish-brown, rounded gravels up to 3" in diameter, very loose, very dry (10YR6/2).	KRY635SB002	
	10				
	11		***No Returns***		
	12		***Gravel with Sand and Silt - GM*** Gravels, sandy, silty, loose, dry.		
	13		***No Returns***		
	14				
	15		***Sand - SW*** Sand, light yellowish-brown, moderately well-sorted, 20% pebbles, loose, wet (10YR5/4).		
	16		***No Returns***		
	17				
	18				
	19		***Sand - SW*** Sand as above, loose, wet, very few fines.		
	20		End of Log		
	21				
	22				
	23				
	24				
	25				

DRILLING DATE: 5-8-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY636

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No returns		Ambient: PID=0.40 FID=5.0
	1				
	2				
	3				
	4		***Sand with Gravel - SW*** Sand with gravel, light olive-brown, medium-grained, with oxidized pebbles (5%), pebbles are sub-angular, loose, damp.		
	5		***No returns***		
	6		***Gravel - GP*** Gravel with sand, varied colors, but mostly light olive-brown, mod. dense, dry.		
	7		***No Returns***		
	8				
	9		***Sand with Gravel - SW*** Sand with gravels, sand is med. to coarse-grained, lt. olive-brown, loose, damp, gravels are varied in color, sub-angular (20%), loose, damp, no odor.		2.6/10.6
	10		***No Returns***		
	11		***Gravel - GP*** Gravel, angular with sand, dry, poor returns, loose.		
	12		***No Returns***		
	13				
	14		***Sand with Gravel - SW*** difiiculty getting gravels to stay in sampler, 2 drives unsuccessful, 3rd drive yields 0.8 ft. gravel and sand, medium-grained, yellowish-brown, soft, wet, contamination present.		14.5/280
	15		End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 5-9-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY637

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Sand with Silt and Gravel - SM*** Sand/Silt, dark brown with some pebble gravel, soft, damp (surface) (10YR2/2)		Ambient: PID=0.05 FID=6.0
	1		***Sand with clay - SC*** Sand, fine-grained, lt. yellowish-brown, sl. clayey, soft, damp (10YR2/4).		
	2		***No returns***		
	3				
	4		***Sand with clay - SC*** Clayey sand as above.		
	5		***Sand with Silt and Clay - SC*** Sand, silty, gravelly.		
	6		***No Returns***		
	7		***Sand - SW*** Sand, olive-yellow, sl. clayey, med.-grained, 30% rounded gravels, soft, moist (5Y6/6)		
	8		***No returns***		
	9		***Sand with Gravel - SW*** Sand w/gravel, sand is lt. yellowish-brown, med.-grained, 20% pebbles, sub-angular, sub-rounded, loose, dry.		
	10		***No returns***		
	11		***Sand with Gravel - SW*** Sand with gravel (as above).		
	12		***No Returns***		
	13				
	14		***Gravel with Sand - GW*** Gravel with sand, 80% angular to sub-angular gravels, petro substance		50/100
	15		***Gravel with Sand - GW*** (second drive) Gravel with sand, gravels are angular, sand is coarse, no fines, loose, wet, contaminated,		
	16		End of Log		
	17				
	18				
	19				
	20				

DRILLING DATE: 5-9-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY638

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No Returns	No Samples	Ambient: PID=0.17 FID=4.8
	3		***Gravel with Sand - GW*** Sandy gravel, brown (10YR3/2), sl. moist, loose, trace cobbles, angular to sub-rounded coarse gravels.		
	5		***Sand with Gravel - SW*** Sand with gravel, yellowish-brown, 20% pebbles, rounded to sub-rounded, loose, damp, some reddish larger gravels(10YR3/2).		
			No returns		
	9		***Sand with Gravel - SW*** Sand, coarse, with gravel up to 1.5", rounded to sub-rounded, few medium sands, very loose, damp, light yellowish-brown (10YR3/2).		
	10		***Sand wiht Gravel - SW*** As above.		18.5/10.5
			No Returns		
	14		***Sand with Gravel - SW*** As above		13/17
	15		End of Log		

DRILLING DATE: 5-8-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY639

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No Returns		Ambient: PID=0.11 FID=3.12
	3		***Gravel with Sand - GW*** Sand with gravel, dark brown, some oxidation, loose, damp.		
			No Returns		
	5		***Gravel and Sand - GW*** Gravel, sandy, silty, brown with reddish angular gravel (gravels are dark red).		
			No returns		
	9		***Gravel and Sand - GW-*** Gravel, silty with fine sand, lt. grayish-brown, angular to sub-angular frags, some reddish frags, loose, dry.		
	10		***No Returns***		
	11		***Gravel, Sand and Silt - GW*** As above.		
			No Returns		
	14		***Sand - SP*** Medium to coarse-grained, dark yellowish-brown (10YR4/2), moderately well-sorted, loose, damp.	KRY639SB001	27.8/7.2
	15		End of Log		

DRILLING DATE: 5-8-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY640

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
	1		***No Returns*** Drilling like gravel.		
	2				
	3				
	4		***Sand with Silt and Clay - SC*** Sand, silty, brown, sl. clayey, wet (surface).		
	5		***No Returns***		
	6		***Sand with Silt and Clay - SC*** Light yellowish-brown, some fine sand, soft, damp, grading to gravel last 0.2 ft. (10YR5/3).		
	7				
	8		***Gravel with Sand - GW*** Gravel, sande, gravels are rounded to sub-rounded, loose, damp. (10YR5/2)	KRY640SB001	
	9				
	10		***No Returns***		
	11		***Gravel with Sand - GW*** As above, gravels up to 3", rounded.		
	12				
	13		***No returns***		
	14		***Gravel with Sand - GW*** Gravels, sandy, little to no fines, very loose, wet, angular to sub-angular gravels.		
	15		End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 5-8-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY647

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Gravels and Cobbles - GW*** Gravels and cobbles, very silty, gray, light brown, trace fine-grained sand, sl. moist.	No Samples	5/0
	1		***No Recovery***		
	2				
	3				
	4				
	5		***Silt with Gravel - ML*** Gravelly silt, light brown, fine to coarse gravel, dry to sl. moist, poor recovery. cobbles throughout.		4/0
	6		***No Recovery***		
	7				
	8				
	9				
	10		***Gravel with Sand and Silt - GW*** Silty gravels, fine to coarse, cobbly, clayey in part, sl. moist.		3/0
	11		***No Returns***		
	12				
	13				
	14				
	15		End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 5-2-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY650

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt with Gravel - ML*** Gravelly silt, 45% fine to coarse gravel, light brown silt, poor recovery (2.5Y4/2)	No Samples	2/0
	1		***No Recovery***		
	2				
	3				
	4				
	5		***Gravel with Silt - GM*** Silty, sandy gravel, fine grained to coarse gravel, , light brown, 20% silt, 20% fine to coarse sand, poorly sorted, sl. petro odor, sl. moist, poor recovery, trace iron oxide mottling.		5/0
	6				
	7		***No Recovery***		
	8				
	9				
	10		***Sand with Gravel - SW*** Gravelly sand, brown (2.5Y5/4), 30% fine to coarse-grained, poorly sorted, gravel is sub-rounded, sl. moist, sl. odor.		3/0
	11				
	12		***Sand with Gravel - SW*** As above. Less gravel, 10% gravel, fine to med. grained, silty sand, predominantly fine-grained, moderately well-sorted, moist.		
	13		***Sand with Gravel - SW*** gravelly sand, brown, fine to coarse-grained, silty, 15-20% gravel, fine to coarse gravel, rounded, sl. moist, sl. odor.		1/0
	14				
	15		***Sand with Gravel - SW*** As above, sl. odor, slightly moist, wet at 17.5 feet (2.5Y5/4).		0/0
	16		***Sand with Gravel - SW*** Gravelly sand, brown, fine to coarse-grained, 30% gravel, fine to coarse, sl. odor, wet. (2.5Y5/4)		0/0
	17				
	18		***Sand with Gravel - SW*** As above.		0/0
	19		End of Log		
	20				

DRILLING DATE: 5-2-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 19
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY651

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt with Gravel - ML*** Silt and gravel, light brown, no odors or staining. (5YR6/3).		34/17
	1		***No Recovery***		
	2				
	3				
	4		***Silt and Sand with Gravel - ML/SW*** Light brown silt snad and gravel.		60/21
	5				
	6		***No Recovery***		
	7				
	8				
	9		***Silt and Sand with Gravel - ML/SW*** Brown silt, sand, and gravel, no odors, no staining (5YR6/4).		39/13
	10				
	11		***No recovery*** Spoon at 16 feet had no recovery.		
	12				
	13				
	14				
	15				
	16				
	17		***Sand with Gravel - SW/GW*** Brown gravelly sand to sandy gravel, petroleum odor.		
	18			KRY651SB001	
	19				
	20				

DRILLING DATE: 5-18-06
DRILLING METHOD:
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY652

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt with Gravel - ML*** Brown gravelly, sandy silt to gravelly, silty snad. Dry, no odors.		
	1		***No Recovery***	No Samples	
	2				
	3				
	4		***Silt and Sand with Gravel - ML*** Brown sandy silt to silty sand with trace fine gravel, no odors or staining.		
	5				
	6		***Silt and Sand with Gravel - ML*** Brown fine sandy silt, damp.		
	7				
	8		***Sand with Gravel - SW*** Gravelly sand with silt, brown, gravel is fine to medium-grained.		
	9				
	10		***Sand with Gravel - SW*** Gravelly sand to sandy gravel, brown, some moderate amount of silt.		
	11				
	12				
	13				
	14		***No Recovery***		
	15				
	16		***Sand with Gravel - SW*** As above. Less silt, no odor.		
	17				
	18				
	19		End of Log		
	20				

DRILLING DATE: 5-18-06
DRILLING METHOD:
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY653

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
	1		***No Returns*** Drilling is difficult fro 0 to 4 ft.	No Samples	Ambient: PID=22.3 FID=-3.1
	2				
	3				
	4		***Sand with Gravel - SW*** Sand, gravelly, rounded to sub-rounded pebbles, up to 1.5", loose, damp, dark yellowish-brown (10YR5/3)		
	5		***Sand with Gravel - SW*** Sand, coarse, with gravel, pebbles up to 1", sub-angular, loose, 30% fine sand and silts, dry, light olive-brown.		
	6		***No Returns***		
	7				
	8				
	9		***Sand with Gravel - SW*** Sand with gravels, sub-rounded gravels, sand is med- to fine-grained, light olive-brown (2.5Y5/4), some pebbles, sub-angular. loose, sl. damp.		0.6/-2.3
	10		***Sand with Gravel - SW*** Sand, light olive-brown with pebble gravel, sub-angular, up to 0.5". loose, damp, (2.5Y5/4), occasional larger rounded gravels.		0/-1.7
	11		***No Recovery***		
	12				
	13				
	14		***Sand - SP*** As above. Less silt, no odor.Coarse-grained, with 10% rounded to sub-rounded gravels, very few fines, loose, wet.		
	15		***No Recovery*** End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 5-9-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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(406)442-5588

Kalispell Pole, Reliance Refinery, And Yale Oil Facilities

Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY654

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Surface gravel*** with fine sand and silt, poor returns.	No Samples	Ambient: PID=0.15 FID=-0.13
	1		***No Returns*** Rock at 4.0 feet, hard driving.		
	2				
	3				
	4		***Sand with Gravel - SW*** Sand with gravel, sand is medium to fine-grained. light yellowish-gray, loose, dry.		
	5		***Gravel with Sand - GW*** Gravel with sand, light brown, loose, dry, poor returns.		
	6		***No Returns***		
	7				
	8				
	9				
	10		***Gravel with Sand - GW*** As above.		29.5/7.5
	11		***No Recovery***		
	12				
	13				
	14		***Sand - SP*** Sand, coarse-grained, pebbels up to 0.5", moderately well-sorted, very loose, wet.		30.1/-7.0
	15		***No Recovery*** End of Log		
	16				
	17				
	18				
	19				
	20				

DRILLING DATE: 5-8-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 15
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY655

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		Ambient: PID=0.36 FID=-3.98
	1		***Clayey Silt - ML*** Clayey silt, dark grayish-brown (2.5Y4/2), some coarse-grained gravel (rounded), sl. plastic, sl. damp, loose, very fine silt and clay.		
	2		***No Returns***		982/15.3
	3				
	4		***Sand with Gravel - SW*** Gravelly sand, (2.5Y5/2), fine to med. sand, dry loose, gravels 20%, rounded.		256/14
	5		***Clay with Silt - CL*** Silty clay, (2.5Y4/2),plastic, damp.		726/21
	6		***CLay with Silt - CL*** Silty clay as above with greater amount of gravels dispersed throughout, damp, plastic, gravels are sub-rounded and coarse.		
	7				
	8		***Sand with Gravel - SW*** Gravelly sand, light olive brown (2.5Y5/3), fine to coarse-grained, fine gravels, sub-rounded to sub-angular, sl. damp, loose.		52.7/18.3
	9				
	10		***Sand with Gravel - SW*** As above, poor recovery.		
	11		***No Recovery***		25/15
	12				
	13				
	14		***Sand with Gravel - SW*** Gravelly sand, light olive-brown (2.5Y5/3), mostly med. to coarse-grained, some fine sand, gravels are fine and sub-rounded, wet, loose.		17.9/95.2
	15				
	16		***Sand with Gravel - SW*** Gravelly sand as above, definite chemical odor noted.	KRY655SB001	15.3/113
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-15-06
DRILLING METHOD:
LOGGED BY: J. Allewalt, R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY656

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Clayey Silt - ML*** Light brown, dry silt with sand and gravel (5YR5/2)	KRY656SS001	57.3/26
	1		***CLay with Silt - CL*** Dark brown to black clay with silt and minor gravel, changing to brown silt and gravel with some sand, minor recovery based on material up flights (2.5YR4/3)		
	2				
	3				22.5/28.1
	4		***Sand with Gravel - SW*** Grayish-brown, fine to coarse sand and fine to medium gravel, trace silt.	KRY656SB001	23.3/24.5
	5				
	6		***Sand with Gravel - SW*** Brown, fine to medium silty sand and gravel.		8.7/30.2
	7				
	8		***Sand with Gravel - SW*** Gray to brown medium to coarse sand and gravel, abundant fine to coarse gravel and cobbles.	KRY656SB002	8.66/30.2
	9				
	10		***Silt and Sand - ML*** Light brown, dry, silt with some sand and abundant gravel. Minor recovery.		11/24
	11		***No Recovery***		
	12				
	13				
	14		***No Recovery***		
	15				22.9/175
	16		***Sand with Gravel - SW*** Brown, medium to coarse sand and gravel, some silt, strong odor.	KRY656SB003	
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-15-06
DRILLING METHOD:
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY657

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Clayey Silt - ML*** Light brown, dry silt with sand and gravel.	KRY657SS001	7.1/26.1
	1		***Silt and Sand with Clay - ML*** Dark brown silt with some clay and fine to coarse gravel (2.5Y4/1).		
	2		***Silt and Sandl - ML*** Grayish-brown, fine to coarse sand and fine to medium gravel, trace silt.		
	3				
	4		***Sand with Gravel - SW*** Brown fine to coarse sand and gravel, some silt (2.5YR5/3)	KRY657SB001	6.72/26.5
	5				
	6		***Sand with Silt - ML/SW*** Brown silty sand to sandy silt with abundant gravel and some silt, light petro odor (2.5YR5/3)		5.3/21.5
	7				
	8		***No Recovery***		
	9				3.2/31
	10		***Sand with Silt - ML*** Brown gravelly silt with some sand.	KRY657SB002	
	11		***No Recovery*** Auger grinding on gravel with cobbles, about 13' drilling becomes easier, 0.2' recovery is brown sand and gravel.		
	12				
	13				
	14		***No Recovery***		
	15				8.9/82
	16		***Gravel with Sand - GP*** Brwon sandy gravel with petroleum odor, brown sheen.		
	17			KRY657SB003	
	18				
	19		End of Log		
	20				

DRILLING DATE: 5-15-06
DRILLING METHOD:
LOGGED BY: R. Laskowski
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 18.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY658

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Gravel with Sand - GW*** Sandy gravel, light brownish-gray (2.5YR6/2), fine to coarse gravel, 35% fine sand, dry.	KRY658SS001	3.4/38.4
	1		***No Returns***		
	2				
	3				
	4		***Gravel with Sand - GW*** Sandy gravel as above, dry to moist.		2/29.2
	5		***No Returns***	KRY658SB001	
			Gravel with Sand - GW Sandy gravel, dark grayish-brownm fine to coarse-grained, 30% fine sand, trace clay, trace woody debris, moist.		3.04/31.1
	6				
	7		***No Recovery***		
	8		***Sand - SP*** Gravelly sand, dark grayish-brown (2.5YR4/2), fine to medium sand, fine to large gravel (15%), trace clay very damp.	KRY658SB002	2.5/30
	9		***No Recovery***		
	10		***Sand with Gravel - SP*** Gravelly sand as above, trace clayey, strong odor at 11.5'.		
	11				
	12		***No Returns***		9.1/91
	13				
	14		***Sand and Gravel - SP*** Gravelly sand, very dark grayish-brown (2.5YR3/2), medium to coarse sand, poorly sorted, 25% fine to coarse gravels, wet, contaminated, free product.	KRY658SB003	13/138
	15				
	16		***Sand and Gravel - SP*** Gravelly sand as above, wet, visual free product, strong odor.	KRY658SB004	
	17		End of Log		22/211
	18				
	19				
	20				

DRILLING DATE: 5-16-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY659

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt with Gravel - ML*** Gravelly silt, olive-brown (2.5YR4/3), 10% fine gravel, dry.	KRY659SS001	0.43/12.5
	1		***No Returns***		
	2				
	3				
	4		***Gravel with Sand - GW*** Olive-brown, fine to coarse, 40% sil, dry.	KRY659SB001	.075/17.5
	5				
	6		***Gravel with Sand - GW*** Silty Gravel as above.		
	7		***No Returns***		
	8		***Gravel with Sand - GW*** Sandy gravel, red, gree, olive-brown, fine to coarse gravel, 30% fine to medium, 10% silt, dry, becoming moist at 9.0'.	KRY659SB002	2.2/28.6
	9				
	10		***Gravel with Sand - GW*** Sandy gravel as above, moist, very slight petro odor.		
	11		***No Recovery***		
	12				
	13				
	14		***Gravel with Sand - GW*** Sandy gravel as above, red, green, olive-brown, 30% fine sand, moderate petroleum odor, wet at 15.5'.		8.7/85
	15				
	16		***Sand with Gravel - GP*** Gravelly sand, olive-brown (2.5YR4/3), fine to medium-grained, moderately sorted, 35% fine gravel, trace silty, wet	KRY659SB003	11.6/103
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-16-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY660

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Sand with Gravel - SW*** (fill), loose, stained, no odor, dry.	KRY660SS001	Ambient: PID=0.0 FID=3.7
	1		***No Returns***		
	2				
	3				
	4		***Gravel with Sand - GW*** Varied colors, dry, loose, rounded to sub-rounded pebbles to cobble-sized.	KRY660SB001	
	5				
	6		***Gravel with Sand - GW*** Silty Gravel as above, well-rounded coming up augers, difficult drilling.		
	7		***No Returns***		
	8		***Gravel with Sand - GP*** As above, sand is medium-grained (<50%), loose, gray (2.5Y5/4), dry.	KRY660SB002	
	9		***No Returns***		
	10		***Gravel and Sand - GP*** Dry, loose.		
	11		***No Returns***		
	12				
	13				
	14				
	15		***Sand with Gravel - GP*** Gravel with coarse sand, strong odor, light gray, some clay, wet.		170/44
	16		***No Returns***		
	17				
	18				
	19		***Sand with Gravel - SW*** Sand with 20% gravel, strong odor, sand is coarse, up to 2" gravel, loose, wet.		176/18.5
	20				
	21		End of Log		
	22				
	23				
	24				
	25				

DRILLING DATE: 5-22-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY662

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Sand - SP*** Gravelly sand, light to dark olive-brown (2.5Y5/4), very fine to fine-grained, 20% gravel fine to coarse, trace silt, trace wood frags, dry.	KRY662SS001	7/15
	1		***No Returns***		
	2				
	3				
	4		***Sand and Gravel - SP*** As above, 25% gravel, moist.	KRY662SB001	9/18
	5				
	6		***Gravel with Sand - GW*** Sandy gravel, dark grayish-brown (2.5Y4/2), fine to coarse gravels, 35% fine sand, sl. moist.		2/15
	7		***No Returns***		
	8		***Gravel with Sand - GW*** Sandy gravel, dark grayish-brown, red, light green, medium to coarse gravel, 40% fine sand, trace silt, dry.	KRY662SB002	12/36
	9				
	10		***Gravel with Sand - GW*** Sandy gravel as above, poor returns.		
	11		***No Returns***		3/19
	12				
	13				
	14		***Gravel with Sand - GW*** Sandy gravel as above, coarse gravels, 35% very fine to fine sand, moist to very moist, sl. odor.		6/80
	15				
	16		***No Recovery***		14/127
	17		***Sand and Gravel - SP*** Gravelly sand, dark olive-brown (2.5Y3/3), medium to coarse-grained, moderately sorted, loose, 25% fine gravel, strong odor, visual contamination, wet.	KRY662SB003	18/158
	18				
	19		End of Log		
	20				

DRILLING DATE: 5-16-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 18.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY663

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Gravel with Sand - GW*** Sandy gravels and cobbles, fine to coarse gravel, cobbles to 8-inches, 40% fine sand and silt, very dark grayish-brown (2.5Y3/2).	KRY663SS001	Ambient: PID=0.5 FID=1.6
	1				
	2				
	3				
	4		***Gravel with Sand - GW*** Sandy gravels as above, very poor returns, insufficient for sample.		
	5		***No Returns***		
	6		***Gravel with Sand - GW*** Sandy gravels and cobbles as above.	KRY663SB001	
	7		***No Returns***		
			Gravel with Sand - GW Sandy gravels as above.		
	8		***Gravel with Sand - GW*** Sandy gravels and cobbles as above, very dark grayish-brown (2.5Y3/2), fine to coarse gravels, 75% fine sand, moist.	KRY663SB002	
	9				
	10				
	11				
	12				
	13		***No Returns***		
	14				
	15				
	16		***Sand and Gravel -SP*** Light olive-brown (2.5Y5/4), fine to medium-grained, trace coarse grained, moderately sorted, 10% silt, 20% fine to coarse gravel, dry, wet at 16.5', moderate to strong odor.	KRY663SB003	20/10
	17		End of Log		
	18				
	19				
	20				

DRILLING DATE: 5-17-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 17
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL): 4000
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY664

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			Silty Gravel - GM Light, olive brown, silty, gravels. 2.5YR5/4. 30% silt, 10% fine sand.	KRY664SS001	3/25
	1		***No Recovery***		
	2				
	3				
	4		***Silty Sand - SM*** Light, olive brown, silty, sand. 35% silty, very fine to fine sand. Trace clay, very moist.	KRY664SB001	4/39
	5				
	6		***Silty Sand - SM*** As above.		6/58
	7		***No Recovery***		
	8		***Sandy Gravel - GW*** Red/green/grey fine to coarse sand gravel. 30% sand, 10% silt.	KRY664SB002	4/30
	9				6/40
	10		***Sandy Gravel - GW*** As above.		
	11		***No Recovery***		
	12				
	13				
	14		***Gravelly Sand - SP*** Light, olive brown, fine to medium grained gravelly sand. 2.5YR 5/4. Damp, slight odor. 15% large gravel.		6/48
	15				
	16		***Gravelly Sand - SP*** As above. Slight odor. Wet at 17 feet.		
	17		***Gravelly Sand - SP*** As above. Fine to medium grained. 20% fine to coarse gravel. Wet. Slight odor.	KRY664SB003	15/85
	18				
	19		End of Log		
	20				

DRILLING DATE: 5-16-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 18.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY665

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Sandy Gravel - GW*** Light, olive brown, sandy gravel. 2.5YR 4/3. 35% sand, fine grained. 10% silt, dry to moist.	KRY665SS001	1/13
	1				
	2		***No Recovery***		
	3				
	4		***Gravelly Sand - SP*** Light, olive brown, gravelly sand. Very fine to fine grained. 25% fine to coarse gravel. 10% silt, very moist.	KRY665SB001	17/22
	5				
	6		***Silty Sand - SM*** Light, olive brown, very fine grained silty sand. 30% silt, trace clay, very moist.		
	7		***No Recovery***		22/22
	8		***Silty Sand - SM*** Red/green/rust orange, very fine grained gravelly, silty sand. 30% silt, 20% gravel, dry.	KRY665SB002	11/26
	9				
	10		***Silty Sandy - SM*** As above.		1/18
	11		***No Recovery***		
	12				
	13				
	14				
	15				
	16		***Gravelly Sand - SP*** Light, olive brown, gravelly, sand. Dry.		17/100
	17		***No Recovery***		
	18				
	19		***Sand - SP*** Olive brown, fine to medium grained sand. Trace fine gravel. Strong odor, wet.	KRY665SB003	10/150
	20				
	21		End of Log		

DRILLING DATE: 5-16-06
DRILLING METHOD:
LOGGED BY: J. Ruth
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 20.5
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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LOG OF BOREHOLE

Borehole ID: KRY666

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0–1		***Gravel - GP*** Gravel Fill	KRY666SS001	
	2–3		***No Recovery***		
	4–5		***Sand - SP*** Light, brownish gray, poorly graded, fine grained sand. Loose, damp.	KRY666SB001	0.86/-16
	5–8		***No Recovery***		
	9–10		***Sandy Gravel - GW*** Light, yellowish brown, sandy, gravel. Sand is medium to coarse grained. Gravels are sub- angular to sub-rounded. Loose, damp.	KRY666SB002	0.80/-15
	11–12		***No Recovery***		
	13–14		***Gravel - GW*** Gravel as above.		1.32/-13
	15–16		***No Recovery***		
	17–19		***Sandy Gravel - GW*** Sandy gravel. Loose, wet.		2.5/-11
	20–21		***Sand - SW*** Light, yellowish brown, sand with gravels(10%). Gravels are sub-rounded pebbles, loose, wet.		24/86
	22–23		***No Recovery***		
	24–25		End of Log		

DRILLING DATE: 4-27-06
DRILLING METHOD:
LOGGED BY: D. Shaffer
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 25.0
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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Kalispell Pole, Reliance Refinery, And Yale Oil Facilities

Flathead County
Montana

LOG OF BOREHOLE

Borehole ID: KRY667

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0–1		***Gravelly Sand - SW*** Light, olive brown gravelly, sand. Fine to coarse sand. Fine to medium grained rounded gravels. Dry, loose.		
	2–3		***No Recovery***		
	4–5		***Gravelly Sand - SW*** Gravelly sand as above, with more coarse gravel. Some cobbles.		
	6–8		***No Recovery***		
	9–11		***Gravelly Sand - SW*** Gravelly sand as above.	KRY667SB001	
	12–15		***No Recovery***		
	16–18		***Sandy Gravel - GW*** Sandy gravel. Coarse sand and fine to coarse gravel. Sub-rounded and rounded. Distinct chemical odor and discoloration on grains	KRY667SB002	
	19–21		***Sandy Gravel - GW*** Dark gray, sandy, gravel. 2.5YR 4/1. Sands are medium to coarse grained. Wet. Distinct chemical odor.		
	22–23		***No Recovery***		
	24–25		***Sandy Gravel - GW*** As above.		
	26		***No Recovery*** End of Log		

DRILLING DATE: 6-01-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 25.0
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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Helena, Montana
(406)442-5588

Kalispell Pole, Reliance Refinery, And Yale Oil Facilities

Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY669

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0–1		***Gravelly Sand - SW*** Light, olive brown gravelly, sand. Fine to coarse sand. 2.5YR 5/3. Fine to coarse grained sand and fine gravels. Trace cobbles, dry, loose.	No Samples	
	1–4		***No Recovery***		
	4–6		***Gravelly Sand - SW*** Gravelly sand as above, with greater % coarse gravels. Some cobbles.		
	6–9		***No Recovery***		
	9–10		***Gravelly Sand - SW*** Gravelly sand as above. Some cobbles.		
	10–14		***No Recovery***		
	14–15		***Sand - SP*** Olive brown, medium grained, sand. 2.5YR 4/3, damp. No odors or contaminant evidence.		
	15–17		***No Recovery***		
	17–19		***Sand - SP*** Medium to coarse grained sand. Olive brown, 2.5YR 4/4. Wet at 16.5 feet. Loose. No sign of contamination.		
	19–23		***Sand - SP*** Medium grained, well sorted sand as above. Wet.		
	23–24		***No Recovery***		
	24–25		***Sand - SP*** Sand as above.		
	25–26		End of Log		

DRILLING DATE: 6-01-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 25.0
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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Flathead County
Montana

LOG OF BOREHOLE

Borehole ID: KRY670

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0	0		Ground Surface		
			No Recovery		Ambient: PID=0.07 FID=3.5
	2		***Gravelly Sand - SW*** Light olive brown, gravelly sand. 2.5 YR 5/4. Fine to medium sand. 10-15% gravels. Slightly damp, loose.		
	4		***Gravelly Sand - SW*** Gravelly sand as above, with greater % coarse gravels.	KRY670SB001	
	6		***Gravelly Sand - SW*** As above.		
	8		***No Recovery***		
	9		***Sand - SP*** Dark gray to olive brown, fine sand. Well sorted, wet, loose. Water at 8.5 feet. Distinct petroleum odor.	KRY670SB002	82/219
	12		***Sand - SP*** Fine sand as above with petroleum odor.		94/233
	14		***Clay - CL*** Olive brown, silty, clay. 2.5YR 4/3. Slightly plastic.		
			End of Log		

DRILLING DATE: 6-01-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 14.00
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY671

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0–1		***Gravelly Sand - SW*** Black, gravelly, sand for 0.5 feet grading to light olive brown, gravelly, sand. 2.5YR 5/4. Fine to coarse gravel, rounded. Sand is fine to medium grained. Dry, loose.	No Samples	Ambient: PID=1.6 FID=3.2
	1–2		***No Recovery***		56/5
	4–5		***Gravelly Sand - SW*** Light, olive brown, gravelly, sand. 2.5YR 5/4. Gravel is fine to coarse, rounded and sub-rounded. Trace cobbles.		
	5–6		***No Recovery***		59/5
	9–10		***Gravelly Sand - SW*** Gravelly sand as above. No odors or visual evidence of contamination.		
	10–11		***No Recovery***		59/5
	16–17		***Sandy Gravel - GW*** Sandy gravel. Fine sand, fine to coarse, rounded gravels.		59/6
	17–18		***No Recovery***		
	24–25		***Sandy Gravel - GW*** Sandy gravel as above.		
	25–26		End of Log		

DRILLING DATE: 6-02-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 25.0
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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Flathead County Montana

LOG OF BOREHOLE

Borehole ID: KRY672

Elevation(+/- AMSL)	Depth(ft bgs)	Lithologic Symbol/ Recovery	Lithologic Description	Soil Sample ID	PID/FID Reading
0.0			Ground Surface		
	0		***Silt - OL*** Organic silts and soil. Slightly moist, loose. 2.5YR 3/2		
	1		***Gravelly Sand - SW*** Gravelly sands. Fine to coarse sand and fine to coarse gravel. Trace cobbles.		
	2				
	3				
	4				
	5			KRY672SB001	
	6				
	7		***No Recovery***		
	8		***Gravelly Sand - SW*** Gravelly sand as above.		
	9		***Sandy Gravel - GW*** Coarse gravels and medium to coarse sand. Dry, loose. Light, brownish gray.	KRY672SB002	
	10				
	11		***Gravelly Sand - SW*** Gravelly sand. 2.5YR 5/4. Fine to medium sand and fine to coarse gravel. Wet at 11.5 feet.		
	12		***Sandy Gravel - GW*** Sandy gravels with vaiable fine to coarse sand and fine to coarse gravel. 2.5YR 5/3 and 2.5YR 4/3.	KRY672SB003	
	13				
	14				
	15				
	16				
	17				
	18				
	19				
	20				
	21				
	22				
	23				
	24		End of Log		
	25				

DRILLING DATE: 6-02-06
DRILLING METHOD:
LOGGED BY: J. Allewalt
CLIENT: MDEQ
PROJECT NO.: S1176-37KPT004

BOREHOLE DEPTH (ft bgs): 24.0
BOREHOLE DIAMETER (in.): 7 7/8
GROUND SURFACE ELEVATION (ft AMSL):
DRILLING CO.: Cascade

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APPENDIX E

MONITORING WELL DEVELOPMENT LOGS AND SAMPLING DATA SHEETS

GROUNDWATER SAMPLING DATA SHEETS

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION ~~KRY/KPT1GW001~~ KPT-1

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL SA DD

SAMPLE ID KRYKPT1GW001

SAMPLE DATE 6-22-06

SAMPLE TIME 1750

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.41 riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION Screen 13 - 28 TDC 29

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient PID/FID: 0.17/-0.61 ppm Reading: 0.2/1.6 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1715	Start	pump	0.4L/min						pump @ 23' from riser
1720	0.4L/min	0.8	10.88	6.68	0.403	156	1.63	27.4	
1725	"	1.3	10.43	6.67	0.402	144	0.86	15.6	
1732	"	2.0	10.29	6.67	0.402	125	0.66	15.2	SWL @ 17.41
1735	"	2.8	10.18	6.67	0.402	114	0.63	14.8	
1738	"	3.1	10.14	6.66	0.402	110	0.64	15.4	
1742	"	3.3	10.13	6.66	0.403	108	0.64	14.9	17.41 SWL
1750	collect	sample							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C
Metals	250 ml	250 ml	HNO_3
Dioxin	1L	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

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WELL IDENTIFICATION KPT-2

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Roth Ls. Ninefeldt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 16.88

SAMPLE ID KRY/KPT2GW001

SAMPLE DATE 6/28/06
SAMPLE TIME 19:30

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID background .02/2.97 reading .02/3.01 well screen 13-28' sampled with peristaltic pump tubing set at 21' bTOC

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		5 gal							water is dark
									green tea color
									strong petro
									odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT3

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.24

SAMPLE ID KRYKPT3GW02

SAMPLE DATE 8-3-06

SAMPLE TIME 1100

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Method used was 1/2" poly inside 1" poly tubing to below WL. M. Bucy reports to product reading on WL meter.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
1100	Purged w/ peristaltic pump								
		Removed 5 L prior to sampling							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Dioxin	AMBER GL Jar	1-L (2)	none

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID — DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

19
20
22

WELL IDENTIFICATION KPT-3

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Ninefeldt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.97

WELL DEPTH (TD)(ft below MP/GS) 29 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION

SAMPLE ID KRYKPT3GW001

SAMPLE DATE 6/28/06
SAMPLE TIME 17:45

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID 0.05/4.70 Background 0.37/6.56 reading screen 13-28' sampled with peristaltic pump. Tubing set at 19' bgs

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		5	11.90	6.65	.410	186	1.51	918	Slight pale green color, sheen on water

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-4

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL Tolson/Puc

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.02

WELL DEPTH (TD)(ft below MP/GS) 29 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION

SAMPLE ID KRYKPT4 GW001

SAMPLE DATE 6/28/06
SAMPLE TIME 15:15

LOW-FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID 0.38/1.15 (background) 0.78/132
screen 13-28' tubing set at 21' b TOC

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		5	12.06	6.58	.503	267	1.74	918	light pale yellow color
									slight petro odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-5

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA

SAMPLE ID KRYKPT5GW001

SAMPLE DATE 6/23/06

SAMPLE TIME 1030

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 16.04 Rise

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION screen 13-28'

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID lamp not functioning, could not obtain PID/FID
no odor or sheen noted

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1005	start pump								pump @ 19'
1014	0.3L/min	0.5 gal	9.74	6.57	0.425	180	3.16	31.6	(hit what felt like sediment
1017	"	1.0 gal	9.69	6.58	0.425	164	2.70	28.6	@ 20.5-21'...)
1021	"	1.4 gal	9.65	6.58	0.424	155	2.79	25.6	SWL @ 16.04
1025	"	1.8 gal	9.69	6.58	0.425	148	2.69	26.4	"
1028	"	2.2 gal	9.69	6.58	0.427	142	3.09	30.2	"
1030	sample collected								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-6

PROJECT
PROJECT NUMBER
SAMPLING PERSONNEL D. Shafer J. Ruth

SAMPLE ID KRYKPT6GW001
SAMPLE DATE 6-23-06
SAMPLE TIME 1420

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 14.50
WELL DEPTH (TD)(ft below MP/GS) 29 MEAS RPTD MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)
MP ELEVATION (ft amsl) ___ SWL ELEV (ft amsl) ___ WELL STICKUP (ft +/- GS) ___
WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION
LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**___ **MONITORING WELL** X
CASING VOLUME (gals) = ___ FEET OF WATER (TD-SWL) x ___ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = ___ gals
ACTUAL VOLUME REMOVED (gals) ___ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 0.4/-3.1 reading 0.4/-2.1
Pump intake set at ~21' btoc

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1355									
1401		0.5	10.86	7.05	0.358	191	0.11	-1.8	water pumping clear
1410		2.0	10.66	6.90	0.358	258	0.04	-4.8	wl = 14.50, no DD
1416		2.5	10.61	6.89	0.358	260	0.04	-3.4	
1422		3.0	10.57	6.89	0.358	259	0.04	-3.7	water clear
1426		3.5	10.57	6.91	0.358	259	0.03	-2.7	
1430		4	10.54	6.91	0.358	259	0.04	-2.6	
1435		5	10.43	6.92	0.358	258	0.04	-1.4	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical	soil		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID MS/MSD DATE ___ TIME ___

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-7

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth D. Shaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) N/A

WELL DEPTH (TD)(ft below MP/GS) 28.5 MEAS__ RPTD X MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) X

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____ 12.5-27.5 Screen

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION 100' north of RR - next to KPT-8

SAMPLE ID KRYKPT7GW001

SAMPLE DATE 6/23/06

SAMPLE TIME 0900

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID Background .58/.42 reading 6.5/1.3 screen 12.5-27.5

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0835									
0842		0.5	9.36	7.14	0.392	172	0.05	17	water is clear
0845		1.0	9.34	7.15	0.393	179	0.05	19	in. meter not working
0850		1.5	9.24	7.16	0.393	185	0.04	18	water is sl. turbid
0854		2.0	9.28	7.16	0.393	188	0.03	14	
0855		2.5	9.32	7.17	0.392	193	0.03	10	water is clear
0900		3.0	9.36	7.18	0.391	201	0.02	7.5	
		3.5	9.38	7.18	0.391	203	0.02	6.8	
0905		4.0	9.36	7.18	0.391	208	0.03	4.9	
0909		4.5	9.34	7.18	0.391	212	0.03	4.6	
0912		5.0	9.40	7.18	0.391	216	0.03	2.7	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			
Aldehydes ketones			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-8

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth, D. Shaffer

SAMPLE ID KRYKPT8GW001

SAMPLE DATE 6-23-06

SAMPLE TIME 1145

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP))

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS:

FID: 1.3 PID: 1.23 Background .58/.42

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
1110		0.0							
		0.5	10.75	7.16	0.348	211	0.32	-0.1	water clear
1118		1.0	10.31	6.93	0.342	310	0.21	-0.2	
1120		1.5	10.33	6.89	0.341	336	0.22	-0.6	
1129	20min/3gal	3.0	10.28	6.84	0.336	403	0.29	-1.6	
1135	0.56L/min	4.0	10.25	6.87	0.334	424	0.30	-1.1	
1140		5.0	10.26	6.89	0.333	437	0.31	0.6	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			
Aldehydes, Ketones			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-9

SAMPLE ID KRYKPT9GW001

SAMPLE DATE 6-28-06
SAMPLE TIME 1040

PROJECT _____
PROJECT NUMBER _____
SAMPLING PERSONNEL D. Shaffer
STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 5.52
WELL DEPTH (TD)(ft below MP/GS) 15' MEAS (RPTD) MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___
MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____
WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Set pump at 10' bgs

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1009	0.5L/55sec								
	0.55L/min	0.5	12.31	7.21	0.438	73.3	0.33	2	pumping clear NO DO
1020		1.5	11.98	6.83	0.434	52	0.35	-7.5	
1025		2.5	11.96	6.80	0.435	91	0.03	-7.8	
1032		3.0	12.13	6.76	0.432	140	0.11	-9.4	
1036		3.5	12.18	6.72	~~0.432~~ 0.338	165	0.22	-9.7	
1042		4.0	11.92	6.64	0.326	200	0.16	-7.1	
1045		5.0	12.08	6.60	0.328	223	0.13	-6.2	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical suite	40ml VOA	5-40ml	HCL
	AGT	5-L	2-H_2SO_4 3-unp

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-10

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Ninefelt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 7.74

WELL DEPTH (TD)(ft below MP/GS) 27 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) 4 SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYKPT10GW001

SAMPLE DATE 6/27/06

SAMPLE TIME 12:00

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PTD/FTD 1.52/1.18 2.0/~~0.10~~ 0.83
screen 8-23

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 11:08									dark brown water
11:18		1.0							dark brown water
11:24		2.0	13.2	6.70	.216	39.9	0.07	165	clearing up, light rust
11:29		2.5	13.05	6.60	.216	55.5	0.05	155	SWL 7.81
11:35		3.0	12.98	6.56	.216	45.2	0.05	33.7	SWL 7.79, clear
11:40		3.5	13.03	6.54	.215	44.9	0.08	38.3	
11:45		4.0	13.12	6.53	.215	50.1	0.09	21.2	
11:50		4.5	13.16	6.53	.216	53.7	0.10	17.5	
11:55		5.0	13.11	6.51	.216	55.9	0.10	24.6	SWL 7.78

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-11

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaller

SAMPLE ID KRYKPT11 GW001

SAMPLE DATE 6-28-06 1700

SAMPLE TIME 1700

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 8.45

WELL DEPTH (TD)(ft below MP/GS) 74 MEAS (RPTD) MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2.0 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Pump set at 60' ~~bgs~~ bgs. Flush-mount in ditch

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1635									
1638		0.5	13.41	7.34	0.210	163	1.24	28	WL -no DD
1645		1.0	11.56	7.00	0.201	252	1.44	-1.6	pumping clear
1650		1.5	11.16	6.78	0.199	298	1.14	-1.9	
1658		2.5	11.18	6.64	0.199	342	1.26	-3.1	"
1704		3.0	11.06	6.62	0.198	363	1.43	-5	
1709	0.42/min	3.5	11.04	6.62	0.198	378	0.96		
1715		4.0	11.01	6.58	0.198	390	-0.55		DO fluctuating

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT2

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaler J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.32

WELL DEPTH (TD)(ft below MP/GS) 24.5 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

SAMPLE ID KRYKPT12GW001

SAMPLE DATE 6-23-06

SAMPLE TIME 1550

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID 0.3/-2.4 reading 0.3/-1.2

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1520									
1523		0.5	11.25	6.84	0.358	136	0.35	-53	clear
1527		1.0	11.10	6.74	0.359	197	0.30	-4.4	
1531		1.5	11.03	6.73	0.357	248	0.32	-5.0	
1536		2.0	11.07	6.73	0.356	281	0.31	-4.7	
1540		2.5	11.02	6.74	0.357	261	0.31	-5.3	
1547		3.0	10.82	6.74	0.357	342	0.31	-1.7	
1551		3.5	10.84	6.73	0.358	358	0.31	-4.4	
1555		4.0	10.91	6.72	0.357	368	0.31	-4.7	
1558		5.0	11.12	6.74	0.356	373	0.32	-5.5	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT13

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shalu

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 7.63

SAMPLE ID KRYKPT13GW001

SAMPLE DATE 6-28-06

SAMPLE TIME 1215

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1125									WL
1140		0.5	14.48	7.22	0.260	4.4	0.03	-7.1	8.15-8.35
1150		1.0	13.08	6.81	0.252	128	0.35	-7.2	
1159	0.25	1.5	13.43	6.72	0.254	201	0.49	-7.9	
1212	~~2.5~~ L/min	2.5	13.12	6.58	0.251	267	0.45	-8.1	
1221		3.0	12.51	6.49	0.246	299	0.31	-8.5	
1228		3.5	12.67	6.49	0.246	307	0.22	4.2	
1233		4	12.75	6.56	0.246	295	0.13	3.6	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-14

PROJECT KPY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Nineffort

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 8.50

WELL DEPTH (TD)(ft below MP (GS)) 109 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

SAMPLE ID KRYKPT14GW001

SAMPLE DATE 6/27/06

SAMPLE TIME 1345

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background reading
Screen 96-106' bgs Set pump at 100'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1253									WL
	0.5/100 sec	0.5	13.07	6.98	0.319	-55	0.25	49	
1310	~~0.34/min~~	1.0	11.37	6.45	0.329	5.9	0.10	30	8.50 - no DO
1315	0.34/min	1.5	11.23	6.4	0.332	27	0.08	33	
1321		2.0	11.20	6.34	0.334	35	0.08	29	
1330		2.5	10.99	6.33	0.335	49	0.06	39	
1338		3.0	11.04	~~5.6~~	0.336	63	0.07	38	
1345		3.5	10.93	~~4.0~~	0.336	62	0.07	39	
1351		4.0	10.93	6.43	0.337	71	0.06	35	sampling

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-15

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL SA RL

SAMPLE ID KRYKPT15GW001

SAMPLE DATE 6-27-06

SAMPLE TIME 1445

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.96

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: ambient PID|FID: 0|0 ppm reading 0.18|6.67 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1420	.25 l/m								Begin Pumping
1425		1.25 l	13.57	7.02	0.349	-47	2.65	85	▽ = 18.0 steady
1430		2.5 l	12.82	6.96	0.343	-65	1.22	75	
1435		3.75 l	12.28	6.91	0.342	-92	0.82	56	
1440		5.0 l	~~12.~~ 11.64	6.93	0.342	-101	0.60	55	
1445		6.25 l	11.65	6.94	0.342	-103	0.58	56	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
VOCs, SVOCs, PCP ~~EPH~~	amber liters, VOAs	1 l ambers, 40 ml VOAs	HCl, H_2SO_4, Nitric
EPH, metals	plastic	250 ml plastic	

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-16

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA

SAMPLE ID KRYKPT16GW001

SAMPLE DATE 6-23-06

SAMPLE TIME 1300

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.24 Riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION screen 14-29'

LOW--FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID lamp not functioning / no PID/FID reading
no odor or sheen noted from/on H_2O

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1220	Start	pump							Pump @ 23' below riser (TOC)
1230	0.4L/min	1.0gal	11.29	6.62	0.452	135	3.02	14.0	
1235	"	1.3gal	11.07	6.61	0.453	133	2.85	13	
1239	"	1.6gal	10.98	6.61	0.452	131	2.79	13.0	
1243	"	1.9gal	10.91	6.60	0.452	128	2.73	12.3	SWL @ 18.24
1246	"	2.2gal	10.93	6.60	0.452	126	2.70	12.6	"
1249	"	2.5gal	10.90	6.59	0.453	124	2.70	12.7	"
1300	sample collected								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~10L (including DUP below)	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRYKPT16GW701 dup DATE 6/23/06 TIME 1310

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-17

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D Shaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 10.49

SAMPLE ID KRYKPT17 GWC01

SAMPLE DATE 6-29-06

SAMPLE TIME 0930

WELL DEPTH (TD)(ft below MP/GS) 14 (MEAS) RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0855									definite petro odor
0905		1.3	11.64	6.71	1.407	-64	-2.38	31	in water being pumped
0912		2.3	11.58	6.62	1.408	-68	-1.95	2.2	Sheen on discharge water
0917		3.0	11.61	6.60	1.408	-70	-2.09	1.0	
0923		3.5	11.62	6.58	1.407	-72	-2.11	0.4	
0929		4.0	11.67	6.57	1.406	-74	-2.34	0.1	sampled

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-18

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D Shaller, D Donahue

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.77

SAMPLE ID KRYKPT18GW001

SAMPLE DATE 6-28-06

SAMPLE TIME 1840

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Set pump at 30'. Remove downhole tubing to sample

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1817									
1824		0.5	11.23	6.88	0.864	-56	-0.89	0.2	turbid at first then clear
1827		1.0	11.75	6.47	0.862	-49	-0.62	0.5	
1829	0.5L/5sec	1.5	11.74	6.33	0.857	44	-0.57	0.9	
1835	~0.6L/min	2.5	11.77	6.18	0.858	36	-0.56	0.5	WL=18.71
1841		3.5	10.72	6.02	0.853	-30	-0.61	14	
1846		4.0	10.76	5.94	0.852	-26	-0.57	9.1	sampled
		Removed 4.5 gals prior to sampling							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard suite analysis			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-19

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth. D. Donohue

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.49 15.52

15.49
1552

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRY KPT96WC01

SAMPLE DATE 6/27/06
SAMPLE TIME 18:30

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: 1 inch Tubing To 18' 1/2 Tubing To 19' bgs
Screen 13-23' bgs sampled w/ peristaltic pump. Tubing set To 20'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									no parameters measured
									0.03' of product in well

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-20

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Nineveldt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.16

SAMPLE ID KRYKPT20GW201

SAMPLE DATE 6/28/06

SAMPLE TIME 10:30

WELL DEPTH (TD)(ft below MP/GS) 20 MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) ___ SWL ELEV (ft amsl) ___ WELL STICKUP (ft +/- GS) ___

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP___ MONITORING WELL ___**

CASING VOLUME (gals) = ___ FEET OF WATER (TD-SWL) x ___ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = ___ gals

ACTUAL VOLUME REMOVED (gals) ___ WATER LEVEL RECOVERY INFORMATION

COMMENTS: no product, slight oily smell screen 10-20' bgs
PID/FID Background 11.2/-1.0 reading 15.3/-1.2

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 09:50									oily sheen in
		5gal							bucket, clear/gree
									water

GROUNDWATER SAMPLES COLLECTED sampled with peristaltic pump/tube at 17' bgs

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID ~~KRYKPT20GW001~~ DATE 6/28/06 TIME 10:35

KRYKPT20GW201

Tetra Tech EM Inc.

15' 7"

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-21

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Winefelt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 16.29

WELL DEPTH (TD)(ft below MP/GS) 23 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRY KPT 21 GW00

SAMPLE DATE 6/28/06

SAMPLE TIME 12:45

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID 1.1/0.010 reading 1.35/0.76 screen 8-23
no product measured, probe clean 1 inch tubing stopped at 15' 7" To
set pump tubing at 18' bto

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		5 gal	11.88	6.83	.905	169	1.48	919	clear - slightly
									milky
									very slight
									odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KPT-22

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D Shelton

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 9.28

WELL DEPTH (TD)(ft below MP/GS) 16 MEAS (RPTD) MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

SAMPLE ID KRYKPT22GW001

SAMPLE DATE 6/28/06

SAMPLE TIME 1530

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID 0.57 / -1.28 bkgnd / Set pump at 12' bgs
0.61 / 0.58

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE ~~(GPM)~~	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) ~~1455~~ 1500									
1502		1.5	13.46	6.26	0.316	220	-0.34	48	pumping clear
1512	0.6 L/min	2.0	13.23	6.12	0.313	257	-0.47	27	
1515	"	2.5	13.05	6.05	0.311	283	-0.76	9	
1520		3.0	13.01	6.04	0.310	301	-0.99	7.2	
1523		3.5	13.00	6.04	0.311	314	-0.79	6.7	
1526		4.0	13.01	6.06	0.310	320	-0.64	4.1	sampled

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY/00A

PROJECT

PROJECT NUMBER

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 9.38

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)____ Top of Casing (TOC)____

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) _____ WELL LOCATION DESCRIPTION

SAMPLE ID KRY100AGW001

SAMPLE DATE 6/15/06

SAMPLE TIME 14:15

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL**____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 0.3/-1.05 reading 15.5/330 screen set pump at 20'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 13:42									WL =
1348		1.0	8.35	7.16	0.336	18.2	7.8	253	9.40
1354	0.54/48sec	2.0	8.26	7.06	0.337	4.3	4.7	375	
1400	"	3.0	8.22	7.11	0.337	-5.0	0.49		
1406	"	4.0	8.23	7.11	0.339	-9.0	0.46		
1413	"	5.0	8.21	7.12	0.340	-11.2	0.45	NA	Sampled
									cleaned up well

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY101A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.62

SAMPLE ID KRY101AGW001

SAMPLE DATE 6-14-06

SAMPLE TIME 1800

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: used electr. pump/compressor

PURGING/SAMPLING DATA

	TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
	(start)									
1720	1720	start pump								
1725	1725	.1 gpm								
1730	1730	"	0.3	9.83	8.60	0.336	-18	1.07	46.7	
1737	1737	"	1.0	9.59	8.93	0.335	-45	0.36	37	
	1750	"	2.3	9.50	8.99	0.337	-63	0.20	23.4	15.69 SWL
	1755	"	2.8	9.41	9.04	0.335	-68	0.17	20	
	1800	Collect	sample							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	1L + VOA	~6 L	4°C, H_2SO_4, HCl
Metals	250 mL poly	250 mL	HNO_3
Dioxins	2 1L	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY101B

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL J. Ruth, D. Shaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.61

SAMPLE ID KRY101B GW001

SAMPLE DATE 6/15/06

SAMPLE TIME 0900

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID Background: 0.24/-0.6 reading: 23/25
well screen 85-95' pump set at 90' bgs Used generator

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0822									WL
0830	0.5 l/min	0.5	9.56	7.38	0.275	133	1.89	904	15.61
0835	"	1.0	9.52	7.43	0.275	128	1.73	903	"
0842	"	2.3	9.49	7.52	0.274	129	1.67	445	
0850	"	3.0	9.45	7.51	0.275	132	1.64	120	
0856	"	4.5	9.44	7.52	0.273	132	1.62	6.2	sampled

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Aldehydes, Bromate			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 102 A

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D. Donahue J Roth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 23.35'

SAMPLE ID KRY 102 A GW 0001

SAMPLE DATE 6/13/06

SAMPLE TIME 11:40

WELL DEPTH (TD)(ft below MP/GS) — MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS) — Top of Casing (TOC) X

MP ELEVATION (ft amsl) — SWL ELEV (ft amsl) — WELL STICKUP (ft +/- GS) —

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION McElroy & Wilkins

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: WL 21 - 33 = 12' = 27 + 2 ~ 29' set pump

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE ~~LPM (GPM)~~	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1025	.75L/min								23.36' MP ~~28.36~~ 500ml/45sec
1051		2.5 gals							water turbid at first
									pump
1055									took flow cell apart - too
									much bubbles
1111	.5L/min		10.18	7.17	.441	293	3.53	-1.2 ?	
1119	.4L/min		9.84	7.06	.434	330.5	2.97	6.7	
1128	.45L/min		9.95	6.97	.427	360.1	2.84	0.1	
1140	.45		9.98	6.93	.423	372	2.88	0	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite	See Sampling forms		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY 102 A GW 701 DATE 6/13/06 TIME 1200

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY102B

PROJECT Kry Kalispell MT
PROJECT NUMBER
SAMPLING PERSONNEL RL, JA
STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 23.30 PVC Riser
WELL DEPTH (TD)(ft below MP/GS) 105 MEAS ___ RPTD X MP DESCRIPTION: Ground Surface (GS) X Top of Casing (TOC) ___
MP ELEVATION (ft amsl) ___ SWL ELEV (ft amsl) ___ WELL STICKUP (ft +/- GS) ___
WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION McElroy & Wilken

SAMPLE ID KRY102BGW001
SAMPLE DATE 6/13/06
SAMPLE TIME 1105

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP** ___ **MONITORING WELL** ___
CASING VOLUME (gals) = ___ FEET OF WATER (TD-SWL) x ___ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = ___ gals
ACTUAL VOLUME REMOVED (gals) ___ WATER LEVEL RECOVERY INFORMATION ___
COMMENTS: Sample slightly milky colored.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 10:15	Start	pump							10 ppm PID 2 opening 1.6 ppm FID 3 well.
10:30	< 0.3 gpm	0.3	14.29	7.72	0.335		2.65		
10:35	"	0.5	13.88	9.17	0.336	0	2.47	250	SWL @ 23.3
10:42	"	0.8	13.06	8.62	0.336	3	2.40	610	
10:52			12.59	8.17	0.336	9	2.23	221	
1100		1.5	12.85	8.23	0.337	11	2.16	180	
1105	Sample	collected			*MS/MSD				SWL @ 23.3

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	various	~ 9L	various

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY102BGW001 MS/MSD DATE 6/13/06 TIME 1105

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY103A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL, AL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.79

SAMPLE ID KRY103AGW001

SAMPLE DATE 6-15-06

SAMPLE TIME 0925

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Elect. compressor

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0855									0.43 ppm PID 1400 ppm FID
0900		0.5	10.67	5.97	0.696	-2	1.4	688	
0905		0.9	10.30	5.95	0.697	-18	0.58	550	∇ = 11.80 stable
0910		1.2	10.43	5.95	0.697	-27	0.37	469	slow pump rate
0915		1.6	10.21	5.96	0.694	-29	0.27	570	NTU still high - change back to 2 gpm
0920		2.0	10.17	5.95	0.698	-31	0.24	352	- water is clear
0925		2.4	10.15	5.95	0.698	-31	0.22	317	sample time

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 103B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth Dan Shaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.39

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)____ Top of Casing (TOC)____

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

SAMPLE ID KRY103BGW001

SAMPLE DATE 4/15/06

SAMPLE TIME ~~11:00~~ 11:00

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID background 0/3 reading 1.2/5.3
screen 55-65 pump set at 60' used generator

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1030									WL
1035	0.5gal/48sec	1.0	9.04	7.36	0.298	156	2.28	900	
1040	"	2.0	9.00	7.42	0.297	154	2.04	900	1140 no DO
1045		2.5	8.98	7.43	0.297	157	1.99	900	
1050		3.0	8.96	7.43	0.297	158	1.95	676	
1055		4.0	8.95	7.43	0.297	160	1.95	3 [illegible]	
1058		5.0	8.94	7.43	.297	161	1.94	347	470

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 104A

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL John Ruth Dan Schaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 25.31

SAMPLE ID KRY104A GW001

SAMPLE DATE 6/14/06

SAMPLE TIME ~~14:00~~ 14:00

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT (***1/25(TD-SWL)X(DIA)²***) = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____ used generator

COMMENTS: PID/FID Background: 0.4/2.4 reading 1.7/14.2
sample time on bottles was 14:00 actually sampled at 15:50

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
13:45	Pump Problems								
14:32	.41/min								SWL 25.31 very tur
14:43	.41/min	1.5	10.1	7.61	.303	149	8.16	906	SWL 25.36
14:55	.41/min	2.0	9.41	7.59	.301	213	6.15	903	SWL 25.37
15:10	.42l/min	4.5	9.33	7.59	0.300	242	4.5	892	SWL 25.41
15:20	.42l/min	5.0	9.08	7.57	0.302	259	3.91	212	SWL 25.40
15:30	.42l/min	7.0	9.14	7.58	0.301	272	3.6	120	SWL 25.33
1534	.42l/min	8.0	9.17	7.57	0.300	277	3.35	121	SWL 25.32
15:45	.42l/min	9.0	9.08	7.54	0.300	289	2.96	143	SWL 25.34

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
VOC / SVOC	3-40ml / 2 1 liter		HCL / cool
PCP	1 liter		cool
VPH / EPH	2-40ml / 2-1 liter		HCL / cool

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY105A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL, JA

SAMPLE ID KRY105AGW001

SAMPLE DATE 6-15-06

SAMPLE TIME 1700 hrs

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 6.52

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP_____ MONITORING WELL _____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Electric compressor - Set sample intake midway between water level + bottom of screen.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1618									4.4 ppm PID 8.290 FID
1628		1.0	9.33	6.74	0.320	94	1.85	234	Silty + sandy at start. clears up
1633		1.5	9.23	6.71	0.319	90	1.27	77	
1638		2.0	9.16	6.78	0.320	87	1.86	127	∇ steady at 6.53
1643		2.5	9.15	6.69	0.320	85	0.92	48	
1648		3.0	9.12	6.69	0.320	84	0.89	58	
1653		3.5	9.12	6.69	0.320	82	0.89	54	
1658		4.0	9.13	6.70	0.320	83	0.89	51	
1700									Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	amber liters, voas	5 liters, 5-40 ml voas	H_2SO_4, HCL

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY106A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL, JA

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 9.51

SAMPLE ID KRY106A GW001

SAMPLE DATE 6-15-06

SAMPLE TIME 1525 hrs

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Electric compressor

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1440									0.45 ppm = PID 126 ppm = FID
1600		0.9	9.45	6.70	0.338	62	2.13	173	Adjust pumping rate ↑ to ½ l/m
1510		2.0	9.45	6.70	0.336	36	1.37	104	
1515		2.5	9.43	6.69	0.337	30	1.21	87	▽ 9.57 stable
1520		3.0	9.45	6.69	0.337	28	1.14	79	
1525		3.5	9.45	6.69	0.337	27	1.18	81	Sample Time

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	liter bottles + voas	5 l , 5-40 ml	H_2SO_4, HCL, cool

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY106B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL, JA

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 9.44

SAMPLE ID KRY106BGW001

SAMPLE DATE 6-15-06

SAMPLE TIME 1400

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Elect. Compressor

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1308									0.67 ppm PID 0.42 ppm FID
1323		1.0	10.90	6.86	0.333	104	4.67	2000	Water is very silty.
1330		1.3	9.80	6.77	0.332	89	1.25	1322	
1335		1.5	9.65	6.76	0.332	77	1.04	607	
1340		1.8	9.62	6.75	0.333	75	0.99	432	
1345		2.1	9.63	6.75	0.332	73	0.95	262	
1350		2.4	9.59	6.75	0.332	74	0.95	200	
1355		2.7	9.60	6.75	0.332	73	0.95	189	
1400									Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std. Suite	5-1 l amber, 5-40 ml vo		10as-HCL, 2-l H_2SO_4

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY107A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.30

SAMPLE ID KRY107AGW001

SAMPLE DATE 6/16/06

SAMPLE TIME 13:30

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 2.3/+1.8 reading 28/1.6 well screen 9-29 pump set at 25

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 12:48									WL
1255	0.5L/49sec	1.0	10.38	7.02	0.403	156	2.41	7.5	
1300		2.0	10.30	6.98	0.402	180	2.58	9.4	17.30 No DD
1305		3.0	9.92	6.97	0.402	192	2.51	1.5	
1312		4.0	9.93	6.98	0.402	204	2.62	0.4	"
1317		5.0	10.17	6.98	0.402	208	2.36	-3.0	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			
metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY107B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL Dan Shaffer John Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 19.71

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

SAMPLE ID KRY107BGW001

SAMPLE DATE 6/16/06

SAMPLE TIME 1215

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 3.3/0.1 reading 150/1.7
well screen 121-131 set pump at 127'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1135									WL
1139		0.5	10.15	7.57	0.285	122	1.81	907	
	.54/55sec	1.0	9.87	7.48	0.287	144	1.35	906	
1145		2.0	9.86	7.45	0.302	161	1.15	906	19.71 No DD
1152		3.0	9.70	7.32	0.320	190	1.12	857	
1158		4.0	9.70	7.32	0.321	201	1.11	56	
1203		5.0	9.66	7.32	0.324	214	1.17	36	
1208		6.0	9.61	7.31	0.324	219	1.13	27	
1213		7.0	9.64	7.32	0.325	223	1.15	19	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY108A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA MB

SAMPLE ID KRY108AGW001

SAMPLE DATE 6-22-06

SAMPLE TIME 1550

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.63' riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: ambient PID/FID (ppm): 0.24, -1.9 Reading: 17.2, 1.3 (ppm)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1520	start pump		0.4 L/min						pump @ 20' below riser
1530	0.4L/min	1.2	10.48	6.49	0.425	162	3.46	17.1	
1533	"	1.5	10.36	6.51	0.424	159	3.82	16.4	
1536	"	2.0	10.5	6.51	0.424	155	2.78	15.9	
1539	"	2.2	10.38	6.52	0.423	152	2.68	15.1	
1542	"	2.5	10.36	6.51	0.426	150	2.58	13.8	SWL @ 18.63
1545	"	2.9	10.13	6.51	0.424	147	2.52	14.2	
1550	sample collected								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY109A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 9.27

SAMPLE ID KRY109AGW001

SAMPLE DATE 6-16-06

SAMPLE TIME 1335

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS __ RPTD __ MP DESCRIPTION: Ground Surface (GS) __ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP ____ **MONITORING WELL** ____

CASING VOLUME (gals) = 2" FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS:

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED ~~(Gal)~~ ℓ	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1255	400 ml/m								PID = 34 ppm FID = -4 ppm
1300		2 ℓ	13.84	6.94	0.210	101	9.45	2000	Milky brown at start
1305		4 ℓ	13.67	6.94	0.211	111	5.19	2000	slow pumping rate
1310	200 ml/m	5 ℓ	14.98	6.90	0.206	121	5.16	1047	∇ = 9.27
1315		6 ℓ	15.49	8.44	0.206	123	5.06	305	water clear
1320		7 ℓ	15.59	9.03	0.206	112	4.97	217	
1325		8 ℓ	15.54	9.00	0.205	103	4.96	166	
1330		9 ℓ	15.58	8.98	0.205	97	4.94	147 ~~97~~	
1335		10 ℓ	15.60	8.98	0.206	96	4.91	142	Sample Time

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY110A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth, O. Shaffer

SAMPLE ID KRY110AGW001

SAMPLE DATE 6/15/06

SAMPLE TIME 16:15

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP))

WELL DEPTH (TD)(ft below MP/GS) ____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) ____ SWL ELEV (ft amsl) ____ WELL STICKUP (ft +/- GS) ____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = ____ FEET OF WATER (TD-SWL) x ____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = ____ gals

ACTUAL VOLUME REMOVED (gals) ____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 4.3/2.6 reading 9.8/4.7 Screen 35-55' pump at 50 feet bgs

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 15:40									
1547	1.0L/90 sec	1.0	9.07	7.22	0.329	114	0.69	27	No DD
1553	"	2.0	9.05	7.20	0.229	114	0.59	24	
1600	"	3.0	9.00	7.21	0.329	113	0.59	16	
1605	"	4.0	8.99	7.21	0.329	113	0.60	18	No DD
1610	"	5.0	9.00	7.22	0.329	113	0.54	18	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID ____ DATE ____ TIME ____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY110B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL D. Shaffer, J. Ruth

SAMPLE ID KRY110BGW001

SAMPLE DATE 6/16/06
SAMPLE TIME 09:15

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 8.06

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 26/-0.11 reading 97/3.2
well screen 76-86 pump set at 82' bgs

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0835									
0841		0.5	10.2	7.31	0.329	128	1.38	908	adjusting rate at control
0850	0.54/75	1.0	9.81	7.27	0.330	114	0.79	345	box
		2.0	9.63	7.26	0.331	104	0.71	300	WL
0903		2.5	9.56	7.26	0.331	100	0.69	230	8.30
0910		3.0	9.51	7.26	0.331	97	0.62	195	
0914		3.5	9.5	7.26	0.331	96	0.63	175	
0920		4.0	9.51	7.27	0.329	95	0.67	145	
0924		5.0	9.48	7.27	0.329	94	0.62	903	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 111A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, RL

SAMPLE ID KRY111AGW001

SAMPLE DATE 6-16-06

SAMPLE TIME 1110

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.78

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) _____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP_____ MONITORING WELL _____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS:

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 810	collect PID/FID								PID 6 ppm FID 2700 ppm
1030	start pump								little bit of sheen on H_2O
1040	0.3L/min	0.6	10.46	6.65	0.598	-76	0.60	600	
1045	"	1.1	10.31	6.33	0.644	-66	0.48	335	
1050	"	1.5	10.20	6.28	0.657	-64	0.34	215	
1055	"	2.0	10.20	6.25	0.667	-62	0.25	139	
1100	"	2.4	10.06	6.22	0.681	-60	0.20	105	SWL @18.80 steady
1105 ~~1115~~	"	3.0	10.20	6.20	0.695	-59	0.16	82	
1110	"	3.4	10.11	6.20	0.699	-58	0.16	79.8	Sample taken

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA & 1-liter	~5.5 L	H_2SO_4, HCl, 4°C
Metals	250ml	250ml	HNO_3
Dioxins	1 liter	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY111AGW701 DATE 6-16-06 TIME 1115
(dioxin only on dup)
also KRY111AQE001
↳ std suite metals + dioxin 1200

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY111B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, RL

SAMPLE ID KRY111BGW0001

SAMPLE DATE 6-16-06

SAMPLE TIME 0925

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.80 Riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW--FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Electric compressor
Set bladder in middle of screen interval.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED ~~(Gal)~~ ℓ	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0850	200 ml/m								PID 37ppm FID ~2ppm
0857		1 ℓ	10.82	6.64	0.355	171	2.4	2000	
0902		2 ℓ	10.42	6.75	0.355	143	0.78	687	▽ 17.87 steady
0907		3 ℓ	10.24	6.76	0.356	120	0.61	245	
0912		4 ℓ	10.18	6.76	0.356	98	0.48	115	
0917		5 ℓ	10.18	6.76	0.356	97	0.47	113	
0922		6 ℓ	10.20	6.77	0.356	95	0.47	109	
0925									Sample Time

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite, Metals, Dioxin/Furans	amber liters, voas, ½ gal plastic	7 liters, 500 ml plastic 5-40ml voa	HCL, H_2SO_4, Nitric

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY112A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA RL

SAMPLE ID KRY112AGW001

SAMPLE DATE 6-14-06

SAMPLE TIME 1155

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.6

WELL DEPTH (TD)(ft below MP/GS) 29 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW--FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Used electric air compressor for pumping

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1015	take	SWL +	meas.	c	PID/FID				PID 1.3 FID 0.67
1110	start pumping								
1120		.75	9.58	8.78	0.482	182	6.97	247	Silty
1130		~~1.0~~ 1.75	9.20	8.72	0.483	195	6.42	58.5	clearing
1140		2.50	9.21	8.74	0.482	190	6.16	32.2	
1150		3.25	9.26	8.79	0.483	185	6.37	31.6	
1155		3.70	9.18	8.81	0.482	184	6.28	29.5	Sample Time

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	various	~6L	various
	(1L + VOA)		(HCl + H_2SO_4 + 4°C)

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KR4112B

PROJECT KR4

PROJECT NUMBER

SAMPLING PERSONNEL JA, RL

SAMPLE ID KR4112BGW001

SAMPLE DATE 6-14-06

SAMPLE TIME 1010

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.94

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION Gravel Pit

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS:

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 930	Start	Pump							
935		1 gal	9.66	8.07	0.404	-213	1.26	2000	
942		1.5 gal	9.63	8.36	0.404	-220	0.75	587	18.05 SWL Stable
947		2.0 gal	9.57	8.46	0.406	-129	0.87	198	
957		3.0 gal	9.62	8.45	0.406	-108	0.91	154	
1005		3.5	9.69	8.49	0.407	-100	0.94	140	
1010		4.0	9.70	8.54	0.407	-97	0.95	135	Sample time

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	various	~ 6L	various

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY113BA

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, DS

SAMPLE ID KRY113AGW001

SAMPLE DATE 6-22-06

SAMPLE TIME 1215

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.25 riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient: 0.77 / -0.05 ppm Reading ~~19.1 / 4.3 ppm~~ 22.7 / 359 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1114	start pump								Pump @ 25' below riser
~~1117~~									
1125	0.4L/min	0.5	11.26	7.61	0.447	90	3.28	75	
1129	"	1.0	10.88	7.54	0.449	74.4	1.94	63.9	
1141	"	1.5	11.01	7.56	0.448	73	2.96	59	
1148	"	2.0	11.34	7.64	0.447	59	3.13	49	SWL @ 18.29
1157	"	3.0	11.36	7.51	0.449	45.8	2.84	42.7	
1200	"	3.3	11.43	7.5	0.448	41.4	2.82	40.7	
1203	"	3.6	11.51	7.51	0.442	37.3	2.90	30.9	
1215	sample collected								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	H_2SO_4, HCl, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION ~~KRY12A~~ KRY-113B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, JF

SAMPLE ID ~~KRY12BGW001~~ KRY113BGW001

SAMPLE DATE 6-22-06

SAMPLE TIME 1010

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.75 Riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: ambient: 0.77 / -0.05 ppm Reading: ~~[illegible] / 359 ppm~~ 19.1 / 4.3 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0900	start	pump							pump @ 107' bgs
0910	0.1 L/min	0.5 gallons							
0940	"	1.0	12.22	8.01	0.415	101.3	3.07	153.6	SWL @ 18.76
0944	"	1.1	12.38	7.75	0.350	59.3	2.75	99.4	
0948	"	1.2	12.44	7.67	0.344	41.2	2.66	123.4	
0951	"	1.3	12.33	7.67	0.336	25.9	2.65	126.4	
0954	"	1.4	12.00	7.67	0.334	14.3	2.38	112.0	
0957	"	1.5	12.08	7.67	0.333	10.0	2.51	118.9	
1000	"	1.6	11.87	7.66	0.333	2.9	2.70	98.6	
1003	"	1.7	11.77	7.67	0.332	-4.3	2.76	79.2	
1006	"	1.8	11.88	7.66	0.332	-6.8	3.02	76.0	
1010	sample	taken							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA & 1L	~5 L	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 114A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Ninefeldt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.10

WELL DEPTH (TD)(ft below MP/GS) 29 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRY114A GW001

SAMPLE DATE 6/29/06

SAMPLE TIME 11:00

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background .55/.76 Reading 1.30/2.90
well screen 17-27' Product 17.33 / water 18.10 .77' product

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		5 gal					light		yellow brown water
									with brown floating
									oil droplets
									strong odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			
Dioxins			
Aldehydes, Chloride, Bromide			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY114B

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL _____

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.28

SAMPLE ID KRY 114B GW001

SAMPLE DATE ~~KY~~ 7-5-06

SAMPLE TIME 1855

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Bkgrnd PID/FID .3/.6 wellhead ~~PID~~/FID 3.2/9.5

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1820	.4 l/m								Begin pumping
1835		6 l	10.77	6.79	0.349	123	2.86	265	∇ = 18.31 steady
1840		8 l	10.62	6.79	0.348	120	2.76	217	slow rate to .3 l/m
1845		9.5 l	10.51	6.80	0.349	115	2.67	138	
1850		11 l	10.50	6.80	0.349	114	2.71	132	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 115A

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL J. Ruth, O. Donohue

SAMPLE ID KRY115AGW001

SAMPLE DATE 6/13/06

SAMPLE TIME 16:30

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 20.00

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT **(1/25(TD-SWL)X(DIA)^2)** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID Background 0.78/2.21 Reading 1.4/2.4
Screen 12' bgs to 32' bgs Pump set @ 28' bgs

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1500									Controller unit prob - needed to repair
1550	.5L/min	2	12.2	6.33	.357 ~~.274~~	257	1.78	46	
1610	.45L/min	2.5	11.34	6.10	.359	400	1.37	38.1	
1620	.5L/min	1.	11.03	6.06	.357	453.7	1.3	30	
1625		6	11.08	6.14	.357	470	1.27	22.3	start sampling

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
VOC SVOC PCB EPH/VPH	See sample sheet		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY115B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL, JA

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 19.69

SAMPLE ID KRY115BG10001

SAMPLE DATE 6-13-06

SAMPLE TIME 1555

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION Gravel Pit

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Water is cloudy

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1440	Start	pump							PID = 1.2 ppm FID = 0.69 ppm
1515	0.	0.8	12.89	9.28	0.374	14	1.24	223	19.69 WL - stable
1520		1.5	12.57	10.27	0.376	-3	0.70	139	
1530		1.8	13.18	9.65	0.376	-10	0.63	112	
1540		2.0	13.27	9.94	0.376	-21	0.56	99.2	
1550		2.2	12.53	9.78	0.376	-28	0.56	101	
1555	Sample	taken							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	Various (1-liter + VOA)	~6 liters	Various (HCl + H_2SO_4 + 4°C)

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY116A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL, JA

SAMPLE ID KRY116AGW001

SAMPLE DATE 6-14-06

SAMPLE TIME 1547

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 14.32 Riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Used elect. compressor

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1450	pump started								
1453	~0.3L/min	600mL							
1500	"	0.5 gal	10.22	8.15	0.343	180	10.33	936	cloudy
1510	"	1.4 gal	9.84	8.84	0.344	211	9.32	430	clearing
1520	"	2.2 gal	9.85	8.85	0.346	216	9.11	275	
1530		3.0	10.38	8.93	0.351	217	8.68	182	
1538		3.4	10.34	9.09	0.351	217	8.42	150	
1543		3.9	10.03	9.22	0.351	218	8.26	137	
1547		4.2	9.97	9.25	0.351	216	8.18	118	Sample time
									Water is clear

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	various	~6L	various

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY116B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth O. Schaffer

SAMPLE ID KRY116BGW001

SAMPLE DATE 6/14/06

SAMPLE TIME 18:00

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 14.88

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT (*1/25(TD-SWL)X(DIA)²*) = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 0.2/2.2 reading 24.61/4.82 used gen pump intake @ 100' bgs screen 95-105'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 17:17									
17:17	0.5 L/min								
17:25	0.5 L/min	1.0	9.81	7.42	0.315	186	2.64	905	SWL 14.90
1730	"	2.0	9.59	7.35	0.314	203	2.16	160	
1740	"	3.0	9.60	7.42	0.314	215	2.05	57	= 14.91
1747	"	4.0	9.54	7.43	0.315	222	2.00	47	
1753	"	5.0	9.51	7.42	0.315	227	1.98	27	
1759	"	6.0	9.48	7.43	0.315	230	1.98	20	sampled

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
VOC/SVOC	3-40ml / 2-1 liter		HCL/Cool
PCP	1-1 liter		Cool
VPH/EPH	2-40ml / 2-1 liter		HCL/H_2SO_4

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY118A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL

SAMPLE ID KRY118AGW001

SAMPLE DATE 7-5-06

SAMPLE TIME 1550

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.15

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Bkground PID/FID 0/1 ppm - Well Head PID/FID 1.3/1.8 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1520	.3 l/m								Begin pumping - Silty
1530		3 l	10.45	6.67	0.310	185	10.76	845	
1535		4.5 l	9.88	6.72	0.314	186	8.64	473	▽ = 11.22 - steady
1540		6 l	9.78	6.74	0.313	181	8.47	341	
1545		7.5 l	9.67	6.75	0.314	170	8.34	234	water is clear
1550		9.0 l	9.63	6.76	0.314	169	8.39	234	
1550		6.5 l	9.62	6.76	0.315	167	8.41	231	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite, Dioxins, Metals			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY118B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.43

SAMPLE ID KRY118BGW001

SAMPLE DATE 7-5-06

SAMPLE TIME 1700

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: BKgrd PID/FID 6/6 ppm wellhead PID/FID 4.7/7.3 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1630	0.2 l/m								Begin Pumping
1640		2 l	11.12	6.91	0.317	82	7.24	>2000	silty
1645		3 l	11.02	6.92	0.316	75	3.47	834	∇ = 11.49 steady
1650		4 l	10.92	6.93	0.316	65	3.48	290	water is clear
1655		5 l	10.73	6.93	0.316	57	3.33	180	
1700		6 l	10.74	6.93	0.316	55	3.27	175	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite, Dioxins, metals			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY121A

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL J. Ruth J. Allewait

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 20.32 PVC

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

SAMPLE ID KRY121AGW001

SAMPLE DATE 6/20/06

SAMPLE TIME 1130

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID Background .54/1.60 reading

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1100	Start	pumping							Screen @ 12-32'
1109	~0.1gpm	1gal	purge						Pump @ 26'
1112	"	1.3	10.2	7.0	0.416	-69.2	0.40	3.4	
1115	"	1.6	9.93	6.95	0.417	-82.8	0.20	12.2	
1118	"	2.0	9.97	6.95	0.416	-86.1	0.16	1.5	
1121	"	2.3	9.91	6.96	0.417	-88.7	0.15	10.7	
1124	"	2.6	9.89	6.97	0.416	-91.3	0.12	10.4	
1130	Sample	collected							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	
Metals	250ml	250ml	
Dioxin	2 1L	2L	

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY121AGW70 dup DATE 6/20/06 TIME 1140

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY121B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL SA RL

SAMPLE ID KRY121BGW001

SAMPLE DATE 6-28-06

SAMPLE TIME 1210

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 20.89 riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) X

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Ambient PID/FID: 0/7 ppm Reading: 6/11 ppm PID/FID
See notes on back of sheet

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1125	.25 l/m								Begin - silty
1135		2.5 l	12.02	7.01	0.364	-261	1.91	791	
1140		3.75 l	11.89	7.46	0.363	-275	0.68	738	∇ = 20.90 - steady
1146		1.3 gal	11.80	7.74	0.362	-277	0.53	447	
1153		1.8 gal	11.72	7.69	0.362	-280	0.46	333	
1158		7.75 l	11.94	7.6	0.359	-271	0.46	210	water is clear
1205		10 l	11.97	7.65	0.360	-264	0.46	189	
1210		12.5 l	11.96	7.66	0.360	-261	0.45	182	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl H_2SO_4 4°C
Metals	250mL	250mL	HNO_3
Dioxins & Furans	1L	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY121BQE001 DATE 6-28-06 TIME 1730

Rinsate Sample

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY122A

PROJECT KRY

SAMPLE ID KRY122AGW001

PROJECT NUMBER

SAMPLING PERSONNEL John Ruth Jeff Ninofelt

SAMPLE DATE 6/26/06
SAMPLE TIME 16:30

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 13.29

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: PID/FID Background .04/0.36 52.1/3.8
well screen 7-27' pump set at 21' bgs very hot location 90's

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 15:50	0.5 l/min								Brown silty
16:03		1.5	11.4	6.94	.986	205	2.04	0.1	clear
16:10		2.0	11.09	6.74	.980	286	3.80	0.7	SWL 13.51
16:17		2.5	12.58	6.50	.973	392	0.55	-2.4	SWL 13.35
16:29	0.3 l/min	3.0	9.23	6.59	.994	473	0.95	34.9	temp anomalous
16:40	0.3	3.5	12.76	5.98	.991	516	1.24	109	due to sunny conditions
16:50	0.21 l/min	4.0	12.78	5.87	.982	536	1.31	50.7	
17:00	0.21 l/min	4.5	13.91	6.10	.989	535	1.40	63.0	SWL 13.39
17:10	0.2 l/min		14.09	6.24	.988	520	1.49	55.5	SWL 13.39
17:20		5.0	14.04	6.31	.987	507	1.56	53.9	SWL 13.39
							Sample time on bottle		
				was	16:30	. Actually sampled at 17:30			

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY122AGE001 DATE 6/26/06 TIME 1830
Rinsate

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY122B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, RL

SAMPLE ID KRY122BGW001

SAMPLE DATE 6-28-06

SAMPLE TIME 0950

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 13.19 bgs

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION Flushmount

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient PID/FID: 0.5/1.8 ppm Reading: 21/12 ppm (PID/FID)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0920	.3 l/m								Begin pumping
0925		1.5	11.22	7.0	0.349	120	1.98	536	
0930		3.0	10.60	6.95	0.350	107	1.35	318	
0933		4.5	10.44	6.94	0.350	86	1.84	225	SWL @ 19.2
0940		6.5	10.26	6.92	0.353	57	1.88	174	Stabilized
0943		7.5	10.22	6.93	0.352	53	1.11	167	
0950		9.6	10.21	6.92	0.352	44	1.11	155	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID MS/MSD designated DATE 6/28/06 TIME 0950

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY123A

PROJECT KRY
PROJECT NUMBER
SAMPLING PERSONNEL JA, DD
STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 13.28

SAMPLE ID KRY123AGW001
SAMPLE DATE 6-21-06
SAMPLE TIME 0935

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___
MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____
WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____
CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals
ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____
COMMENTS: Ambient PID|FID = 0.87|-2.98 ; Reading: 5.91|-1.6 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0906	start pump		400 mL/min						
0916		1 gal	9.62	6.67	0.339	160	2.85	46.4	
0920		1.4 gal	9.29	6.70	0.338	162	1.91	28.8	SWL @ 13.28
0924		1.8 gal	9.17	6.73	0.339	160	1.75	21.6	"
0927		2.1 gal	9.14	6.71	0.339	159	1.70	19.8	"
0930		2.5 gal	9.17	6.70	0.340	157	1.67	18.3	"
0935	Collect Sample								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			
Metals			
Dioxin			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY123AGW0001 DATE 6/21/06 TIME 0935
Dioxin MS/MSD
4 jars

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY125A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.44 bgp

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION Rocky MTN Marine

SAMPLE ID KRY125AGW001

Flushmount

SAMPLE DATE 6-26-06

SAMPLE TIME 1745

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient PID/FID: 0/3 ppm PID/FID Reading: 95/9 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED ~~(Gal)~~ ℓ	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1710		≈ .3 ℓ/m							
1716		1.8 ℓ	12.13	6.47	1,333	37	4.85	85	▽ = 15.9 - Decrease pump rate
1727		2.8 ℓ	12.24	6.43	1,345	64	3.95	62	
1732		3.3 ℓ	12.13	6.43	1.347	66	3.85	65	Stabilized @ 15.93
1737		3.8 ℓ	12.13	6.42	1.355	70	3.58	59	
1742		4.3 ℓ	12.12	6.42	1.356	70	3.51	57	
1745									Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY125AQE001 DATE 6/26/06 TIME 1830

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY125B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) Flushmount 21.45 bgs

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION Rocky Mtn Marine

SAMPLE ID KRY125B-W001

SAMPLE DATE 6-26-06

SAMPLE TIME 1635

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Ambient PID/FID 0/3 ppm PID/FID Reading: 9/16 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1610		1 l/5min							Begin pumping
1615		1 l	12.47	6.81	0.374	102	2.73	85	
1620		2 l	12.18	6.82	0.373	63	1.71	69	▽ = 21.45 Steady
1625		3 l	12.17	6.82	0.370	61	1.65	48	
1630		4 l	11.94	6.83	0.370	67	1.61	47	
1635		5 l	11.89	6.83	0.370	71	1.59	48	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA & 1L	~5L	HCl H_2SO_4 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY126A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL SA JR

SAMPLE ID KRY126AGW001

SAMPLE DATE 6/21/06

SAMPLE TIME 1315

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.81 Riser

WELL DEPTH (TD)(ft below MP/GS) ____ MEAS ____ RPTD ____ MP DESCRIPTION: Ground Surface (GS) ____ Top of Casing (TOC) ____

MP ELEVATION (ft amsl) ____ SWL ELEV (ft amsl) ____ WELL STICKUP (ft +/- GS) ____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION ____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP** ____ **MONITORING WELL** ____

CASING VOLUME (gals) = ____ FEET OF WATER (TD-SWL) x ____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = ____ gals

ACTUAL VOLUME REMOVED (gals) ____ WATER LEVEL RECOVERY INFORMATION ____

COMMENTS: PID/FID Background 4.1/1.1 reading 57/41
well screen 5-25'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1205	start pump		0.4 L/min						water cloudy
1218	0.4L/min	1.2	10.61	6.51	0.802	176	5.23	1355	
1224	"	2.1	10.28	6.50	0.776	180	4.71	703	water clearing
1227	"	2.5	10.27	6.50	0.775	179	4.61	597	
1230	"	2.9	10.15	6.50	0.774	178	4.52	501	
1240	"	4.0	10.26	6.51	0.714	176	4.95	525	
1250	"	5.0	9.91	6.5	0.695	168	4.16	353	
1254	"	5.2	9.90	6.5	0.690	166	4.05	258	
1258	"	5.6	9.8	6.5	0.681	163	3.92	180	
1301	"	5.9	9.83	6.5	0.681	161	3.91	152	
1304	"	6.2	9.81	6.5	0.678	157	3.84	119	
1307	"	6.5	9.78	6.5	0.670	155	3.8	78	
1315	collect sample								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1 liter	~5L	HCl, H_2SO_4 4°C
Metals	250ml poly	250ml	HNO_3
Dioxins	1 liter	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID ____ DATE ____ TIME ____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY127A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA DD

SAMPLE ID KRY127AGW001

SAMPLE DATE 6-21-06

SAMPLE TIME 1120

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 7.31ft Riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: ambient PID/FID: 4.75/-1.55ppm Reading: 70.2/1.04 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1050	start	pump	400 mL/min						
1100	0.4L/min	1 gal	11.17	6.69	0.311	159	5.06	229	
1104	"	1.3 gal	10.06	6.87	0.313	157	3.61	165	
1107	"	1.9 gal	9.88	6.88	0.313	156	3.38	108	
1110	"	2.2	9.84	6.89	0.312	155	3.31	89.4	
1113	"	2.5	9.78	6.89	0.313	154	3.26	72.4	7.32 ft bmp
1116	"	2.9	9.82	6.89	0.313	151	3.23	60.5	
1120	sample								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C
Metals	250 ml	250 ml	HNO_3
Dioxin	2 1L	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 128A GW001

PROJECT _____

PROJECT NUMBER ~~KRY 128~~

SAMPLING PERSONNEL D Shelton G Niederdt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 13.81

WELL DEPTH (TD)(ft below MP/GS) 26.5 (MEAS) RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

SAMPLE ID KRY128AGW001

SAMPLE DATE June 27, 2006

SAMPLE TIME 1800

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: TN/FD
Pump set at 22'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1726									
		0.5	12.48	6.51	0.946	180	0.38	923	
1736	0.624 min	1.0	11.67	5.46	0.967	464.9	0.84	205.3	
1742		2.0	11.43	5.48	0.965	423	1.46	79	
1749		3.0	11.36	5.56	0.963	418	1.59	44	
1751		4.0	11.36	5.65	0.955	414	1.69	27	
1753		4.5	11.36	5.71	0.951	412	1.73	20	
1757		5.0	11.36	5.77	0.948	411	1.81	17	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY128B

PROJECT KRY

SAMPLE ID KRY128BGW001

PROJECT NUMBER

SAMPLING PERSONNEL SA, RL

SAMPLE DATE 6-28-06

SAMPLE TIME 1750 hrs

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.73' Flushmount

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient: 0/4 ppm (PID/FID) Reading: 4/20 ppm (PID/FID)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1710	.2 l/m		15.87	7.06	0.348	~~150~~	~~3.13~~	~~2000~~	Begin pumping
1715		1 l	↓	↓	↓	-150	3.13	>2000	Silty
1720		2 l	13.62	7.00	0.348	-193	1.16	>2000	∇ = 15.8 - steady
1725		3 l	12.88	6.99	0.350	-232	0.76	1998	
1730		4 l	12.19	7.03	0.351	-197	0.67	2000	
1740		6 l	11.95	7.00	0.352	-210	0.44	264	Water-clear
1745		7 l	11.98	7.00	0.351	-222	0.42	202	
1750		8 l	11.99	7.00	0.351	-221	0.40	195	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY129A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA DD

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 14.18

SAMPLE ID KRY129AGW001

SAMPLE DATE 6-27-06

SAMPLE TIME 1805

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: ambient PID/FID (ppm): 0.3/-1.8 Reading: 58.8/0.2 (1730)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1730	.4 l/m								
1735		2 l	12.56	6.67	1.076	128	2.48	1532	
1740		4 l	11.80	6.77	1.032	127	3.40	1236	▽=
1745		6 l	11.73	6.83	1.009	128	4.22	820	▽ = 15.3 slow pumping
1750	.25 l/m	7.25 l	12.05	6.95	1.019	129	4.21	656	rate to .25 l/m
1755		8.50 l	11.97	6.70	1.026	129	4.05	560	▽ = 15.5 - steady
1800		9.75 l	11.99	6.95	1.040	127	3.88	528	
1805		11.0 l	11.97	6.93	1.042	125	3.84	516	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl H_2SO_4, 4°C
Metals	250 ml	250 mL	HNO_3
Dioxin+Furan	1L	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY129B

PROJECT KRY
PROJECT NUMBER
SAMPLING PERSONNEL JA DD
STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.52

SAMPLE ID KRY129BGW001
SAMPLE DATE 6-21-06
SAMPLE TIME 1915

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS ___ RPTD ___ MP DESCRIPTION: Ground Surface (GS) ___ Top of Casing (TOC) ___
MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____
WELL DIAMETER (inside/inches) _____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP** ____ **MONITORING WELL** ____
CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals
ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____
COMMENTS: ambient PID/FID (ppm): 0.3/-1.8 Reading: 69.2/4.8 (1730pm)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1735	bailer put down well 1st to check for presence of LNAPL → none present								
1815	Start pump								
1838	0.2L/min	0.75	13.44	6.78	0.415	112	3.14	1552	turbidity is
1845	"	1.2	13.22	6.8	0.413	96	2.41	931	reading high,
1848	"	1.3	13.12	6.8	0.414	88	2.22	648	but water does not appear that
1851	"	1.4	12.99	6.8	0.414	81	2.13	434	cloudy.
1854	"	1.5	13.05	6.8	0.414	74	1.99	280	
1857	"	1.6	12.79	6.79	0.416	65	1.75	180	SWL @ 18.55
1900	"	1.7	12.81	6.79	0.417	58	1.61	137	
1905	"	1.8	13.10	6.79	0.419	52	1.51	118	
1911	"	1.9	12.84	6.78	0.418	42	1.35	164	SWL @ 18.57
1915	"	2.0	12.81	6.78	0.417	40	1.30	138	Sample collected

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA & 1L	~5L	HCl, H_2SO_4, 4°C
Metals	250ml	250 ml	HNO_3
Dioxins	1L	2L	4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY 130A

PROJECT KRY Fluorescent

PROJECT NUMBER

SAMPLING PERSONNEL JRuth JAllewalt

SAMPLE ID KRY130AGW001

SAMPLE DATE 6-20-06

SAMPLE TIME 1600

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 12.65 Riser

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Ambient PID/FID (ppm): 0.4/1.5 reading: 1.5/3.2

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1510	Start	pump							Screen @ 25-45
									pump @ 37.5'
15:27	.5l/min	1 gal	10.5	7.35	.451	160.9	0.83	2	No drawdown
15:33		1.8	10.06	7.32	.454	178	0.95	0.6	No drawdown
15:38		2.2	9.97	7.32	.454	186	1.04	3.1	"
15:43		2.6	9.94	7.34	0.454	194	1.09	1.5	"
15:47		3.1	9.90	7.34	0.454	196	1.11	1.4	"
1600	Collect sample								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	1L + VOA	~8L	

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRY130AGW001 DATE 6/20/06 TIME 1600

MS/MSD

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY130B

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer John R.

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 13.22

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION Next to Keri Dodge

SAMPLE ID KRY130BGW001

SAMPLE DATE 6-22-06

SAMPLE TIME 1630

LOW-FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Use peristaltic pump (Solinst Model 410) to sample well. Inlet set at 38' bgs.
NOTE: Well was pumped previous day (6-21-06 - a.m.) - 20 gals removed

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1545									
1550		0.5	11.65	7.06	0.282	153	1.37	18.5	water pumping clear.
1555	0.1gpm	1.0	11.02	6.83	0.281	286	1.38	23	
1559		1.5	11.07	6.89	0.281	327	1.53	—	
1602		2.0	11.14	6.96	0.281	350	1.64	—	
1606		2.5	11.44	7.04	0.283	364	1.78	200	
1611		3.0	11.37	7.06	0.286	372	1.93	215	
1615	0.16gpm	4.0	11.54	7.16	0.288	375	2.13	228	
1620	≤0.6L/min	5.0	11.36	7.20	0.289	377	2.14	118	
1628		5.5	11.70	7.30	0.291	377	1.79	53	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY139A

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL JA

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 9.50

SAMPLE ID KRY139AGW00

SAMPLE DATE 6-27-06

SAMPLE TIME 1215

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient PID|FID: 0|4 ppm Reading: 3|2 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (~~GPM~~)	VOL REMOVED (~~Gal~~)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1148	Start	pump		~ 0.5 L/min					pump @ 18.5'
1154		3 l	11.85	7.65	1,970	-84	1.91	97	
1202		7 l	10.59	8.43	1,490	-94	0.61	55	▽ = 9.56 steady
1206		8.2 l	11.00	8.37	1,490	-98	0.43	57	slow pump rate to .3 l/m
1210		9.4 l	10.97	8.35	1.50	-99	0.35	61	
1215		10.6 l	10.95	8.34	1.50	-99	0.38	63	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY139B

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL JA

SAMPLE ID KRY139BGW001

SAMPLE DATE 6-27-06

SAMPLE TIME 1055

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) ~~9.81~~ 8.91

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Ambient 0/4 ppm PID/FID Reading 3/25 ppm
PID/FID:

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED ~~(Gal)~~ ℓ	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1020	.75 ℓ/5m								Begin pumping
1025		.75 ℓ	13.64	7.05	0.329	75	3.75	2000	milky color-silt
1030		1.5 ℓ	12.39	6.96	0.344	83	1.95	2000	pump @ 171'
1035		2.25 ℓ	12.34	6.95	0.344	87	1.82	1355	▽ = 8.91 stable
1040		3.0 ℓ	12.10	6.94	0.346	88	1.74	898	
1045		3.75 ℓ	12.47	6.94	0.344	88	1.69	675	
1050		4.5 ℓ	12.18	6.94	0.345	87	1.64	580	
1055		5.25 ℓ	12.15	6.95	0.345	85	1.62	565	Collect sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl H_2SO_4 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION IW-1

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) NA MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION 7 feet from NW corner of maint. building

SAMPLE ID KRYIW01GW001

SAMPLE DATE 6-21-06

SAMPLE TIME 1750

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Well is locked 7' NW of NW corner of maint. building under 50 gal barrel over well head. Sampled from riser-pipe spigot adjacent to well head. Standard cap.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1733	Turned back to 5gpm/55sec								
	5.5gpm								
1737		22	10.13	7.35	0.341	80	1.05	-1.1	Water very clear
1740		38	9.87	7.30	0.340	54	0.91	-1.3	
1747		75	9.76	7.29	0.339	48	0.90	-1.6	
1753		110	9.74	7.29	0.339	48	0.87	-1.8	sampled
		120							
		Purged approximately 120 gallons prior to sample collection. Sampled from end of 50' garden hose.							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical	suite		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION IW-2

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) UNK

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION Between SE corner of big blue bldg and red boxcar

SAMPLE ID KRYIW02GW001

SAMPLE DATE 6-21-06

SAMPLE TIME 1830

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Well is located between SE corner of big blue bldg and red RR boxcar. 3" stickup on 6" casing steel, drums "Al Chloride solution" next to well. Sampled from riser-stand pipe adjacent to well.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1810	5gal/55sec								
1816	=5.5 gpm	38	9.67	7.25	0.338	137	0.48	-2.7	Water is clear
1821		60	9.67	7.24	0.337	127	0.45	-2.7	"
1826		88	9.66	7.24	0.338	120	0.45	-2.7	
1831		115	9.65	7.25	0.337	111	0.44	-2.7	sampled
		120 TOTAL							
Sampled from 50' garden hose attached to spigot stand pipe after removing approximately 120 from well using installed submersible.									

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical suite.			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION KRY IW3

40-60 feet?
1000 gpm

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL DD

SAMPLE ID None

SAMPLE DATE _____

SAMPLE TIME _____

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) ~3' WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
			Well - Downhole Access						
					Problems				
						See Sample Sheet			

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION IW-4

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) NA

WELL DEPTH (TD)(ft below MP/GS) 40-50 MEAS (RPTD) MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION Inside small building, hydrant pump

SAMPLE ID KRYIW04GW001

SAMPLE DATE 6-22-06

SAMPLE TIME 0840

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Purged well with pump in well. Hydrant pump used for fire; other. Ran 1½" hose outside to NW of building @ 7.5 gpm until parameters stable. Sampled from hydrant-~~[illegible]~~ hose.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0820	5 gals/40 sec								
0824	7.5 gpm	25	11.25	6.93	.359	-42	0.20	-1	Flow thru - using
0829	"	68	10.34	7.01	0.362	-53	0.09	-2	5 gal bucket
0833	"	95	10.80	7.02	0.364	-55	0.13	-2.4	
0837	"	125	10.80	7.02	0.366	-55	0.10	-2.2	
0840	"	150	10.79	7.02	0.366	-55	0.09	-2.4	sampled
		170	Purged well of 170 gallons prior to sample collection. Too much pressure at hydrant to sample from it - had to sample from end of 50' fire hose.						

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard suite analysis			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION IW-5

KRY-
SAMPLE ID IW-SG-W001

SAMPLE DATE 6-21-06
SAMPLE TIME 1630

PROJECT
PROJECT NUMBER
SAMPLING PERSONNEL D. Shaffer J. Roth
STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP))
WELL DEPTH (TD)(ft below MP/GS) UNK MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__
MP ELEVATION (ft amsl) SWL ELEV (ft amsl) WELL STICKUP (ft +/- GS)
WELL DIAMETER (inside/inches) WELL LOCATION DESCRIPTION
LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____
CASING VOLUME (gals) = ____ FEET OF WATER (TD-SWL) x ____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = ____ gals
ACTUAL VOLUME REMOVED (gals) ____ WATER LEVEL RECOVERY INFORMATION
COMMENTS: Sampled well by attaching 50' garden hose to spigot directly from well plumbing inside building. Pump rate = 5gpm. Ran hose outside to n. side of building. Surface pump Jacuzzi - existing installed.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1603	5								Water started turbid/orange
1610	"	35	8.70	7.15	0.279	113	0.25	92	cleared OK
1615	"	60	8.65	7.27	0.280	-68	0.13	6.4	
1620	"	85	8.67	7.34	0.280	-78	0.12	0.8	
1625	"	110	8.67	7.37	0.281	-83	0.13	-1.2	water clearing well
1632	"	145	8.66	7.39	0.281	-86	0.12	-0.9	
1635	"	160	8.66	7.40	0.281	-87	0.11	-2.0	
		Purged approximately 170 gallons from well prior to sampling. Sampled from end of hose.							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard suite analyses			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID NO DATE ____ TIME ____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION FW-6

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL D. Shaffer J. Roth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) NA

WELL DEPTH (TD)(ft below MP/GS) 80-100 MEAS RPTD MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 6" surface WELL LOCATION DESCRIPTION 30' NW of Stillwater building (office)

SAMPLE ID KRYIW06GW001

SAMPLE DATE 6-21-06

SAMPLE TIME 1715

LOW-FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Sampled well by attaching 50' hose to standpipe spigot next to well - 30' NW of Stillwater office building.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1752	5gal/4hose								
1657	~6.5gpm	37	5.06	7.50	0.278	30.6	0.43	4.8	water pumping clear
1700	"	52	7.54	7.51	0.278	24.6	0.46	3.9	
1705	"	85	7.90	7.55	0.278	24	0.52	7.0	
1710		120	8.32	7.56	0.279	27	0.61	6.5	
		Purged approximately 130 gals prior to sample collection.							
		Sampled all from end of hose.							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analysis suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID NO DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION IW-7

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) N/A

SAMPLE ID KRYIW7GW001

SAMPLE DATE 6-22-06

SAMPLE TIME 0930

WELL DEPTH (TD)(ft below MP/GS) UNK MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION In small shack beneath overhead

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Sampled from faucet on south side of shack - outside. Pressure holding tank inside shack - 10' x 3', Submasible in well - cycling on/off frequently.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0918	5 gals / 70 sec								
0924	4.3 gpm	25	10.93	7.35	0.337	142	0.54	-0.6	water clear
0928		43	10.84	7.38	0.337	140	0.50	-0.8	" "
0933		65	10.84	7.40	0.338	140	0.51	-0.6	
0939		90	10.86	7.40	0.338	136	0.53	-0.4	
0948		130	10.84	7.41	0.338	132	0.58	-0.3	sampled
			Pump off						
			Purged approximately 140 gallons prior to sample collection. Sampled from end of hose.						

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical	suite.		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION IW-8

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) UNK

SAMPLE ID KRYIW8GW001

SAMPLE DATE 6-22-06

SAMPLE TIME 10:15

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION McKelvey & Wilkens water supply well for cement trucks

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ___

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Sampled from overflow hose & valve, Turned on large pump to overhead fill pipe - ran for approximately 5 mins.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1008									
	large	UNK	9.42	7.42	0.386	148	1.08	-1.5	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analysis	suite		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW1

PROJECT KRY

PROJECT NUMBER S1176

SAMPLING PERSONNEL D. Donohue

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

SAMPLE ID KRY RW1GW001

SAMPLE DATE 6/28/06

SAMPLE TIME 1545

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: No well log; well has manifold & feeds 4 residences; 6" casing w/ ~80 gal(?) pressure Tank

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1514	7.5								parameters measured in
									5 gal bucket.
1545			7.81	7.51	0.302	113.7	3.55	0.3	sample collected at
collect sample									spigot on pump house,
									"downstream" of
									pressure tank

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite	5-1L + 5-40ml		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW-6

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Nineteldt

SAMPLE ID KRY RW6 G-Wood

SAMPLE DATE 6/29/06

SAMPLE TIME 15:38

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP** X **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Todd Gardner Owner 95 Nickelson Drive
Used peristaltic pump at well head. No electricity to pump

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		6	10.87	6.92	.422	-65	12.9	912	light brown rusty
									water, no odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW8

MTn Springs Hot Tub

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D. Donohue

SAMPLE ID KRYRW8GW001

SAMPLE DATE 6/28/06

SAMPLE TIME 1215

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: No well log; submersible pump in large pressure tank (cistern)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1145	~6 gpm								Called owner; he started pumping tank.
1155		60	10.33	7.64	0.354	106.6	4.77	clear (813.7)	
									parameters measured in bucket
1215		180	13.17 ±	7.67	0.353	71.7	4.20	clear 831	
	collect sample		10.47	7.68	0.353	60.8	5.80	(clear) 28.7	
									sample collected at tap inside building

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Stnd Suite	5-1L + 5-40ml		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW9 Gipe Residence

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D Donohue

SAMPLE ID KRY RW9 GW 001

SAMPLE DATE 06/23/06

SAMPLE TIME 1400

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) ?

WELL DEPTH (TD)(ft below MP/GS) ? MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) ? SWL ELEV (ft amsl) ___ WELL STICKUP (ft +/- GS) ?

WELL DIAMETER (inside/inches) ___ WELL LOCATION DESCRIPTION inside house; sandpoint; completion unknown

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP** X **MONITORING WELL** ___

CASING VOLUME (gals) = ___ FEET OF WATER (TD-SWL) x ___ GALLONS/FOOT **(1/25(TD-SWL)X(DIA)^2)** = ___ gals

ACTUAL VOLUME REMOVED (gals) ___ WATER LEVEL RECOVERY INFORMATION ___

COMMENTS: ~~1355~~ well is sandpoint inside house; shallow.

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1325	5 gpm		10.7	7.46	0.330	117.1	3.0 ~~2.38~~	-0.5	Parameters collected in
1345			10.1	7.52	0.330	121.5	3.13	-0.2	bucket
1400			9.76	7.54	0.331	116.4	3.57	-0.4	
Collect Sample									

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
PCP	1L amber	1 L	cool 4°C
VOC	40 ml VOA	3 - 40 ml	HCL
SVOC	amber glass	2 L	4°C
EPH ~~TPH~~	1 liter amber	2 L	4
VPH	40 ml VOA	2 40 ml	H_2SO_4 HCL

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID ___ DATE ___ TIME ___

Gipe Residence - Sample collected at spigot at west side of house. Shallow well. No water softener on these outside lines, but filter for rust.

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW-9A

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D. Donahue

SAMPLE ID KRYRW96W001A

SAMPLE DATE 6/27/06

SAMPLE TIME 1100

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Shallow Irrigation well outside Mr. Gipes House - NW corner. Surface pump

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1034	10 gpm	0					1.33		surface pump -
1040	"	60 gal	8.46	7.62	0.311	52.7	1.33	0.4	~~Sam~~ parameters collected
1045	"	110	8.47 ~~8.47~~	7.65 ~~8.47~~	0.312	34.4	1.35	-0.3	from bucket
1050 ~~1046~~	"	160	8.52	7.71	0.311	16.3	1.34	-0.3	Pump off to complete
									sample labels
1055		0							pump on
1100		~~100~~ 50	8.44	7.61	0.310	8	1.33	0	sample collected from
									garden hose - no spigot
	Total	210							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite	40 ml & 1 liter bottle	5L + 200 ml	HCl, ~~H_2SO_4~~ H_2SO_4

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW-10

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP))

SAMPLE ID KRYRW10GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1340 hrs

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Collected Sample from outside tap - let tap run ≅5 minutes before sampling - Owner says well is 138' deep

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)			14.16	6.93	0.331	106	~~0.30~~	58	Sample at 1340 hrs
							5.43		

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

Home Owner Blaine McGregor -

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW-11
(Lowite; Wallman)

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D. Donohue

SAMPLE ID KRYRW11GW001

SAMPLE DATE 6/28/06
SAMPLE TIME 1030

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) ~30' MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Run both faucets on outside of house; lawn was recently watered
No well log

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1000		No flow							owner says well about 30' deep
		measured;							
		2 sprinklers							
1015			9.6	7.65	0.286	111.3	5.96	0.2	at tap
1030									
	collect	sample	9.02	7.86	0.285	115	6.60	2.1	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRYRW11GW701 DATE 6/28/06 TIME 1100

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION RW 12 Huntley

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D. Donohue

SAMPLE ID KRY RW12GW001

SAMPLE DATE 6/28/06

SAMPLE TIME 1640

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: No well log; depth unknown

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1614	15 gpm								Parameters in bucket.
1624		150	9.62	7.76	0.308	154.8	5.28	~0.7	gw sample from standpipe
	shut off	white ~~fill bott~~							~~closest~~ closest to
	label bottles								well
1639	pump back on								
1640	15 gpm	15	9.73	7.80	0.308	105.7	6.95	~0.7	
1645		75							
	Total	240 gals							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite	5-1L 5-40ml		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION _____

PROJECT KRY

PROJECT NUMBER _____

SAMPLING PERSONNEL RL

SAMPLE ID KRY RW 13 GW001

SAMPLE DATE 7-7-06

SAMPLE TIME 1105 hrs

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP** ✓ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT $(1/25(TD\text{-}SWL)X(DIA)^2)$ = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Bob Stanearts house - sample from Kitchen sink - no outdoor tap. Let sink run 5 min. prior to sampling

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									Did not take
									any water
									quality parameters-
									sample collected
									from kitchen sink.

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

508 Flathead Drive
across from auto repair barn.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWY-3

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL

SAMPLE ID KRYGWY3GW001

SAMPLE DATE 7-6-07

SAMPLE TIME 1455

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 14.02

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: BKgd PID/FID 2/0 ppm Wellhead 2/1 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1420	.3 l/m								Begin Pump
1425		1.5 l	10.95	6.56	0.947	114	10.47	32	
1430		3 l	10.83	6.48	0.948	126	6.41	32	▽ = 14.02
1435		4.5 l	10.81	6.48	0.948	126	6.33	32	
1440		6 l	11.09	6.48	0.948	126	6.19	32	
1445		7.5 l	10.93	6.48	0.952	123	6.05	32	
1450		9 l	10.92	6.48	0.953	123	6.04	32	
1455		10.5 l	10.92	6.48	0.954	125	6.01	32	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWY-4

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.35'

SAMPLE ID ~~GWY~~ KRYGWY4GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1900

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Bkgrd PID/FID 3/1 ppm Well head 5/1 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1825	.3 ℓ/m								Begin pump
1835		3 ℓ	9.90	6.27	0.669	139	1.78	41	∇ = 18.35
1840		4.5 ℓ	9.70	6.27	0.671	124	0.55	35	
1845		6 ℓ	9.67	6.27	0.670	91	0.51	33	mild petro odor to
1850		7.5 ℓ	9.62	6.27	0.667	70	0.38	35	the purge water.
1855		9 ℓ	9.62	6.27	0.667	68	0.36	32	
1900		10.5 ℓ	9.62	6.27	0.666	69	0.38	32	Collect sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite + metals			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWY-10

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL _____

SAMPLE ID KRYGWY10GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1940

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.1 BTOPVC

WELL DEPTH (TD)(ft below MP/GS) 30.1 MEAS X RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1853	.1	.1	11.8	7.7	0.346	18	-1.25	25	-4" PVC -water clear
1858		.6	11.58	7.55	0.340	13.2	-1.30	16	
1904		1.2	11.53	7.49	0.339	10.9	-1.41	16	
1910		1.8	11.35	7.41	0.336	7.3	-1.48	10	
1915		2.3	11.39	7.37	0.336	4.0	-2.92	6	
1921		2.9	11.39	7.37	0.336	2.6	-2.35	6	
1925		3.3	11.4	7.38	0.334	1.5	-2.38	2	
1930		3.8	11.44	7.38	0.335	1.6	-2.35	2	
1935		4.3	11.4	7.38	0.333	1.5	-2.38	2	
1940		4.8	11.41	7.38	0.333	1.5	-2.33	2	X sample 1940

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
std ste.			
Metals			
dioxin-Furans			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWY-12

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL RL

SAMPLE ID KRYGWY12GW001

SAMPLE DATE 7-07-06

SAMPLE TIME 0715

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.27

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = 4" FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0640	.3 l/m								Start pump
0650		3 l	9.88	6.56	0.429	-45	1.78	33	
0700		6 l	9.77	6.55	0.430	-68	0.41	31	∇ = 17.28
0705		7.5 l	9.77	6.55	0.430	-71	0.38	31	
0710		9 l	9.78	6.55	0.430	-72	0.32	30	
0715		10.5 l	9.78	6.55	0.430	-73	0.30	30	Collect sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWY-13

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 16.85

SAMPLE ID KRYGWY13GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1005 hrs

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Bkgd PID/FID 3/0 ppm Well Head 54/0.7 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0930	.3 l/m								Begin Pump
0940		3 l	12.11	6.43	0.522	-28	4.36	85	
0945		4.5 l	11.65	6.48	0.537	-40	4.66	57	∇ = 16.85
0950		6 l	11.66	6.50	0.538	-43	4.85	50	
0955		7.5 l	11.76	6.52	0.536	-44	5.26	48	
1000		9 l	11.77	6.52	0.537	-44	5.27	47	
1005		10.5 l	11.75	6.53	0.537	-43	5.32	47	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWY-14

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 22.17

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

SAMPLE ID KRWGWY14GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 12.55

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = 4" FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: BKgrd PID/FID 5/0 ppm Well Head 10/1 ppm

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1225	.4 l/m								Begin pump
1230		2 l	11.71	6.69	0.472	116	2.78	42	
1235		4 l	10.81	6.58	0.474	120	1.01	27	slow rate to .3 l/m
1240		5.5 l	10.55	6.57	0.475	97	0.37	27	▽ = 22.19 steady
1245		7 l	10.59	6.57	0.473	96	0.32	27	
1250		8.5 l	10.60	6.57	0.471	92	0.34	27	
1255		10 l	10.60	6.57	0.470	92	0.32	27	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite, Metals, Dioxin			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRYGWY14GW701 DATE 7-6-07 TIME 1330 hrs

Duplicate for Dioxin

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-1

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 12.08

WELL DEPTH (TD)(ft below MP/GS) 23.8 (MEAS) RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

SAMPLE ID KRYGWRR01 (GWC01)

SAMPLE DATE 6-29-09

SAMPLE TIME 1115 hrs

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = 11.7 FEET OF WATER (TD-SWL) x 0.16 GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = 1.7 gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: because of petroleum contamination, field parameters were not measured

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1048		—							Strong pole odor,
1055		0.5		NO	FIELD				Gray.
1101		1.0							
1106		2.0		PARAMETERS					
1113		3.0							sampled

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-2

PROJECT KYR

PROJECT NUMBER

SAMPLING PERSONNEL J.R-Th

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 16.62

WELL DEPTH (TD)(ft below MP/GS) 25 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) 2.0

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYGWRR2GW001

SAMPLE DATE 7/5/06

SAMPLE TIME 16:30

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 0.04/4.1 reading 3.2/63.1 no measurable product, probe clean well screen 13-23 bgs Sample Tube at 19' bgs

PURGING/SAMPLING DATA Sample w/ peristaltic pump

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
1535		5	13.2	6.68	.480	-25	2.4	1608	Clear water
									Strong petroleum
		6	Sampled						odor
									meter readings
									questionable

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-3

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL John Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.64

WELL DEPTH (TD)(ft below MP/GS) 26 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft (+) (-) GS) 1

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION

SAMPLE ID KRYGWRR3GW001

SAMPLE DATE 7/6/06

SAMPLE TIME 11:30

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 1.35/7.01 reading
Screen 9-19'

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 11:00									
11:30		5	10.8	6.71	1.138	-101.1	7.2	912	light green water
									strong petroleum
									odor
11:40		6	sample						

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-4

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer

SAMPLE ID KRYGWRR4GW001

SAMPLE DATE 6-29-06

SAMPLE TIME 1240

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.90

WELL DEPTH (TD)(ft below MP/GS) 17 (MEAS) RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Set pump at 14' btoc

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1210									
	0.5L/min	0.5	12.03	7.15	0.860	110	-0.47	2.3	no odor
1222		1.0	11.88	6.92	0.856	144	-0.35	-1.9	
1229		2.0	11.56	6.83	0.855	177	-0.19	-4.8	
1232		2.5	11.48	6.81	0.848	192	-0.41	-8.6	
1239		3.0	11.57	6.79	0.858	209	-0.55	-8.0	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-5

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 16.50

WELL DEPTH (TD)(ft below MP/GS) 23 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) 1.5'

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID ~~Gw~~ KRYGWRR5GW001

SAMPLE DATE 7/5/06

SAMPLE TIME 19:15

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 0.0/7.3 reading 44/1200 Product 16.45' BTOC .05' product screen 13-23 bgs sampled with peristaltic pump

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
18:35									
19:05		5	13.63	6.97	.348	-81.2	10.4	926	clear to light
									grey water
		6	sampled						

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

GWRR-6

WELL IDENTIFICATION GWRR-6

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL John Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 10.19

WELL DEPTH (TD)(ft below MP/GS) 25 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) X

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYGWRR6GW001

SAMPLE DATE 7/6/06
SAMPLE TIME 09:30

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 31.4/3.5 reading 33.5/4.1 Screen 5-15 Set pump tubing at 14 BTOC Sampled with peristaltic pump

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
08:40									
09:05		5	11.01	6.72	1.178	191	7.4	458	light green water
									no oder
09:15		6							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-7

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 12.6

WELL DEPTH (TD)(ft below MP/GS) 16.5 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft (+)/(-) GS) 2

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYGWRR7GW001

SAMPLE DATE 7/6/06

SAMPLE TIME 13:45

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 2.7/8.7 Reading 2.9/11.2 well screen 6-16 product at 11.3 SWL at 12.6 1.3 feet of brown product

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									1.3' of product
									yellow brown
13:00									water with oil
13:45		7	sampled						globules
									sampled with
									peristaltic pump
									at 15.5' BTOC

GROUNDWATER SAMPLES COLLECTED sampled with peristaltic pump

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard suite			
Metals			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-8

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth G. Minefeldt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 21.6'

WELL DEPTH (TD)(ft below MP/GS) 32 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYGWRR8GW001

SAMPLE DATE 6/29/06
SAMPLE TIME 13:45

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID ~~Background~~ ~~[illegible]~~ ~~[illegible]~~ 0.13/-0.12 0.34/1.1
well screen 20.5-30.5 set ~~[illegible]~~ per static tube at 27' bTOC

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
		5 gal	11.74	6.95	.427	165	2.2	918	clear water
									no oder

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRR-9

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.44

WELL DEPTH (TD)(ft below MP/GS) 28 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC) X

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) 2

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYGWRR9GW001

SAMPLE DATE 7/6/06

SAMPLE TIME 19:15

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 136/9.1 reading 2.9/47 well screen 16-26' bgs Sample with peristaltic pump tubing at 22' BTOC

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start)									
18:40									
		5	10.09	6.49	.515	-91.0	1.00	907	grey green water
									oily oder
									no observable
									product

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GW-1

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL D. Shaffer J. Ruth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 11.66

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS ___ (PTD) MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4" WELL LOCATION DESCRIPTION NW corner of fenced in area

SAMPLE ID KRYGW16W001

SAMPLE DATE 6-22-06

SAMPLE TIME 1830hrs

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Existing well GW-1 11.9-21.9 TD=24'
sampled using bladder pump

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1805									
1810	~0.5 L/min	0.5	10.36	6.51	0.435	228	0.56	-5.5	Water pumping clear
1815		1.0	10.10	6.36	0.432	317	0.62	-5.6	
1818		1.5	10.08	6.28	0.432	344	0.63	-5.7	"
1823		2.5	10.03	6.17	0.435	392	0.67	-5.0	
1830		3.5	10.01	6.09	0.435	436	0.62	-5.9	
1835		4.5	10.04	6.03	0.435	455	0.62	-6	
1841		5.5	10.07	5.99	0.436	468	0.63	-5.7	
		Purged 5.5 gallons prior to sample collection							

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard analytical suite			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GW-5

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL J. Ruth Geoff Nikfeldt

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.76

WELL DEPTH (TD)(ft below MP/GS) 24 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 4 WELL LOCATION DESCRIPTION

SAMPLE ID KRYGW5 GW001

SAMPLE DATE 6/27/06

SAMPLE TIME 09:30

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background .98/.35 reading 1.15/1.33
Screen 14-24 ~~Screen~~ pump set at 20.5' bgs

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 08:55	0.5 l/min								
09:03		0.5	11.2	7.24	.398	139	0.18	10.5	No drawdown
09:09		1.5	10.1	6.81	.395	106	0.07	4.2	SWL 17.72
09:15		2.5	10.05	6.91	.395	99	0.06	1.3	SWL 17.78
09:23		3.5	9.98	6.92	.395	104	0.06	0.1	No drawdown
09:28		4.0	10.03	6.94	.395	99	0.07	0.5	
09:35		5.0	10.08	6.96	.396	102	0.06	0.8	

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRM-1

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL _____

SAMPLE ID KRYGWRM1GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1515

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.85

WELL DEPTH (TD)(ft below MP/GS) 25.4 MEAS X RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1425	.1	.1	15.48	7.04	.509	-24.7	-1.48	840	-water slightly opaque
1433		.45	15.15	6.95	.484	-29.8	-1.29	530	-strong petroleum odor
1436		1.0	15.06	6.93	.466	-36.7	-1.17	144	
1444		1.6	14.90	6.91	.466	-38.9	-1.09	140	
1449		2.1	14.27	6.88	.451	-40.6	-1.08	70	clearing
1502		2.4	14.3	6.86	.446	-40.6	-1.06	42	
1507		2.9	14.31	6.88	.446	-40.4	-1.08	12	
1510		3.2	14.3	6.86	.445	-40.2	-1.06	8	
1515	.1	3.7	14.3	6.87	.446	-40.4	-1.08	4	sample 1515 -strong petroleum odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION GWRM-2

KRY-GWRM2GW001

PROJECT _____

PROJECT NUMBER _____

SAMPLING PERSONNEL J. Fabion

SAMPLE ID GWRM2GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1315

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 17.62

WELL DEPTH (TD)(ft below MP/GS) 25.4 MEAS ✓ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: _____

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1230	.1	–	12.79	6.82	.414	-24.2	-1.27	5.7	contaminated well hydrocarbon (diesel) odor
1237	.1	.25	12.65	6.79	.410	-235	-1.16	3.8	
1245	.1	.48	11.87	6.59	.402	-8.4	-1.56	1	- water clear, odor
1252	.1	.95	11.97	6.48	.403	17.3	-1.40	-2	
1300	.1	1.25	11.89	6.39	.401	28.3	-1.24	-4	
1305		1.44	12.08	6.36	.401	35.0	-1.21	-4	
1310		2.0	11.97	6.31	.402	34.8	-1.19	-4	
1312		2.20	11.98	6.34	.402	35.2	-1.20	-4	clear water - odor sheen
1315		2.95	11.97	6.36	.401	35.0	-1.20	-4	Sample 1315

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
std ste.	(5) 1 lambier		
	(5) 40ml VOA		

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION PW-1

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL John Roth

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 18.24

WELL DEPTH (TD)(ft below MP/GS) 25 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC)__

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2 WELL LOCATION DESCRIPTION

SAMPLE ID KRYPW1GW001

SAMPLE DATE 7/7/06

SAMPLE TIME 10:00

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** X

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: PID/FID Background 28.1/2.6 Reading 650/5.09
well screen 14.5-24.5

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 09:15									
~~09~~									
09:40		4	11.55	6.71	1.603	-96	1.32	917	dark olive green
									water
									Strong petroleum
									odor
									Slight ~~sheen~~ JM
09:50		5.5	Sample						scum

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Standard Suite			
Metals			
Dioxins			

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

collected MS/MSD samples for Dioxins

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION PW-3

PROJECT KRY
PROJECT NUMBER
SAMPLING PERSONNEL SA RL
STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 15.02

SAMPLE ID KRYPW3GW001
SAMPLE DATE 6-29-06
SAMPLE TIME ~~1120~~ 1147

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) X
MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____
WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION flushmount

LOW—FLOW SAMPLING DATA: SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)²)*** = _____ gals
ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: ambient PID|FID: 0|2ppm Reading: 3|2.8ppm (PID|FID)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1117	.3 l/m								Begin Pumping
1120		.9 l	12.37	6.76	0.531	123	4.12	107	
1127		3.0 l	10.79	6.66	0.527	101	1.96	67	
1132		4.5 l	11.12	6.67	0.528	89	1.85	56	
1137		6 l	10.63	6.66	0.528	81	1.74	46	
1142		7.5 l	10.62	6.66	0.527	65	1.71	42	
1147		9 l	10.61	6.66	0.528	65	1.69	41	
~~1150~~									Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite	VOA + 1L	~5L	HCl, H_2SO_4, 4°C

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION NTL mw-04

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 8.73'

SAMPLE ID KRY NTL mw04GW001

SAMPLE DATE 6-29-06

SAMPLE TIME 1435

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: Bottom of well = 17.55'
Bkgrd PID/FID 0/4 wellhead PID/FID 0.7/29

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE ~~(GPM)~~	VOL REMOVED ~~(Gal)~~	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1400	.4 l/m								Begin pumping -
1405		2 l	12.89	6.45	0.932	-48	2.02	144	At start have Fe bacteria
1410		4 l	12.11	6.44	0.943	-55	1.63	132	Purged w/ water - clears up right away
1415		6 l	11.94	6.43	0.944	-60	1.48	60	∇ = 8.81 - stead
1420		8 l	11.88	6.43	0.944	-62	1.00	55	
1425		10 l	11.86	6.43	0.947	-65	0.66	50	Slow rate to .3 l/m
1430		11.5 l	11.80	6.42	0.948	-67	1.21	51	
1435		13.0 l	11.78	6.42	0.948	-71	1.17	53	Collect sample
									Purge water had
									slight petro odor

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRYNTL mw01QE001 DATE 6-29-06 TIME 1500

Rinsate of bladder pump

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION CLCW1

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 22.48

WELL DEPTH (TD)(ft below MP/GS) 28.7 MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)__ Top of Casing (TOC) ✓

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION

SAMPLE ID KRYCLCW1GW001

SAMPLE DATE 7-6-06

SAMPLE TIME 1130

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: 8Kgal PID/FID 3/-2 ppm Well head 48/-2 ppm Bottom of

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1050	.3 l/m								Begin pumping
1100		3 l	11.07	6.41	0.511	79	1.38	44	
1110		6 l	10.91	6.43	0.510	75	1.10	43	
1115		7.5 l	10.83	6.44	0.509	71	0.99	40	
1120		9 l	10.76	6.44	0.509	70	0.98	40	
1125		10.5 l	10.75	6.44	0.508	70	0.98	40	
									Collect sample at 1130

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION SW-9

PROJECT KRY

PROJECT NUMBER

SAMPLING PERSONNEL JA, RL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) 13.02

SAMPLE ID KRYSW9GW001

SAMPLE DATE 6-29-06

SAMPLE TIME 0935

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC) X

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) 2" WELL LOCATION DESCRIPTION _____

LOW-FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP____ MONITORING WELL ____**

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: ambient PID/FID: 0.11/0.90 ppm Reading: 0.4/1.8 ppm (PID/FID)

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 0910	Start pump								.3 l/m
0915		1.5 l	10.96	6.23	1,241	1	2.31	31	Purge water has
0920		3 l	10.45	6.24	1,234	0	1.07	31	petroleum odor
0925		4.5 l	10.35	6.25	1,202	-11	0.78	28	
0930		6 l	10.33	6.25	1.163	-13	0.41	27	
0935		7.5 l	10.33	6.25	1.156	-14	0.42	27	Collect Sample

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
Std Suite		~10L	

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID KRYSW9GW70b DATE 6/29/06 TIME 1000

Duplicate

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION PWS 1

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP))

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS___ RPTD___ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) _____ WELL LOCATION DESCRIPTION

SAMPLE ID KRYPWS1GW001

SAMPLE DATE 6/27/06

SAMPLE TIME 1430

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM:** **RESIDENTIAL/INDUSTRIAL TAP**_____ **MONITORING WELL** _____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION

COMMENTS: Hi vol well - ~1300 gpm ; well feeds reservoir

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1400		5 gal							wells run ~ 4x per day. no purge; collected at sample tap.
		10 gal	16.84	7.65	0.316	130.7	6.39	0.5	
1430	Fill out labels & collect sample								

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE
STD Suite	5L + 40 ml	5L + 5-40 ml	

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
GROUNDWATER SAMPLING DATA SHEET

WELL IDENTIFICATION PWS 2

PROJECT KRY

PROJECT NUMBER 51176

SAMPLING PERSONNEL D. Donohue

SAMPLE ID KRY PWS2GW001

SAMPLE DATE 6/27/06

SAMPLE TIME 1530

STATIC WATER LEVEL (SWL) (ft below Measuring Point (MP)) _____

WELL DEPTH (TD)(ft below MP/GS) _____ MEAS__ RPTD__ MP DESCRIPTION: Ground Surface (GS)___ Top of Casing (TOC)___

MP ELEVATION (ft amsl) _____ SWL ELEV (ft amsl) _____ WELL STICKUP (ft +/- GS) _____

WELL DIAMETER (inside/inches) ____ WELL LOCATION DESCRIPTION _____

LOW—FLOW SAMPLING DATA: **SAMPLE COLLECTED FROM: RESIDENTIAL/INDUSTRIAL TAP**____ **MONITORING WELL** ____

CASING VOLUME (gals) = _____ FEET OF WATER (TD-SWL) x _____ GALLONS/FOOT ***(1/25(TD-SWL)X(DIA)^2)*** = _____ gals

ACTUAL VOLUME REMOVED (gals) _____ WATER LEVEL RECOVERY INFORMATION _____

COMMENTS: 1300 gpm; turbine pump; water supply well runs often to fill reservoir tank

PURGING/SAMPLING DATA

TIME (hr:min)	DISCHARGE RATE (GPM)	VOL REMOVED (Gal)	T (°C)	Ph	SC (mS/cm)	ORP (mv)	DO (mg/L)	Turb (NTU)	Comments
(start) 1515	–	5							sample at spigot
		10	9.59	7.90	0.309	174.9	(7.72)?	(3.5)?	at discharge line in
									break room where
1530	collect	sample							well is located; same
									setup as PWS1.
									no purge - well
									running - runs 4X
									a day

GROUNDWATER SAMPLES COLLECTED

ANALYSIS	CONTAINER TYPE	VOLUME	PRESERVATIVE

QUALITY CONTROL SAMPLES COLLECTED: SAMPLE ID _____ DATE _____ TIME _____

Tetra Tech EM Inc.

MONITORING WELL DEVELOPMENT FORMS

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 100A

Project KR4
Project No.
Date(s) of Installation 5-19-06
Date(s) of Development 6-11-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development rig

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) 6 – 26' bgs
Total Length of Well Casing 28' bgs
Measured Total Depth (TOC) Initial 26.7
Final 27.8
Initial Depth to Water (TOC) 9.6' Date 6-11-06 Time 1230
Stabilized Depth to Water (TOC) 9.6' Date 6-11-06 Time 1350

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X Surging — 2" surge block
X Overpumping — Grundfos
___ Air Lift Pumping
___ Backwashing
X Bailing — 2" stainless steel
___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 17.1 Ft. of water
x 0.163 Gallons/Foot
= 2.79 Gallons per Single Casing Volume
Sand Pack Volume: 17 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 25.12 Gallons (in borehole)
- 2.79 Gallons of Casing Volume
= 22.33 x 0.3 (Assuming porosity = 30%)
= 6.69 Gallons Within Sand Pack
Single Purge Volume: 9.49 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 28.46 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: increments on 500gal tank
Rate of Development 2.2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.2 gpm @ 23 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
4	2.2	1245	9.9	7.8	.382	2157	5.06 mg/L
7	↓	1300	9.97	7.4	.353	2432	4.14 "
25		1315	8.69	7.65	.362	2440	3.75 "
40		1325	8.8	7.3	.358	534	1.48 "
75		1335	8.82	7.57	.351	260	3.09 "
100		1350	8.9	7.29	.346	140	3.04 "

Development Completed at 100 Gallons Discharged. Date: 6-11-06 Time: 1350
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 101A

Project: KRY - Kalispell MT
Project No.:
Date(s) of Installation: 5/19/06
Date(s) of Development: 6/5/06
Personnel/Company: D. Lowrie / Cascade
Type of Rig Used: Development Rig

Casing Diameter/Type: 2"
Borehole Diameter: 6 1/4"
Screened Interval(s): 9 - 29' bgs
Total Length of Well Casing: 31' bgs
Measured Total Depth ~~(TOC)~~ bgs: Initial 30' Final 30'
Initial Depth to Water ~~(TOC)~~ bgs: 14.5 Date 6/5/06 Time 0800
Stabilized Depth to Water (TOC): 14.6 Date 6/5/06 Time 1030

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge rod
- X Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 15.5 Ft. of water
x .163 Gallons/Foot
= 2.53 Gallons per Single Casing Volume
Sand Pack Volume: 15.5 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 22.76 Gallons (in borehole)
- 2.53 Gallons of Casing Volume
= 20.24 x 0.3 (Assuming porosity = 30%)
= 6.07 Gallons Within Sand Pack
Single Purge Volume: 8.60 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 25.8 Gallons
Actual Purge Volume: 192.5 Gallons
Volume Measured by: 55 gal drum
Rate of Development: 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2 gpm @ 28 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
5 gal	2 gpm	0840	9.65	8.02	.299	743.1	1.71
55 gal	)	0859	9.5	7.55	.304	2617	5.60
110 gal	)	0920	10.37	7.68	.302	1201	6.06

Development Completed at 192.5 Gallons Discharged. Date: 6/5/06 Time: 1020
Personnel: S. Allewalt

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 101B

Project KRY
Project No.
Date(s) of Installation 5/20/06
Date(s) of Development 6/2/06
Personnel/Company D. Lowrie / Cascade
Type of Rig Used Develpmt rig

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) 85-95' bgs
Total Length of Well Casing 100'
Measured Total Depth (TOC) Initial 99'
bgs Final 99.5'
Initial Depth to Water
bgs (TOC) 17' Date 6/2/06 Time 1625
Stabilized Depth to Water
(TOC) 17.1' Date 6/2/06 Time 1745

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X Surging — 2" surge block
___ Overpumping
___ Air Lift Pumping
___ Backwashing
X Bailing — 2" bailer (stainless)
___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 200 Gallons
Total Fluids Added: 200 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 82 Ft. of water
x 0.163 Gallons/Foot
= 13.37 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 13.37 Gallons of Casing Volume
= 14.54 x 0.3 (Assuming porosity = 30%)
= 4.36 Gallons Within Sand Pack
Single Purge Volume: 217.73 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 253.2 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 55 gal drums
Rate of Development 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
5 gal	2gpm	1649	11.9	7.45		2700	1.47
55 gal	↓	1705	11.34	7.48	.272	2665	2.45
110 gal	↓	1720	11.71	7.74	.277	2675	3.41

Development Completed at 110 Gallons Discharged. Date: 6/2/06 Time: 1725
Personnel: J Allewalt

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 103A

Project: KRY Kalispell MT
Project No.:
Date(s) of Installation: 5/22/06
Date(s) of Development: 6/5/06
Personnel/Company: D. Lowrie / Cascade
Type of Rig Used: Dvlpmt rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6"/4"
Screened Interval(s): 5-25' bgs
Total Length of Well Casing: 27'
Measured Total Depth (~~TOC~~ bgs) Initial: 27' Final: 27'
Initial Depth to Water (~~TOC~~ bgs): 8' Date: 6/5/06 Time: 1530
Stabilized Depth to Water (TOC): 8' Date: 6/5/06 Time: 1820

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge block
- X Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 19 Ft. of water
x 0.163 Gallons/Foot
= 3.10 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 3.10 Gallons of Casing Volume
= 24.81 x 0.3 (Assuming porosity = 30%)
= 7.44 Gallons Within Sand Pack
Single Purge Volume: 10.54 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 31.6 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 55 gal drum
Rate of Development: 4 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 4gpm @ 24 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
20 gal	4gpm	1750	11.09	6.96	.298	2660	6.85
45 "		1755	10.83	6.79	.336	2440	2.09
85 "		1812	10.79	7.01	.309	222	2.91
110 "		1820	10.65	7.13	.214	160	2.91

Development Completed at 110 Gallons Discharged. Date: 6/5/06 Time: 1830
Personnel: DA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 103B

Project: KRY Kalispell MT
Project No.:
Date(s) of Installation: 5/22/06
Date(s) of Development: 6/5/06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Dvlpmt rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6"
Screened Interval(s): 55-65' bgs
Total Length of Well Casing: 70'
Measured Total Depth (~~TOC~~ bgs) Initial: 69.5 Final: 70'
Initial Depth to Water (~~TOC~~ bgs): 9' Date: 6/5/06 Time: 1335
Stabilized Depth to Water (TOC): 9' Date: 6/5/06 Time: 1555

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge block
- X Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer (stainless)
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 100 Gallons
Total Fluids Added: 100 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 60.5 Ft. of water
x 0.163 Gallons/Foot
= 9.86 Gallons per Single Casing Volume
Sand Pack Volume: 20 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 29.38 Gallons (in borehole)
- 9.86 Gallons of Casing Volume
= 19.52 x 0.3 (Assuming porosity = 30%)
= 5.86 Gallons Within Sand Pack
Single Purge Volume: 115.72 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 147.16 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 55 gal drum
Rate of Development: 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2 gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
25 gal	2 gpm	1450	9.41	7.0	.330	2619	3.31 ; very cloudy
60 gal	"	1515	9.33	7.17	.299	595	4.3 ; cloudy
105 gal	"	1550	9.87	6.9	.185	128.7	5.3 ; clear
							No odors noted

Development Completed at 110 Gallons Discharged. Date: 6/5/06 Time: 1600
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 104A

Project: KRY
Project No.:
Date(s) of Installation: 5/3/06
Date(s) of Development: 5/24/06
Personnel/Company: Dan / Cascade
Type of Rig Used: Develop. rig

Casing Diameter/Type: 2"
Borehole Diameter: 6"
Screened Interval(s): 20-40' bgs
Total Length of Well Casing: 40'
Measured Total Depth (TOC) Initial: 36.3
Final: 38.0
Initial Depth to Water (TOC): 25.1 Date: 5/25/06 Time: 0854
Stabilized Depth to Water (TOC): 25.1 Date: 5/25/06 Time: 1509

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 16 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 11 Ft. of water
x 0.163 Gallons/Foot
= 1.79 Gallons per Single Casing Volume
Sand Pack Volume: 11 Ft. of Saturated Sand Pack
x 1.47 Gallons/Foot (borehole diameter)
= 16.17 Gallons (in borehole)
- 1.79 Gallons of Casing Volume
= 14.38 x 0.3 (Assuming porosity = 30%)
= 4.3 Gallons Within Sand Pack
Single Purge Volume: 16.1 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 48.3 Gallons
Actual Purge Volume: 72 Gallons
Volume Measured by: 55 gal drums
Rate of Development: 1-2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2 @ 35 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
8	bailer	1130					muddy
10	1-2 gpm	1306		Meter			muddy → cloudy
4	"	1325					"
12	bailed			Inoperable			muddy
18	2gpm	1414					Cloudy
20	"	1440					Cloudy → clear

Development Completed at 72 Gallons Discharged. Date: 5/24/06 Time: 1505
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 10SA

Project: KRY - Kalispell MT
Project No.:
Date(s) of Installation: 5/22/06
Date(s) of Development: 6/6/06
Personnel/Company: D. Lowrie / Cascade

Type of Rig Used: Development rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6"
Screened Interval(s): 5-25' bgs
Total Length of Well Casing: 27'
Measured Total Depth ~~(TOC)~~ bgs: Initial 27' bgs; Final 27'

Initial Depth to Water bgs ~~(TOC)~~: 3' Date 6/6/06 Time 0900
Stabilized Depth to Water (TOC): 3' Date 6/6/06 Time 1045

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge rod
- ___ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 24' Ft. of water
x 0.163 Gallons/Foot
= 3.91 Gallons per Single Casing Volume
Sand Pack Volume: 22 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 32.32 Gallons (in borehole)
- 3.91 Gallons of Casing Volume
= 28.41 x 0.3 (Assuming porosity = 30%)
= 8.52 Gallons Within Sand Pack
Single Purge Volume: 12.43 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 37.3 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 55 gal drum
Rate of Development 3.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 3.5 @ 24 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
5 gal	3.5gpm	1000	10.83	7.42	.294	1472	4.92
55 gal	}	1021	9.94	7.35	.291	128	2.84
110 gal	}	1040	9.98	7.49	.291	42	4.78

Development Completed at 110 Gallons Discharged. Date: 6/6/06 Time: 1045
Personnel: SA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 106A

Project: KRY
Project No.:
Date(s) of Installation: 5/17/06
Date(s) of Development: 6/6/06
Personnel/Company: Dan Lowrie / Cascade

Type of Rig Used: Dvlpmt Rig

Casing Diameter/Type: 2"
Borehole Diameter: 6"
Screened Interval(s): 6 - 26' bgs
Total Length of Well Casing: 28.5'
Measured Total Depth (~~TOC~~ bgs) Initial: 28.5'
Final: 28.5'

Initial Depth to Water
bgs (~~TOC~~): 8.3' Date: 6/6/06 Time: 1410
Stabilized Depth to Water
(TOC): 8.3' Date: 6/6/06 Time: 1545

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge rod
- ___ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 20.2 Ft. of water
x .163 Gallons/Foot
= 3.29 Gallons per Single Casing Volume
Sand Pack Volume: 20.7 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 29.67 Gallons (in borehole)
- 3.29 Gallons of Casing Volume
= 26.38 x 0.3 (Assuming porosity = 30%)
= 7.92 Gallons Within Sand Pack
Single Purge Volume: 11.21 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 33.6 Gallons
Actual Purge Volume: 30 Gallons
Volume Measured by: 55 gal drum
Rate of Development: 4 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 4gpm @ 25 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
5 gal	4gpm	1415	12.11	6.8	.373	529.8	3.27 mg/L
25 gal	"	1540	11.9	5.57	.269	71.8	0.86 "

Development Completed at 30 Gallons Discharged. Date: 6/6/06 Time: 1545
Personnel: SA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 106B

Project: KRY Kalispell MT
Project No.:
Date(s) of Installation: 5-19-06
Date(s) of Development: 6/6/06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Dvlpmt rig

Casing Diameter/Type: 2"
Borehole Diameter: 6"
Screened Interval(s): 73-83'
Total Length of Well Casing: 88'
Measured Total Depth (~~TOC~~ bgs) Initial: 81' Final: 88'
Initial Depth to Water (~~TOC~~ bgs): 7.9 Date: 6/6/06 Time: 1045
Stabilized Depth to Water (TOC): 8 Date: 6/6/06 Time: 1220

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" block (surge)
- X Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 73 Ft. of water
x 0.163 Gallons/Foot
= 11.89 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.4169 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 11.89 Gallons of Casing Volume
= 16.021 x 0.3 (Assuming porosity = 30%)
= 4.81 Gallons Within Sand Pack
Single Purge Volume: 16.7 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 50.1 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 55 gallon drums
Rate of Development: 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2gpm @ 79 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
25 gal	2gpm	1153	10.44	7.49	.220	2642	1.32 mg/L
60 "	↓	1205	10.24	7.46	.302	296.2	3.30 " ; cloudy
110 "	↓	1220	10.48	7.62	.219	146.1	4.36 " ; clear

Development Completed at 110 Gallons Discharged. Date: 6/6/06 Time: 1225
Personnel: SA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 107A

Project KRY
Project No.
Date(s) of Installation 5/2/06
Date(s) of Development 5/24/06
Personnel/Company Dan / Cascade

Type of Rig Used Developmt rig

Casing Diameter/Type 2"
Borehole Diameter 6"
Screened Interval(s) 9-29
Total Length of Well Casing 29
Measured Total Depth (TOC) Initial 31.7
Final 31.7

Initial Depth to Water (TOC) 17.2 Date 5/24/06 Time 1444
Stabilized Depth to Water (TOC) 17.2 Date 5/24/06 Time 1639

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 0-10 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 14.5 Ft. of water
x 0.163 Gallons/Foot
= 2.36 Gallons per Single Casing Volume
Sand Pack Volume: 14.5 Ft. of Saturated Sand Pack
x 1.47 Gallons/Foot (borehole diameter)
= 21.3 Gallons (in borehole)
- 2.36 Gallons of Casing Volume
= 18.96 x 0.3 (Assuming porosity = 30%)
= 5.7 Gallons Within Sand Pack
Single Purge Volume: 18.1 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 54.3 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 2x 55gal drum
Rate of Development 1-2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2gpm @ 27 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
55	1-2gpm	1522	meter				cloudy - clear
55	2 gpm	1607		Inoperable			cloudy - clear

Development Completed at 110 Gallons Discharged. Date: 4/24/06 Time: 1635
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 108A

Project: KRY - Kalispell MT
Project No.:
Date(s) of Installation: 5-19-06
Date(s) of Development: 6-11-06
Personnel/Company: Dan Lowrie / Cascade

Type of Rig Used: Development rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6 1/4"
Screened Interval(s): 10 - 30'
Total Length of Well Casing: 32
Measured Total Depth (TOC) Initial: 32.5
Final: 32.5

Initial Depth to Water (TOC): 20.4 Date: 6-11-06 Time: 1130
Stabilized Depth to Water (TOC): 20.65 Date: 6-11-06 Time: 1230

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 12.1 Ft. of water
x .163 Gallons/Foot
= 1.97 Gallons per Single Casing Volume
Sand Pack Volume: 12 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 17.77 Gallons (in borehole)
- 1.97 Gallons of Casing Volume
= 15.8 x 0.3 (Assuming porosity = 30%)
= 4.74 Gallons Within Sand Pack
Single Purge Volume: 6.71 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 20.13 Gallons
Actual Purge Volume: 25 Gallons
Volume Measured by: 55 gallon drum
Rate of Development: 1.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 1.5 gpm @ 25 Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O. Clarity, Odor, PID Readings, Other:
2	1.5	1145	9.48	7.48	0.355	2613	4.84 mg/L
7		1202	10.53	7.26	.358	267	2.4
9		1207	10.41	7.3	.358	176	2.3
12		1210	10.36	7.3	.358	119	2.19
15		1213	10.34	7.31	.358	111	2.05
20		1218	10.34	7.31	.358	51	2.04
25	1.5	1222	10.32	7.31	.358	12	2.04

Development Completed at 25 Gallons Discharged. Date: 6-11-06 Time: 1240
Personnel:

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. KRY109A

Project KRY- Kalispell MT
Project No.
Date(s) of Installation ~6/1/06 (5/31/06)
Date(s) of Development 6/7/06
Personnel/Company Dan Lowrie / Cascade

Type of Rig Used Dvlpmt Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 5-25'
Total Length of Well Casing 27'
Measured Total Depth (TOC) Initial 21.5' Final 26.5'

Initial Depth to Water (TOC) 6.9 bgs Date 6/7/06 Time 1020
Stabilized Depth to Water (TOC) 6.9 bgs Date 6/7/06 Time 1145

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X Surging — 2" surge block
X Overpumping — pump
___ Air Lift Pumping
___ Backwashing
X Bailing — 2" bailer
___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ~8 Gallons
Total Fluids Added: ~8 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY9D00QS001

PURGE VOLUME CALCULATION

Casing Volume: 14.6 ~~Barton~~ Ft. of water
x 0.163 Gallons/Foot
= 2.38 Gallons per Single Casing Volume
Sand Pack Volume: 14.6 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 21.45 Gallons (in borehole)
- 2.38 Gallons of Casing Volume
= 19.07 x 0.3 (Assuming porosity = 30%)
= 5.72 Gallons Within Sand Pack
Single Purge Volume: 16.10 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 32.5 Gallons
Actual Purge Volume: 70 Gallons
Volume Measured by: Increments on water tank
Rate of Development ~3.5 Gallons/~~Minute~~ (Hour, Day)
Pumping Rate/Depth ___ @ 15 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
25 gal	~3.5 gpm	1129	16.15	7.78	0.161	2789	5.79 mg/L very cloudy
50 gal	"	1140	16.13	7.68	0.157	173.6	5.57 mg/L slightly cloudy
~70 gal	"	1145	16.15	7.65	0.157	65.7	5.94 mg/L clear

Development Completed at 70 Gallons Discharged. Date: 6/7/06 Time: 1145
Personnel: JAllewalt

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. KRY110A

Project KRY- Kalispell, MT
Project No.
Date(s) of Installation 5/11/06
Date(s) of Development 6/7/06
Personnel/Company Dan Lowrie / Cascade

Type of Rig Used Dvlpmt Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 35-55' bgs
Total Length of Well Casing 56.5
Measured Total Depth ~~(TOC)~~ bgs Initial 56.5' Final 56.5'

Initial Depth to Water (~~TOC~~) 6.8 bgs Date 6/7/06 Time 0800
Stabilized Depth to Water (TOC) 5.7 bgs Date 6/7/06 Time 0950

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" Surge block / rod
- X Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

PURGE VOLUME CALCULATION

Casing Volume: 49.7 Ft. of water
x 0.163 Gallons/Foot
= 8.10 Gallons per Single Casing Volume
Sand Pack Volume: 20 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 29.38 Gallons (in borehole)
- 8.10 Gallons of Casing Volume
= 21.28 x 0.3 (Assuming porosity = 30%)
= 6.384 Gallons Within Sand Pack
Single Purge Volume: 44.48 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 133.44 Gallons
Actual Purge Volume: 150 Gallons
Volume Measured by: Increments on water tank
Rate of Development ~4 Gallons/~~Minute~~ (Hour, Day)
Pumping Rate/Depth @~52 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

FLUIDS ADDED

Lost Drilling Fluid: Gallons
Lost Purge Water: Gallons
Water During Installation: 50* Gallons
Total Fluids Added: 50 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

* not sure if + how much, but due to notes on borehole log RE: heaving Sands I'm assuming some water was added

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
25 gal	4 gpm	0921	9.89	7.61	0.236	311.1	2.67 mg/L
125 gal	4 gpm	0939	9.58	7.41	0.232	170.6	2.53 mg/L
150 gal	"	0946	9.68	7.47	0.232	120.2	3.64 mg/L

Development Completed at 150 Gallons Discharged. Date: 6/7/06 Time: 0950
Personnel: J Allewart

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 110B

Project KRY - Kalispell, MT
Project No.
Date(s) of Installation 5/18/06
Date(s) of Development 6/6/06
Personnel/Company Dan Lowrie / Cascade

Type of Rig Used Develpmt rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6"
Screened Interval(s) 76-86' bgs
Total Length of Well Casing 91' bgs
Measured Total Depth (~~TOC~~ bgs) Initial 80' Final 85' bgs

Initial Depth to Water (~~TOC~~ bgs) 5.5' Date 6/6/06 Time 1600
Stabilized Depth to Water (~~TOC~~) 5.7' Date 6/6/06 Time 1800

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X	Surging	2" surge rod
X	Overpumping	Grundfos
	Air Lift Pumping	
	Backwashing	
X	Bailing	2" stainless steel
	Well Jetting	

FLUIDS ADDED

Lost Drilling Fluid: _____ Gallons
Lost Purge Water: _____ Gallons
Water During Installation: 300 Gallons
Total Fluids Added: 300 Gallons
Source of Added Water: Evergreen H2O
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 74.5 Ft. of water
x 0.163 Gallons/Foot
= 12.14 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 12.14 Gallons of Casing Volume
= 15.77 x 0.3 (Assuming porosity = 30%)
= 4.73 Gallons Within Sand Pack
Single Purge Volume: 316.87 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 350.61 Gallons
Actual Purge Volume: 360 Gallons
Volume Measured by: 55 gallon drums
Rate of Development 4 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 4 gpm @ 79 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness _____

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
5 gal	4 gpm	1638	11.82	7.9	0.251	2682	4.3 mg/L
80 gal	↓	1700	11.38	7.3	0.319	307	5.24 "
240 gal	↓	1815	10.10	6.96	0.226	39.5	1.12 mg/L clear

Development Completed at 360 Gallons Discharged. Date: 6/6/06 Time: 1905
Personnel: JA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 111A

Project KRY
Project No.
Date(s) of Installation 5/2/06
Date(s) of Development 5/24/06
Personnel/Company Dan/Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6"
Screened Interval(s) 5-25'
Total Length of Well Casing 25'
Measured Total Depth (TOC) Initial 27
Final 27

Initial Depth to Water (TOC) 19 Date 5/24/06 Time 1059
Stabilized Depth to Water (TOC) 19 Date 5/24/06 Time 1254

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 0-10 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: 15RY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 8 Ft. of water
x 0.163 Gallons/Foot
= 1.3 Gallons per Single Casing Volume
Sand Pack Volume: 8 Ft. of Saturated Sand Pack
x 1.47 Gallons/Foot (borehole diameter)
= 11.8 Gallons (in borehole)
- 1.3 Gallons of Casing Volume
= 10.5 x 0.3 (Assuming porosity = 30%)
= 3.15 Gallons Within Sand Pack
Single Purge Volume: 14.5 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 43.5 Gallons
Actual Purge Volume: 88 Gallons
Volume Measured by: 55 gal drums
Rate of Development 1-2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2 gpm @ 23 Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness Sheen in drum

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
25	1-2 gpm	1120	Meter				Muddy → cloudy (odor)
25	1-2	1143					Muddy → cloudy (odor)
20	1-2	1210	Inoperable →				Muddy → cloudy (odor)
18	1-2	1220					Cloudy → clear (odor)

Development Completed at 88 Gallons Discharged. Date: 4/24/06 Time: 1242
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 111 B

Project: KRY-Kalispell MT
Project No.:
Date(s) of Installation: 5/9/06
Date(s) of Development: 6/2/06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Development rig

Casing Diameter/Type: 2"
Borehole Diameter: 6"
Screened Interval(s): 123-133'
Total Length of Well Casing: 138' ~~(w/ stickup)~~ SA
Measured Total Depth ~~(TOC)~~ bgs: Initial 137' Final 138'
Initial Depth to Water bgs ~~(TOC)~~: 116' bgs Date 6/2/06 Time 1230
Stabilized Depth to Water bgs (TOC): 116' Date 6/2/06 Time 1350

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge rod
- X Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ~200 Gallons
Total Fluids Added: ~200 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 121 Ft. of water
x 0.1163 Gallons/Foot
= 19.723 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.4169 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 19.723 Gallons of Casing Volume
= 8.19 x 0.3 (Assuming porosity = 30%)
= 2.46 Gallons Within Sand Pack
Single Purge Volume: 222.18 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 266.55 Gallons
Actual Purge Volume: 110 Gallons
Volume Measured by: 55 gallon drums
Rate of Development: 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
5 gal	2gpm	1317	11.59	7.64	.311	2676	4.74
55 gal		1328	11.6	7.65	.318	2677	2.29
110 gal		1344	11.06	7.51	.315	148	2.35

Development Completed at 110 Gallons Discharged. Date: 6/2/06 Time: 1345
Personnel: SA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 112A

Project KRY
Project No.
Date(s) of Installation 5/3/06
Date(s) of Development 5/23/06
Personnel/Company Dan/Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6"
Screened Interval(s) 9 - 29 ft
Total Length of Well Casing 29'
Measured Total Depth (TOC) Initial 30.5
Final 29

Initial Depth to Water (TOC) 17.8 Date 5/23/06 Time 1515
Stabilized Depth to Water (TOC) 17.9 Date 5/23/06 Time 1735

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 10 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY400QS001

PURGE VOLUME CALCULATION

Casing Volume: 12.7 Ft. of water
x 0.163 Gallons/Foot
= 2.07 Gallons per Single Casing Volume
Sand Pack Volume: 12 Ft. of Saturated Sand Pack
x 1.47 Gallons/Foot (borehole diameter)
= 18.7 Gallons (in borehole)
- 2.07 Gallons of Casing Volume
= 16.6 x 0.3 (Assuming porosity = 30%)
= 5.0 Gallons Within Sand Pack
Single Purge Volume: 17 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 51 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: 55 gallon drums
Rate of Development 1-2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2 gpm @ 27 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10	1-2 gpm	1550					Muddy
6	1-2	1558		Meter			cloudy
12	1-2	1602					cloudy → clear
22	1-2	1625		Inoperable			cloudy → clear
10	1-2	1643					muddy → clear
20	1-2	1653					cloudy → clear
25	1-2	1715					cloudy → clear

Development Completed at 100 Gallons Discharged. Date: 5/23/06 Time: 1730
Personnel [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 113A

Project: KRY-Kalispell MT
Project No.:
Date(s) of Installation: 5-23-06
Date(s) of Development: 6-11-06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Development Rig

Casing Diameter/Type: 4"
Borehole Diameter: 8 1/4"
Screened Interval(s): 15-35'
Total Length of Well Casing: 37
Measured Total Depth (TOC) Initial: 31.4
Final: 31.0
Initial Depth to Water (TOC): 17.0 Date: 6-11-06 Time: 0730
Stabilized Depth to Water (TOC): 17.0 Date: 6-11-06 Time: 0850

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surgeblock
- ___ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 14.4 Ft. of water
x 0.653 Gallons/Foot
= 9.40 Gallons per Single Casing Volume
Sand Pack Volume: 14.4 Ft. of Saturated Sand Pack
x 2.611 Gallons/Foot (borehole diameter)
= 37.59 Gallons (in borehole)
- 9.40 Gallons of Casing Volume
= 28.2 x 0.3 (Assuming porosity = 30%)
= 8.46 Gallons Within Sand Pack
Single Purge Volume: 17.86 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 53.58 Gallons
Actual Purge Volume: 60 Gallons
Volume Measured by: 55 gallon drum
Rate of Development: 1.3 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 1.3 gpm @ 33 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
7	1.3	0730	9.07	7.87	0.358	2150	5.09
20		0745	9.01	7.46	0.419	2560	4.87
27		0800	9.31	7.73	0.411	240	5.82
45		0818	9.31	7.72	0.410	880	4.82
60	1.3	0840	9.29	7.67	0.412	202	4.12

Development Completed at 60 Gallons Discharged. Date: 6-11-06 Time: 0840
Personnel:

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 113B

Project: KRY-Kalispell MT
Project No.:
Date(s) of Installation: 5-22-06
Date(s) of Development: 6-11-06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Development Rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6"
Screened Interval(s): 102-112
Total Length of Well Casing: 117
Measured Total Depth (TOC) Initial: 114
Final: 121.8
Initial Depth to Water (TOC): 19.95 Date: 6/11/06 Time: 0910
Stabilized Depth to Water (TOC): 20.1 Date: 6/11/06 Time: 1030

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" Stainless Steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 150 Gallons
Total Fluids Added: 150 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY9005S001

PURGE VOLUME CALCULATION

Casing Volume: 94.05 Ft. of water
x 0.163 Gallons/Foot
= 15.33 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 15.33 Gallons of Casing Volume
= 12.58 x 0.3 (Assuming porosity = 30%)
= 3.77 Gallons Within Sand Pack
Single Purge Volume: 169.1 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 207.3 Gallons
Actual Purge Volume: 135 Gallons
Volume Measured by: Increments on 500 gal tank
Rate of Development: 3.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 3.5 gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
10	3.5	0915	10.55	7.74	0.0167	2146	3.66 mg/l
28		0925	10.13	7.17	0.295	2630	5.07
35		0930	10.15	7.60	0.294	2632	5.54
55		0942	10.10	7.67	0.293	2511	4.61
75		0945	10.08	7.65	0.293	485	3.43
95		0955	10.11	7.65	0.293	296	4.57
110		1005	10.11	7.76	0.293	150	4.59
135	3.5	1015	10.06	7.81	0.293	126	4.67

Development Completed at 135 Gallons Discharged. Date: 6/11/06 Time: 1020
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 114A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 5-18-06
Date(s) of Development 6-9-06
Personnel/Company Dan Lawrie / Cascade
Type of Rig Used hand bailer

Casing Diameter/Type 2" PVC
Borehole Diameter 6"/4"
Screened Interval(s) 7-27' bgs
Total Length of Well Casing 29' bgs
Measured Total Depth (TOC) Initial 32'
Final 32'
Initial Depth to Water (TOC) 18.3 Date 6-9-06 Time 0730
Stabilized Depth to Water (TOC) 18.0 Date 6-9-06 Time 0830

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ___ Surging
- ___ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — disposable hand bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 14 Ft. of water
x .163 Gallons/Foot
= 2.282 Gallons per Single Casing Volume
Sand Pack Volume: 13 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 19.10 Gallons (in borehole)
- 2.282 Gallons of Casing Volume
= 16.82 x 0.3 (Assuming porosity = 30%)
= 5.04 Gallons Within Sand Pack
Single Purge Volume: 7.33 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: ~22 Gallons
Actual Purge Volume: 10 Gallons
Volume Measured by: 5 g bucket
Rate of Development ___ Gallons/Minute (Hour, Day)
Pumping Rate/Depth ___ @ ___ Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
- highly contaminated well - DNAPL							
- no parameters		-		10 gallons bailed			0800 - 1000

Development Completed at 10 Gallons Discharged. Date: 6-9-06 Time: 1000
Personnel: [signature] 6-9-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 114B

Project KRY - Kalispell, MT
Project No.
Date(s) of Installation 4-19-06
Date(s) of Development 6-9-06
Personnel/Company Dan Lawrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 108-118' bgs
Total Length of Well Casing 122' bgs
Measured Total Depth (TOC) Initial 109.5
Final 109
Initial Depth to Water (TOC) 18.3 Date 6-9-06 Time 0845
Stabilized Depth to Water (TOC) 18.4 Date 6-9-06 Time 1005

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY9000S001

PURGE VOLUME CALCULATION

Casing Volume: 91.2 Ft. of water
x 0.163 Gallons/Foot
= 14.9 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 14.9 Gallons of Casing Volume
= 13.01 x 0.3 (Assuming porosity = 30%)
= 3.9 Gallons Within Sand Pack
Single Purge Volume: 18.8 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 56.4 Gallons
Actual Purge Volume: 140 Gallons
Volume Measured by: increments on tank (500gal)
Rate of Development ___ Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.5gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
5	2.5	0900	10.86	7.62	0.313	1740	3.38 mg/l
14		0905	10.32	7.42	0.309	2515	2.43
50		0925	10.16	7.47	0.308	2634	1.52
75		0935	10.13	7.59	0.310	1515	2.41
100	2.5	0945	10.13	7.56	0.311	139	2.48
140	2.5	1000	10.13	7.5	0.309	22	2.77

Development Completed at 140 Gallons Discharged. Date: 6-9-06 Time: 1000
Personnel: [signature] 6-9-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 115A

Project KRY
Project No.
Date(s) of Installation 5/4/06
Date(s) of Development 5/24/06
Personnel/Company Dan - cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6"
Screened Interval(s) 12-32' bgs
Total Length of Well Casing 32.5'
Measured Total Depth (TOC) Initial 34.8
Final 34.4

Initial Depth to Water (TOC) 20.1 Date 5/24/06 Time 0834
Stabilized Depth to Water (TOC) 20.1 Date 5/24/06 Time 1050

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 10 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 14.7 Ft. of water
x 0.163 Gallons/Foot
= 2.35 Gallons per Single Casing Volume
Sand Pack Volume: 14.7 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 21.6 Gallons (in borehole)
- 2.35 Gallons of Casing Volume
= 19.26 x 0.3 (Assuming porosity = 30%)
= 5.78 Gallons Within Sand Pack
Single Purge Volume: 18.13 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 34.4 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: 2 x 55 gallon drums
Rate of Development ~2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth ___ @ ___ Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
30	1-2gpm	0850	Meter				Muddy → cloudy
20	"	0915					Muddy → clear
30	2	1000	Inoperable				Muddy → clear
20	2	1020					Cloudy → clear

Development Completed at 100 Gallons Discharged. Date: 5/24/06 Time: 1045
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 115B

Project: KRY - Kalispell MT
Project No.:
Date(s) of Installation: 5/2/06
Date(s) of Development: 6/2/06
Personnel/Company: Dan Lourie / Cascade

Type of Rig Used: Dvlpmt Rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6"
Screened Interval(s): 107-117' bgs
Total Length of Well Casing: 122' bgs
Measured Total Depth ~~(TOC)~~ bgs: Initial 122', Final 122'

Initial Depth to Water bgs ~~(TOC)~~: 20.4 Date 6/2/06 Time 0810
Stabilized Depth to Water (TOC): 20.7 Date 6/2/06 Time 1225

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" surge block
- X Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: Ø Gallons
Total Fluids Added: ___ Gallons
Source of Added Water: ___
Sample Collected of Added Water: Y N
Sample Designation of Added Water: ___

PURGE VOLUME CALCULATION

Casing Volume: 101.6 Ft. of water
x 0.163 Gallons/Foot
= 16.56 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 16.56 Gallons of Casing Volume
= 11.35 x 0.3 (Assuming porosity = 30%)
= 3.40 Gallons Within Sand Pack
Single Purge Volume: 19.96 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 59.88 Gallons
Actual Purge Volume: 220 Gallons
Volume Measured by: 55 gallon drums
Rate of Development ___ Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.), Clarity, Odor, PID Readings, Other:
30	2gpm	1055	11.8	6.41	0.320	152	1.22 mg/L
220	"	1215	11.7	6.5	0.319	98	1.16 mg/L

Development Completed at 220 Gallons Discharged. Date: 6/2/06 Time: 1215
Personnel: SA

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 116A

Project KRY
Project No.
Date(s) of Installation 5/5/06
Date(s) of Development 5/23/06
Personnel/Company Dan/Cascade

Type of Rig Used Development rig

Casing Diameter/Type 2"
Borehole Diameter 6"
Screened Interval(s) 7-27'
Total Length of Well Casing 29' + ~2' stickup
Measured Total Depth (TOC) Initial 30.5
Final 30.2

Initial Depth to Water (TOC) 14.6 Date 5/23/06 Time 1136
Stabilized Depth to Water (TOC) 14.5 Date 5/23/06 Time 1455

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — Stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 10 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 15.9 Ft. of water
x 0.163 Gallons/Foot
= 2.6 Gallons per Single Casing Volume
Sand Pack Volume: 15.9 Ft. of Saturated Sand Pack
x 1.47 Gallons/Foot (borehole diameter)
= 23.4 Gallons (in borehole)
- 2.6 Gallons of Casing Volume
= 20.8 x 0.3 (Assuming porosity = 30%)
= 6.2 Gallons Within Sand Pack
Single Purge Volume: 18.8 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 3~~8~~6.4 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: 55 gal drums
Rate of Development 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth ___ @ ___ Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
25	2 gpm	1218	Meter				cloudy/silty
50	2	1305					clear
10	2	1435		Inoperable		6	cloudy
15	2	1440					cloudy → clear

Development Completed at 100 Gallons Discharged. Date: 5/23/06 Time: 1450
Personnel: B. Antonioli

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. KRY118A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 6/1/2006
Date(s) of Development 6/7/06
Personnel/Company Dan Lowrie / Cascade

Type of Rig Used Dvlpmt Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 6-26'
Total Length of Well Casing 28' bgs
Measured Total Depth (TOC) Initial 27.3 bgs
Final 27.5 bgs

Initial Depth to Water
(TOC) 10 bgs Date 6/7/06 Time 1500
Stabilized Depth to Water
(TOC) 9.58 bgs Date 6/7/06 Time 1625

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X	Surging	2" Surge block
X	Overpumping	pump (Grundfos)
	Air Lift Pumping	
	Backwashing	
X	Bailing	2" bailer
	Well Jetting	

FLUIDS ADDED

Lost Drilling Fluid: _____ Gallons
Lost Purge Water: _____ Gallons
Water During Installation: _____ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 17.3 Ft. of water
x 0.163 Gallons/Foot
= 2.82 Gallons per Single Casing Volume
Sand Pack Volume: 17.3 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 25.41 Gallons (in borehole)
- 2.82 Gallons of Casing Volume
= 22.59 x 0.3 (Assuming porosity = 30%)
= 6.78 Gallons Within Sand Pack
Single Purge Volume: ~9.60 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: ~29 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: Increments on H2O tank
Rate of Development 3.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 3.5gpm @ 24 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
5 gal	~3.5gpm	1555	13.42	7.67	0.205	2719.5	7.74 mg/L cloudy
35 gal	"	1605	9.44	6.93	0.180	2620.4	6.81 mg/L cloudy
~90 gal	"	1621	9.35	7.25	0.181	1542.8	6.51 mg/L slightly cloudy
100 gal		1625					→ clear

Development Completed at 100 Gallons Discharged. Date: 6/7/06 Time: 1630
Personnel: SAllewalt

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. KRY118B

Project KRY - Kalispell MT
Project No.
Date(s) of Installation 6/1/06
Date(s) of Development 6/7/06
Personnel/Company Dan Lowrie / Cascade

Type of Rig Used Dvlpmt Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4
Screened Interval(s) 95 - 105'
Total Length of Well Casing 110'
Measured Total Depth (TOC) Initial 109' bgs
Final 109.5' bgs

Initial Depth to Water (TOC) 10 bgs Date 6/7/06 Time 1600
Stabilized Depth to Water (TOC) 10' bgs Date 6/7/06 Time 1750

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- X Surging — 2" Surge block
- X Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: @ least ___ Gallons
Total Fluids Added: 1 casing vol. Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 99 Ft. of water
x 0.163 Gallons/Foot
= 16.13 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 0.149 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 16.13 Gallons of Casing Volume
= 11.78 x 0.3 (Assuming porosity = 30%)
= 3.53 Gallons Within Sand Pack
Single Purge Volume: 39.32 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: ~79 Gallons
Actual Purge Volume: 105 Gallons
Volume Measured by: 55 gallon drum
Rate of Development 3 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 3 gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
2 gal	3 gpm	1707	11.19	7.5	.274	105	3.55 cloudy
50 gal	"	1723	10.25	7.5	0.201	814.7	4.09 cloudy
85 gal	"	1735	10.17	7.3	0.200	468.0	4.28 cloudy → clearing
100 gal	"	1740	10.37	7.34	0.201	347.1	4.35

Development Completed at 105 Gallons Discharged. Date: 6/7/06 Time: 1745
Personnel: SAllenalt

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 121A

Project: KRY
Project No.:
Date(s) of Installation: 5/4/06
Date(s) of Development: 5/24/06
Personnel/Company: Dan / Cascade
Type of Rig Used: Development Rig

Casing Diameter/Type: 2"
Borehole Diameter: 6"
Screened Interval(s): 12-32' bgs
Total Length of Well Casing: 32
Measured Total Depth (TOC) Initial: 35
Final: 34.9
Initial Depth to Water (TOC): 20.9 Date: 5/24/06 Time: 1652
Stabilized Depth to Water (TOC): 20.9 Date: 5/24/06 Time: 1835

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 10 Gallons
Total Fluids Added: 10 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KR9900QS001

PURGE VOLUME CALCULATION

Casing Volume: 14.1 Ft. of water
x 0.163 Gallons/Foot
= 2.3 Gallons per Single Casing Volume
Sand Pack Volume: 14.1 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 20.7 Gallons (in borehole)
- 2.3 Gallons of Casing Volume
= 18.4 x 0.3 (Assuming porosity = 30%)
= 5.5 Gallons Within Sand Pack
Single Purge Volume: 17.8 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 33.4 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: 55 gallon drums
Rate of Development: 1-2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: ___ @ ___ Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness: Sheen in drum

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
55	1-2 gpm	1703	Meter				Cloudy → clear; odor
55	1-2 "	1752	Inoperable				Cloudy → clear; odor

Development Completed at 100 Gallons Discharged. Date: 5/24/06 Time: 1835
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 121B

Project KRY-Kalispell, MT
Project No.
Date(s) of Installation 4-25-06
Date(s) of Development 6-13-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 4"
Borehole Diameter 8"
Screened Interval(s) 119-129' bgs
Total Length of Well Casing 134' bgs
Measured Total Depth (TOC) Initial 134 (report)
Final
Initial Depth to Water (TOC) 22 Date 6-13-06 Time 1330
Stabilized Depth to Water (TOC) 22 Date 6-13-06 Time 1600

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 4½" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 4½" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 0 Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 112 Ft. of water
x 0.6653 Gallons/Foot
= 73.14 Gallons per Single Casing Volume
Sand Pack Volume: 17 Ft. of Saturated Sand Pack
x 2.611 Gallons/Foot (borehole diameter)
= 44.39 Gallons (in borehole)
- 73.14 Gallons of Casing Volume
= -28.75 x 0.3 (Assuming porosity = 30%)
= -8.63 Gallons Within Sand Pack
Single Purge Volume: 64.51 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 193.53 Gallons
Actual Purge Volume: 200 Gallons
Volume Measured by: increments on 500gal tank
Rate of Development 3.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 3.5gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10		1336	11.1	7.52	.349	2490	3.25
40	3.5		10.91	7.83	.351	2652	4.59
80			11.03	7.35	.319	2646	3.60
120			10.66	7.08	.315	2350	1.49
135			10.68	7.07	.315	2240	1.27
145			10.56	7.13	.313	298	3.52
160			10.69	7.16	.313	130	3.67
200		1600	10.57	7.08	.314	175	3.63

Development Completed at 200 Gallons Discharged. Date: 6-13-06 Time: 1600
Personnel:

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 122A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation Mon 5-31-06
Date(s) of Development 6-12-06
Personnel/Company Dan Lawrie / Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) 7-27' bgs
Total Length of Well Casing 29'
Measured Total Depth (TOC) Initial 27'
Final 29

Initial Depth to Water (TOC) 13.2' Date 6-12-06 Time 1510
Stabilized Depth to Water (TOC) 13.4 Date 6-12-06 Time 1620

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" Surgeblock
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 13.8 Ft. of water
x 0.163 Gallons/Foot
= 2.25 Gallons per Single Casing Volume
Sand Pack Volume: 13.8 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 20.27 Gallons (in borehole)
- 2.25 Gallons of Casing Volume
= 18.02 x 0.3 (Assuming porosity = 30%)
= 5.41 Gallons Within Sand Pack
Single Purge Volume: 7.66 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 22.98 Gallons
Actual Purge Volume: 125 Gallons
Volume Measured by: 55 gallon drum
Rate of Development 2.2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.2 gpm @ 24 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
15	2.2	1530	10.72	7.45	.979	7490	3.27 wooden
40	↓	1538	9.81	7.33	.990	2630	4.47
75		1544	9.76	7.25	.957	2620	3.86
85		1550	9.55	7.20	.982	495	3.89 water clear
100		1600	9.57	7.2	.970	159	3.84
125		1610	9.60	7.20	.964	4.9	3.88

Development Completed at 125 Gallons Discharged. Date: 6-12-06 Time: 1615
Personnel: [signature] 6-12-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

WELL DEVELOPMENT DATA SHEET

WELL NO. 122B

Project: KRY - Kolispell mt
Project No.:
Date(s) of Installation: 5-30-06
Date(s) of Development: 6-12-06
Personnel/Company: Don Lawrz / Cascade
Type of Rig Used: Development Rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6 1/4"
Screened Interval(s): 83-93' bgs
Total Length of Well Casing: 98' bgs
Measured Total Depth (TOC) Initial: 97' bgs
Final: 97.5' bgs
Initial Depth to Water (TOC): 13.1 Date: 6/12/06 Time: 1630
Stabilized Depth to Water (TOC): 13.4 Date: 6/12/06 Time: 1735

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: Ø Gallons
Total Fluids Added: Ø Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 83.9 Ft. of water
x .163 Gallons/Foot
= 13.68 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 13.68 Gallons of Casing Volume
= 14.23 x 0.3 (Assuming porosity = 30%)
= 4.27 Gallons Within Sand Pack
Single Purge Volume: 17.95 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 53.85 Gallons
Actual Purge Volume: 140 Gallons
Volume Measured by: increments on 500gal tank
Rate of Development: 2.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2.5 gpm @ 90 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10	2.5	1630	10.8	7.8	0.310	2645	6.92 no odor
25	↓	1636	10.2	7.75	.314	2050	5.32
50		1646	10.0	7.5	.311	589	5.28
75		1657	10.05	7.5	.312	450	4.24
100		1710	10.29	7.5	.311	421	4.80
120		1720	10.22	7.6	.312	350	4.62
140	↓	1730	10.2	7.6	.312	310	4.48

Development Completed at 140 Gallons Discharged. Date: 6/12/06 Time: 1735
Personnel: J Faubion

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 123A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 4-21-06
Date(s) of Development 6-8-06
Personnel/Company Dan Lawrie / Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 5-25' bgs
Total Length of Well Casing 25' bgs
Measured Total Depth (TOC) Initial 28.45 BTOC 3.4 steel
Final 28.45

Initial Depth to Water (TOC) 15.35 Date 6-8-06 Time 1200
Stabilized Depth to Water (TOC) 15.0 Date " Time 1240

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X Surging — 2" surge rod
X Overpumping — Grundfos
___ Air Lift Pumping
___ Backwashing
X Bailing — 2" stainless steel
___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 13.1 Ft. of water
x 0.163 Gallons/Foot
= 2.14 Gallons per Single Casing Volume
Sand Pack Volume: 13 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 19.24 Gallons (in borehole)
- 2.14 Gallons of Casing Volume
= 17.10 x 0.3 (Assuming porosity = 30%)
= 5.13 Gallons Within Sand Pack
Single Purge Volume: 7.27 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 21.81 Gallons
Actual Purge Volume: 75 Gallons
Volume Measured by: 55 gal drum
Rate of Development 3.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 3.5 gpm @ 23 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
4 gal	3.5 gpm	1207	9.77	7.67	.326	774	3.69 mg/L
15	3.5 gpm	1216	9.44	7.50	.323	95.0	3.55
45	"	1225	9.21	7.52	.323	34.5	3.56

Development Completed at 75 Gallons Discharged. Date: 6-8-06 Time: 1230
Personnel: [signature] 6-8-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 125A

Project: KRI - Kalispell, MT
Project No.:
Date(s) of Installation: 4-26-06
Date(s) of Development: ~~6-8-06~~ 6-14-06
Personnel/Company: Dan Lawrie
Type of Rig Used: Development Rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6 1/4"
Screened Interval(s): ~~26~~ ~~16~~ 14 5-25' bgs
Total Length of Well Casing: 26
Measured Total Depth (TOC) Initial: ~~15.9~~ 25.6
Final: ~~15.0~~ 26.0
Initial Depth to Water (TOC): 15.9 Date: ~~6-8-06~~ 6-14-06 Time: 1330
Stabilized Depth to Water (TOC): 15.6 Date: 6-14-06 Time: 1450

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 9.7 Ft. of water
x 0.163 Gallons/Foot
= 1.58 Gallons per Single Casing Volume
Sand Pack Volume: 9.7 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 14.25 Gallons (in borehole)
- 1.58 Gallons of Casing Volume
= 12.67 x 0.3 (Assuming porosity = 30%)
= 3.80 Gallons Within Sand Pack
Single Purge Volume: 5.38 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 16.14 Gallons
Actual Purge Volume: 25 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development: 1.1 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 1.1 gpm @ 22 Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
5	1.1	1400	12.4	7.17	1.121	2640	4.37
7			13.1	7.14	1.188	1184	4.9
10			12.47	7.21	1.196	1120	6.14
15			12.48	7.2	1.187	940	3.54
25		1450	12.42	7.18	1.182	460	4.27
- well draws down - shed on water							

Development Completed at 25 Gallons Discharged. Date: 6-14-06 Time: 1500
Personnel: [signature] 6-14-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 125B

Project KRY - Kalispell MT
Project No.
Date(s) of Installation 6-1-06
Date(s) of Development 6-14-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 126-116
Total Length of Well Casing 126
Measured Total Depth (TOC) Initial 126'
Final 126'

Initial Depth to Water (TOC) 21.3 Date 6-14-06 Time 1410
Stabilized Depth to Water (TOC) 21.0 Date 6-14-06 Time 1600

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 104.7 Ft. of water
x 0.163 Gallons/Foot
= 17.07 Gallons per Single Casing Volume
Sand Pack Volume: 15 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 22.04 Gallons (in borehole)
- 17.07 Gallons of Casing Volume
= 4.97 x 0.3 (Assuming porosity = 30%)
= 1.49 Gallons Within Sand Pack
Single Purge Volume: 18.56 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 55.68 Gallons
Actual Purge Volume: 155 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development 2.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.5 gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
15	2.5	1430	10.22	7.64	.389	2630	5.34 mg/l
35		1448	10.34	7.6	.389	455	6.9
75		1525	10.24	7.64	.375	432	4.53
135		1546	10.27	7.66	.376	309	4.48
155	2.5	1550	10.21	7.64	.376	76	4.43

Development Completed at 155 Gallons Discharged. Date: 6-14-06 Time: 1600
Personnel: J. Faubion

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 126A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 5-25-06
Date(s) of Development 6-20-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) ~~29.8 19.8 SA~~ 5-25' bgs
Total Length of Well Casing ~~29.8 SA~~ 27' bgs
Measured Total Depth (TOC) Initial 29.8 BTOPVC
Final 29.8
Initial Depth to Water (TOC) 6.45 Date 6-20-06 Time 0930
Stabilized Depth to Water (TOC) 6.45 Date 6-20-06 Time 1000

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 23.35 Ft. of water
x 0.163 Gallons/Foot
= 3.81 Gallons per Single Casing Volume
Sand Pack Volume: 23.4 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 34.37 Gallons (in borehole)
- 3.81 Gallons of Casing Volume
= 30.56 x 0.3 (Assuming porosity = 30%)
= 9.17 Gallons Within Sand Pack
Single Purge Volume: 12.98 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 38.94 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: Increments on 500gal tank
Rate of Development 2.2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.2gpm @ 22 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
7	2.2	0930	9.45	7.87	.290	2611	4.87
25		0938	9.24	7.71	.266	2509	6.70
50		0944	9.18	7.76	.285	223	9.8
75		0952	9.14	7.74	.284	180	5.09
100		1000	9.14	7.72	.285	120	5.1

Development Completed at 100 Gallons Discharged. Date: 6-20-06 Time: 1000
Personnel: [signature] 6-20-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 127A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 5-31-06
Date(s) of Development 6-20-06
Personnel/Company Dan Lowell/Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) ~~30-20' SA~~ 5-25' bgs
Total Length of Well Casing ~~30 bgs~~ 27'
Measured Total Depth (TOC) Initial ~~30.4~~ 29.4
Final 30.0

Initial Depth to Water (TOC) 11.9 Date 6-20-06 Time 1020
Stabilized Depth to Water (TOC) 11.7 Date 6-20-06 Time 1115

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 17.5 Ft. of water
x 0.163 Gallons/Foot
= 2.85 Gallons per Single Casing Volume
Sand Pack Volume: 17.5 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 25.71 Gallons (in borehole)
- 2.85 Gallons of Casing Volume
= 22.86 x 0.3 (Assuming porosity = 30%)
= 6.86 Gallons Within Sand Pack
Single Purge Volume: 9.71 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 29.13 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development 2.2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.2 gpm @ 23 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
12	2.2	1030	9.34	7.5	.547	1515	4.87
25		1040	9.18	7.5	.482	350	5.02
~~50~~			~~11~~	~~7.74~~	~~.010~~	~~23~~	~~6.0~~
~~55~~		1048	9.11	7.47	.436	111	6.21
~~75~~ 100		1052	9.0	7.52	.421	55	5.97
100		1100	9.0	7.5	.421	11	5.27

Development Completed at 100 Gallons Discharged. Date: 6-20-06 Time: 1115
Personnel: 6-20-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 128A

Project KRY-Kalispell, MT
Project No.
Date(s) of Installation 5-8-06
Date(s) of Development 6-21-06
Personnel/Company Dan Lowrie / Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) ~~27-17~~ 5-25' bgs
Total Length of Well Casing 27.5' bgs
Measured Total Depth (TOC) Initial 26.9
Final 27.0
Initial Depth to Water (TOC) 11.55 Date 6-21-06 Time 1450
Stabilized Depth to Water (TOC) 11.0 Date 6-21-06 Time 1615

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 15.35 Ft. of water
x 0.163 Gallons/Foot
= 2.5 Gallons per Single Casing Volume
Sand Pack Volume: 13 Ft. of Saturated Sand Pack
x 1.46 Gallons/Foot (borehole diameter)
= 19.097 Gallons (in borehole)
- 2.5 Gallons of Casing Volume
= 16.597 x 0.3 (Assuming porosity = 30%)
= 4.9791 Gallons Within Sand Pack
Single Purge Volume: 7.4791 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 22.44 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: 5g bucket
Rate of Development ___ Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.2 @ 22 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10	2.2	1503	11.17	7.84	.757	2650	7.69
40		1530	10.94	7.64	.765	603	6.49
60		1545	10.56	7.79	.779	340	6.15
80		1558	10.51	7.70	.807	98	6.40
100		1604	10.50	7.7	.811	11	6.36

Development Completed at 100 Gallons Discharged. Date: 6/21-06 Time: 1610
Personnel: [signature] 6-21-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 128B

Project KRY- Kalispell MT
Project No.
Date(s) of Installation 5-25-06
Date(s) of Development 6-21-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) ~~132-122'~~ JA 145-155
Total Length of Well Casing ~~132~~ JA 160' bgs
Measured Total Depth (TOC) Initial 132
Final 132
Initial Depth to Water (TOC) 23.9 Date 6-21-06 Time 1230
Stabilized Depth to Water (TOC) 23.2 Date 6-21-06 Time 1550

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 100 Gallons
Total Fluids Added: ~~0~~ 100 Gallons
Source of Added Water: JA Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY000QS001

PURGE VOLUME CALCULATION

Casing Volume: 108.1 Ft. of water
x 0.163 Gallons/Foot
= 17.5203 Gallons per Single Casing Volume
Sand Pack Volume: 13 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 18.097 Gallons (in borehole)
- 17.5203 Gallons of Casing Volume
= .5767 x 0.3 (Assuming porosity = 30%)
= .173 Gallons Within Sand Pack
Single Purge Volume: 117.69 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 153.07 Gallons
Actual Purge Volume: 210 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development 3 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 3gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness ___

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
5 gals	3gpm	1238	11.6	8.00	.333	2671.6	10.33
25 gal	" "	1245	12.00	8.00	.291	2277	10.68 – shutdown
40		1345	11.29	7.94	.309	2661	5.96
65		1355	11.3	7.82	.312	2650	5.21
80		1400	11.4	7.82	.310	1620	clearing 5.6
110		1409	11.4	7.90	.316	604	5.15 – shutdown
130		1450	11.4	8.0	.307	411	5.24
150		1505	11.14	7.83	.315	202	6.02
170		1520	11.15	7.77	.317	108	5.4
210		1550	11.15	7.72	.320	12	5.25

Development Completed at 210 Gallons Discharged. Date: ___ Time: 1550
Personnel: [signature] 6-21-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

WELL DEVELOPMENT DATA SHEET

WELL NO. 129A

Project KRY- Kalispell MT
Project No.
Date(s) of Installation 5-24-06
Date(s) of Development 6-14-06
Personnel/Company

Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) ~~30-20'~~ 9-29' bgs
Total Length of Well Casing ~~30'~~ SA 31' bgs
Measured Total Depth (TOC) Initial 29.7
Final 30.0

Initial Depth to Water (TOC) 14.3 Date 6-14-06 Time 0800
Stabilized Depth to Water (TOC) 14.0 Date 6-14-06 Time 0900

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 15.4 Ft. of water
x 0.163 Gallons/Foot
= 2.51 Gallons per Single Casing Volume
Sand Pack Volume: 14.7 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 21.59 Gallons (in borehole)
- 2.51 Gallons of Casing Volume
= 19.08 x 0.3 (Assuming porosity = 30%)
= 5.73 Gallons Within Sand Pack
Single Purge Volume: 8.24 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 24.72 Gallons
Actual Purge Volume: 25 Gallons
Volume Measured by: 5 gallon bucket
Rate of Development 1.1 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 1.1 gpm @ ___ Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness

Development Criteria: - contaminated - sheen on water

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
- poor discharge - well draws down - sheen on water							
5	bailed	0800	10.5	7.16	.976	2600	
10	1.1	0815	10.1	7.14	.978	1900	
25	1.1	0900	9.97	7.16	.974	427	

Development Completed at 25 Gallons Discharged. Date: ___ Time: 0900
Personnel: J- 6-14-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 129B

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 6-5-06
Date(s) of Development 6-14-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) 127-137' bgs
Total Length of Well Casing 142'
Measured Total Depth (TOC) Initial 141.5
Final 142
Initial Depth to Water (TOC) 19.3 Date 6-14-06 Time 1020
Stabilized Depth to Water (TOC) 19.0 Date 6-14-06 Time 1200

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 100 Gallons
Total Fluids Added: 100 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: 122.2 Ft. of water
x 0.163 Gallons/Foot
= 19.92 Gallons per Single Casing Volume
Sand Pack Volume: 20 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 29.38 Gallons (in borehole)
- 19.92 Gallons of Casing Volume
= 9.46 x 0.3 (Assuming porosity = 30%)
= 2.84 Gallons Within Sand Pack
Single Purge Volume: 122.76 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 168.28 Gallons
Actual Purge Volume: 130 Gallons
Volume Measured by: increments on 500gal tank
Rate of Development 2.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.5 gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness ___

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
15g	2.5	1030	11.44	7.78	.348	409	5.8
50			11.11	7.74	.362	800	clear, odor? 4.75
100		1130	11.21	7.75	.386	217	3.55
130	2.5	1145	11.25	7.75	.347	131	4.37

Development Completed at 130 Gallons Discharged. Date: 6-14-06 Time: 1150
Personnel: [signature] 6-14-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 130A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 4-27-06
Date(s) of Development 6-15-06
Personnel/Company Dan Lawrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) ~~45-35~~ SA 25-45' bg
Total Length of Well Casing 45'
Measured Total Depth (TOC) Initial 44.7
Final 45.0
Initial Depth to Water (TOC) _____ Date _____ Time ____
Stabilized Depth to Water (TOC) _____ Date _____ Time ____

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: _____ Gallons
Lost Purge Water: _____ Gallons
Water During Installation: _____ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: _____ Ft. of water
x 0.163 Gallons/Foot
= _____ Gallons per Single Casing Volume
Sand Pack Volume: ___ Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= _____ Gallons (in borehole)
- _____ Gallons of Casing Volume
= _____ x 0.3 (Assuming porosity = 30%)
= _____ Gallons Within Sand Pack
Single Purge Volume: _____ Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: _____ Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development _____ Gallons/Minute (Hour, Day)
Pumping Rate/Depth _____ @ _____ Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness _____

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
20		1510	9.73	7.72	0.443	660	5.33
50			9.71	7.72	0.424	130	3.8
75			9.71	7.70	0.423	88	3.0
100		1545	9.72	7.70	0.423	12	3.02

Development Completed at _____ Gallons Discharged. Date: _____ Time: _____
Personnel: [signature] 6-15-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 130B

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 6-04/06-06
Date(s) of Development 6-15-06
Personnel/Company Dan Lawrie / Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) 163-153
Total Length of Well Casing 169'
Measured Total Depth (TOC) Initial 169 (rep)
Final

Initial Depth to Water (TOC) 26.4 Date 6-15-06 Time 1640
Stabilized Depth to Water (TOC) 18.2 Date 6-15-06 Time 1745

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 142.6 Ft. of water
x 0.163 Gallons/Foot
= 23.24 Gallons per Single Casing Volume
Sand Pack Volume: 19 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 27.91 Gallons (in borehole)
- 23.24 Gallons of Casing Volume
= 4.67 x 0.3 (Assuming porosity = 30%)
= 1.40 Gallons Within Sand Pack
Single Purge Volume: 24.64 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 73.92 Gallons
Actual Purge Volume: 150 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development 2.2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.2 gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10	2.2	1642	10.4	8.5	.284	2960	2.92
50		1650	11.1	7.88	.283	2650	2.97
75		1702	11.2	8.02	.285	1560	5.4
125		1725	11.17	7.93	.284	604	4.18
135		1730	11.2	7.87	.284	451	2.78
150	2.2	1742	11.14	7.88	.285	46	2.82 clear

Development Completed at 150 Gallons Discharged. Date: ___ Time: 1745
Personnel: [signature] 6-15-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 132A

Project: KRY - Kalispell MT
Project No.:
Date(s) of Installation: 5-17-06
Date(s) of Development: 6-12-06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Development Rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6"/4"
Screened Interval(s): 6-26' bgs
Total Length of Well Casing: 28.5'
Measured Total Depth (TOC) Initial: 24.3
Final: 25.0
Initial Depth to Water (TOC): 8' Date: 6-12-06 Time: 1300
Stabilized Depth to Water (TOC): 8' Date: 6-12-06 Time: 1410

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: 0 Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 16.3 Ft. of water
x 0.163 Gallons/Foot
= 2.66 Gallons per Single Casing Volume
Sand Pack Volume: 16.3 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 23.94 Gallons (in borehole)
- 2.66 Gallons of Casing Volume
= 21.28 x 0.3 (Assuming porosity = 30%)
= 6.39 Gallons Within Sand Pack
Single Purge Volume: 9.05 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 27.14 Gallons
Actual Purge Volume: 140 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development: 2.2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth: 2.2 gpm @ 22 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10	2.2	1310	11.5	6.8	.523	2668	— muddy
50		1316	11.24	6.82	.581	1690	11.45
75		1325	11.19	6.85	.580	1670	14.06
100		1340	11.13	6.86	.575	930	10.2
120		1355	11.16	7.0	.574	470	13.07
140	2.2	1405	11.16	6.86	.573	184	7.12

Development Completed at 140 Gallons Discharged. Date: 6-12-06 Time: 1410
Personnel: [signature]

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

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WELL DEVELOPMENT DATA SHEET

WELL NO. 133A

Project KRY-Kalispell MT
Project No.
Date(s) of Installation 5-9-06
Date(s) of Development 6-13-06
Personnel/Company Dan Lowell / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 8-28' bgs
Total Length of Well Casing 26'
Measured Total Depth (TOC) Initial 25.6
Final 25.8

Initial Depth to Water (TOC) 18.3 Date 6-13-06 Time 1030
Stabilized Depth to Water (TOC) 11.3 Date 6-13-06 Time 1140

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

X Surging — 2" surge block
X Overpumping — Grundfos
___ Air Lift Pumping
___ Backwashing
X Bailing — 2" stainless steel
___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 7.3 Ft. of water
x 0.1663 Gallons/Foot
= 1.19 Gallons per Single Casing Volume
Sand Pack Volume: 7.3 Ft. of Saturated Sand Pack
x 1.4169 Gallons/Foot (borehole diameter)
= 10.72 Gallons (in borehole)
- 1.19 Gallons of Casing Volume
= 9.53 x 0.3 (Assuming porosity = 30%)
= 2.86 Gallons Within Sand Pack
Single Purge Volume: 4.05 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 12.15 Gallons
Actual Purge Volume: 130 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development 2.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.5 gpm @ 23 Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness

Development Criteria: contaminated / slight odor

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	(D.O.) Clarity, Odor, PID Readings, Other:
5	2.5	1040	11.17	7.6	.428	1760	3.81 mg/l
30		1050	11.16	6.94	.425	172	3.10
55		1105	10.75	6.60	.412	23	0.91
80		1115	10.61	6.66	.411	16	1.41
105		1125	10.66	7.0	.411	11	2.87
130	2.5	1135	10.65	7.1	.411	11	2.78

Development Completed at 130 Gallons Discharged. Date: 6-13-06 Time: 1140
Personnel:

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 134A

Project KRY - Kalispell MT
Project No.
Date(s) of Installation 5-8-06
Date(s) of Development 6-9-06
Personnel/Company Don Lawrie / Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 8-28' bgs
Total Length of Well Casing 33'
Measured Total Depth (TOC) Initial ~~18.2~~ 32.6
Final ~~18.0~~ 33.0

Initial Depth to Water (TOC) 18.2 Date 6-9-06 Time 1250
Stabilized Depth to Water (TOC) 18.0 Date 6-9-06 Time 1430

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging — 2" surge block
- ✓ Overpumping — Grundfos
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing — 2" stainless steel
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 14.4 Ft. of water
x 0.163 Gallons/Foot
= 2.35 Gallons per Single Casing Volume
Sand Pack Volume: 14.4 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 21.15 Gallons (in borehole)
- 2.35 Gallons of Casing Volume
= 18.8 x 0.3 (Assuming porosity = 30%)
= 5.64 Gallons Within Sand Pack
Single Purge Volume: ~8 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: ~24 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: 55 gallon drum
Rate of Development 2.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2.5 gpm @ 25 Ft. (Below Grd.)
Immiscible Phases Present: Y (N) Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
5	2.5	1300	8.94	7.08	.441	319	3.35 mg/l
10		1305	8.91	7.12	.441	180	3.54
15		1315	8.93	7.09	.444	130	3.47
25		1340	8.9	7.08	.442	80	3.47
35		1355	8.92	7.07	.440	20	3.52
55		1400	8.99	7.07	.439	11	5.54
75		1410	8.90	7.08	.432	2	3.68
100	2.5	1420	8.90	7.06	.437	4	3.48

Development Completed at 100 Gallons Discharged. Date: 6-9-06 Time: 1420
Personnel: [signature] 6-9-06

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

WELL DEVELOPMENT DATA SHEET

WELL NO. KRY135A

Project: KRY - Kalispell MT
Project No.: 4/24/SA
Date(s) of Installation: 4/24/2006
Date(s) of Development: 6/8/06
Personnel/Company: Dan Lowrie / Cascade
Type of Rig Used: Dvlpmt Rig

Casing Diameter/Type: 2" PVC
Borehole Diameter: 6 1/4"
Screened Interval(s): 5-25'
Total Length of Well Casing: 25' bgs
Measured Total Depth (TOC) Initial: 25' bgs
Final: 25' bgs
Initial Depth to Water (TOC): 13.9 bgs Date: 6/8/06 Time: 0810
Stabilized Depth to Water (TOC): 13.9 bgs Date: 6/8/06 Time: 1045

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ___ Surging
- ___ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- X Bailing — 2" bailer
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water: ___
Sample Collected of Added Water: Y N
Sample Designation of Added Water: ___

PURGE VOLUME CALCULATION

Casing Volume: 11.1 Ft. of water
x 0.163 Gallons/Foot
= 1.81 Gallons per Single Casing Volume
Sand Pack Volume: 11.1 Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= 16.31 Gallons (in borehole)
- 1.81 Gallons of Casing Volume
= 14.50 x 0.3 (Assuming porosity = 30%)
= 4.35 Gallons Within Sand Pack
Single Purge Volume: 6.16 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 18.5 Gallons
Actual Purge Volume: 18 Gallons
Volume Measured by: 5 gal buckets
Rate of Development ___ Gallons/Minute (Hour, Day)
Pumping Rate/Depth ___ @ ___ Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness 4"

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
	Due to LNAPL & Contamination of well, YSI probes were not used for parameter msmts						

Development Completed at 18 Gallons Discharged. Date: 6/8/06 Time: 1050
Personnel: JAllewaert

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

WELL DEVELOPMENT DATA SHEET

WELL NO. 137A

Project KRY - Kalispell MT
Project No. _____
Date(s) of Installation 4-25-06
Date(s) of Development 6-20-06
Personnel/Company Dan Lowell / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 5-25' bgs
Total Length of Well Casing 25'
Measured Total Depth (TOC) Initial _____
Final _____
Initial Depth to Water (TOC) _____ Date _____ Time ____
Stabilized Depth to Water (TOC) _____ Date _____ Time ____

DEVELOPMENT TECHNIQUE(S) **EQUIPMENT TYPE/CAPACITY**

____ Surging _____
____ Overpumping _____
____ Air Lift Pumping _____
____ Backwashing _____
____ Bailing _____
____ Well Jetting _____

FLUIDS ADDED

Lost Drilling Fluid: _____ Gallons
Lost Purge Water: _____ Gallons
Water During Installation: _____ Gallons
Total Fluids Added: _____ Gallons
Source of Added Water: _____
Sample Collected of Added Water: Y N
Sample Designation of Added Water: _____

PURGE VOLUME CALCULATION

Casing Volume: _____ Ft. of water
x _____ Gallons/Foot
= _____ Gallons per Single Casing Volume
Sand Pack Volume: ____ Ft. of Saturated Sand Pack
x _____ Gallons/Foot (borehole diameter)
= _____ Gallons (in borehole)
- _____ Gallons of Casing Volume
= _____ x 0.3 (Assuming porosity = 30%)
= _____ Gallons Within Sand Pack
Single Purge Volume: _____ Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: _____ Gallons
Actual Purge Volume: _____ Gallons
Volume Measured by: _____
Rate of Development _____ Gallons/Minute (Hour, Day)
Pumping Rate/Depth _____ @ _____ Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness _____

Development Criteria: _____

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
-highly contaminated							
-disposable bailer only - sheen, odor							
-bailed 10g, turbid water 4:50 - 5:50							

Development Completed at _____ Gallons Discharged. Date: _____ Time: _____
Personnel: _____

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 138A

Project KRY- Kalispell MT
Project No.
Date(s) of Installation 4-25-06
Date(s) of Development 6-26-06
Personnel/Company Don Lawrie / Cascade
Type of Rig Used Hand Bailer

Casing Diameter/Type 2"
Borehole Diameter 6 1/4"
Screened Interval(s) 5-25' bgs
Total Length of Well Casing 25'
Measured Total Depth (TOC) Initial
Final
Initial Depth to Water (TOC) 18.1 Date Time
Stabilized Depth to Water (TOC) Date Time

DEVELOPMENT TECHNIQUE(S) **EQUIPMENT TYPE/CAPACITY**

____ Surging
____ Overpumping
____ Air Lift Pumping
____ Backwashing
____ Bailing
____ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: Gallons
Lost Purge Water: Gallons
Water During Installation: Gallons
Total Fluids Added: Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: Ft. of water
x Gallons/Foot
= Gallons per Single Casing Volume
Sand Pack Volume: Ft. of Saturated Sand Pack
x Gallons/Foot (borehole diameter)
= Gallons (in borehole)
- Gallons of Casing Volume
= x 0.3 (Assuming porosity = 30%)
= Gallons Within Sand Pack
Single Purge Volume: Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: Gallons
Actual Purge Volume: Gallons
Volume Measured by:
Rate of Development Gallons/Minute (Hour, Day)
Pumping Rate/Depth @ Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness

Development Criteria:

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
- highly contaminated - crude oil - immiscible layers very oily and disposable bailer							
- no tools / water parameters taken							
- bailed 5 gal 4-4:45 water clearing of turbidity, lots of dissolved & undissolved crude oil contamination							

Development Completed at Gallons Discharged. Date: Time:
Personnel:

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

Sheet 1 of 1

WELL DEVELOPMENT DATA SHEET

WELL NO. 139A

Project KRY-Kalispell, MT
Project No.
Date(s) of Installation 5-24-06
Date(s) of Development 6-15-06
Personnel/Company Dan Lawrie / Cascade

Type of Rig Used Development Rig

Casing Diameter/Type 4" PVC
Borehole Diameter 8"
Screened Interval(s) 7-27' bgs
Total Length of Well Casing 29'
Measured Total Depth (TOC) Initial 29.0
Final 29.0

Initial Depth to Water (TOC) 9.3 Date 6-15-06 Time 1300
Stabilized Depth to Water (TOC) 9.75 Date 6-15-06 Time 1430

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: ___ Gallons
Total Fluids Added: Ø Gallons
Source of Added Water:
Sample Collected of Added Water: Y N
Sample Designation of Added Water:

PURGE VOLUME CALCULATION

Casing Volume: 19.7 Ft. of water
x 0.653 Gallons/Foot
= 12.86 Gallons per Single Casing Volume
Sand Pack Volume: 17.7 Ft. of Saturated Sand Pack
x 2.611 Gallons/Foot (borehole diameter)
= 46.21 Gallons (in borehole)
- 12.86 Gallons of Casing Volume
= 33.35 x 0.3 (Assuming porosity = 30%)
= 10.00 Gallons Within Sand Pack
Single Purge Volume: 22.86 Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: 68.58 Gallons
Actual Purge Volume: 100 Gallons
Volume Measured by: Increments on 500gal tank
Rate of Development 1.5 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 1.5gpm @ 24 Ft. (Below Grd.)
Immiscible Phases Present: (Y) N Thickness

Development Criteria: sheen, odor

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
5	1.5	1300	9.49	7.15	0.715	2880	2.74 mg/l
10		1304	9.20	7.12	0.801	2606	6.0
35		1320	9.13	7.24	0.722	1498	6.13
65		1350	9.13	7.37	0.689	560	4.78
85		1410	9.13	7.30	0.677	340	2.53
100	1.5	1430	9.13	7.29	0.678	78	2.60

Development Completed at 100 Gallons Discharged. Date: 6-15-06 Time: 1430
Personnel: J. Faubion

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

Tetra Tech EM Inc.

WELL DEVELOPMENT DATA SHEET

WELL NO. 139B

Project KRY - Kalispell MT
Project No.
Date(s) of Installation 6-10-06
Date(s) of Development 6-15-06
Personnel/Company Dan Lowrie / Cascade
Type of Rig Used Development Rig

Casing Diameter/Type 2" PVC
Borehole Diameter 6 1/4"
Screened Interval(s) 166-176' bgs
Total Length of Well Casing 181'
Measured Total Depth (TOC) Initial
Final
Initial Depth to Water (TOC) ~~16.13~~ 16.3 Date 6-15-06 Time 1015
Stabilized Depth to Water (TOC) 16.4 Date 6-15-06 Time 1240

DEVELOPMENT TECHNIQUE(S) / **EQUIPMENT TYPE/CAPACITY**

- ✓ Surging
- ✓ Overpumping
- ___ Air Lift Pumping
- ___ Backwashing
- ✓ Bailing
- ___ Well Jetting

FLUIDS ADDED

Lost Drilling Fluid: ___ Gallons
Lost Purge Water: ___ Gallons
Water During Installation: 100 Gallons
Total Fluids Added: 100 Gallons
Source of Added Water: Evergreen
Sample Collected of Added Water: (Y) N
Sample Designation of Added Water: KRY900QS001

PURGE VOLUME CALCULATION

Casing Volume: ___ Ft. of water
x 0.163 Gallons/Foot
= ___ Gallons per Single Casing Volume
Sand Pack Volume: ___ Ft. of Saturated Sand Pack
x 1.469 Gallons/Foot (borehole diameter)
= ___ Gallons (in borehole)
- ___ Gallons of Casing Volume
= ___ x 0.3 (Assuming porosity = 30%)
= ___ Gallons Within Sand Pack
Single Purge Volume: ___ Gallons (Casing Vol. + Sand Pack Vol. + Fluids Added)
Minimum Purge Volume: ___ Gallons
Actual Purge Volume: 210 Gallons
Volume Measured by: increments on 500 gal tank
Rate of Development 2 Gallons/Minute (Hour, Day)
Pumping Rate/Depth 2gpm @ 100 Ft. (Below Grd.)
Immiscible Phases Present: Y N Thickness ___

Development Criteria: ___

Total Volume Discharged	Rate of Discharge	Time	Temp	pH	Specific* Conductance	Turbidity (NTU)	D.O., Clarity, Odor, PID Readings, Other:
10	2.0	1020	9.77	8.21	.282	2480	3.3
30		1030	9.69	8.08	.303	2617	6.0
60		1050	9.70	8.1	.303	2210	6.0
100		1110	9.71	8.1	.303	1960	5.24
125		1130	9.69	8.1	.302	1340	6.4
150		1150	9.65	8.0	.302	640	5.79
180		1215	9.69	8.06	.302	220	5.68
210	2.0	1240	9.69	8.05	.302	114	5.66

Development Completed at 210 Gallons Discharged. Date: 6-15-06 Time: 1245
Personnel: J. Faubion

Note: * Specific Conductance readings temperature compensated to 25°C. If not, report temperatures at which reading obtained.

Volume of water in well or borehole:

1 inch diameter = 0.041 gallons per foot of depth
2 inch diameter = 0.163 gallons per foot of depth
4 inch diameter = 0.653 gallons per foot of depth
5 inch diameter = 1.020 gallons per foot of depth
6 inch diameter = 1.469 gallons per foot of depth
8 inch diameter = 2.611 gallons per foot of depth

APPENDIX F

GPS AND SURVEY LOCATION INFORMATION

ID	EASTING (X)	NORTHING (Y)
KRY402	800,248.83430	1,478,861.92920
KRY403	800,195.49100	1,478,931.01130
KRY409	800,344.82570	1,479,294.82610
KRY410	800,439.47510	1,479,594.82610
KRY411	800,038.45440	1,479,681.99550
KRY412	800,290.28340	1,479,755.79700
KRY414	800,443.14170	1,479,762.16520
KRY415	800,501.05900	1,479,835.00850
KRY420	800,528.46770	1,479,925.36350
KRY422	800,721.96960	1,480,144.11210
KRY423	800,682.45130	1,480,096.20620
KRY424	800,750.24490	1,480,133.18450
KRY425	800,672.20630	1,480,064.67660
KRY426	800,710.37930	1,480,177.90240
KRY427	800,722.63340	1,480,206.84020
KRY428	800,777.66290	1,480,123.74890
KRY429	800,255.74890	1,480,091.62390
KRY430	800,521.61670	1,480,168.57150
KRY432	798,603.37790	1,480,781.22750
KRY433	798,787.14590	1,480,751.67780
KRY436	798,742.53580	1,480,502.32080
KRY437	799,217.92440	1,480,594.82610
KRY438	798,524.63070	1,480,413.39960
KRY439	798,709.94110	1,480,369.14030
KRY440	798,833.98630	1,480,321.33120
KRY442	798,636.38480	1,480,165.40340
KRY443	798,810.84960	1,480,103.54330
KRY444	799,010.58590	1,480,135.12620
KRY445	799,234.17850	1,480,117.75110
KRY447	799,517.92440	1,479,494.82610
KRY451	799,899.17200	1,479,494.82610
KRY452	799,417.92440	1,479,569.64110
KRY453	799,317.92440	1,479,583.20220
KRY454	799,460.60920	1,479,595.56910
KRY455	799,517.92440	1,479,567.15030
KRY456	799,617.92440	1,479,575.45300
KRY457	799,731.19150	1,479,590.89920
KRY459	799,908.93890	1,479,594.82610
KRY460	799,728.58240	1,479,696.92650
KRY462	799,920.89120	1,479,688.34970
KRY463	799,717.92440	1,479,794.82610
KRY464	798,505.00830	1,479,815.42100
KRY465	798,617.92440	1,479,494.82610
KRY466	798,817.92440	1,479,494.82610
KRY467	798,917.92440	1,479,494.82610
KRY471	799,309.94130	1,479,486.10520
KRY475	799,117.92440	1,479,594.82610
KRY477	798,608.89890	1,479,717.53960
KRY478	798,917.92440	1,479,894.82610
KRY479	799,017.92440	1,479,894.82610
KRY480	799,017.92440	1,479,994.82610

KRY481	799,228.57110	1,479,986.56270
KRY482	799,429.40020	1,479,996.16640
KRY483	799,882.35850	1,480,074.25410
KRY484	798,817.92440	1,479,324.46680
KRY486	799,217.20120	1,479,302.05550
KRY493	798,792.92440	1,479,769.82610
KRY494	798,817.92440	1,479,794.82610
KRY496	798,917.92440	1,479,694.82610
KRY499	798,975.53360	1,479,673.61690
KRY501	798,987.65360	1,479,709.46720
KRY502	799,087.49730	1,479,677.36570
KRY504	799,141.24310	1,479,677.72100
KRY505	799,135.26060	1,479,659.82040
KRY506	799,209.78530	1,479,640.63310
KRY507	799,194.31880	1,479,667.15700
KRY508	799,197.22240	1,479,714.47490
KRY514	799,726.76970	1,479,979.38750
KRY515	799,817.92440	1,480,094.82610
KRY549	798,291.69810	1,478,719.03040
KRY550	797,956.74840	1,478,663.16610
KRY551	797,855.03570	1,480,564.12610
KRY552	798,163.05940	1,480,808.26170
KRY553	798,628.40830	1,481,188.88990
KRY554	799,422.49630	1,481,037.81630
KRY555	799,584.74490	1,480,896.36960
KRY556	801,039.79470	1,480,887.90020
KRY557	801,006.99420	1,480,396.32340
KRY558	800,681.41910	1,479,835.28770
KRY559	800,111.15830	1,478,666.41580
KRY560	798,075.73080	1,478,860.00080
KRY561	800,219.69370	1,480,874.42660
KRY562	801,246.93050	1,477,579.01480
KRY601	800,423.35020	1,478,679.56500
KRY603	800,417.92440	1,478,794.82610
KRY604	800,996.05540	1,478,954.50980
KRY605	800,714.44310	1,479,097.66910
KRY606	800,654.41370	1,479,109.52150
KRY607	800,377.82370	1,479,062.25010
KRY608	800,248.41900	1,479,077.45280
KRY609	800,414.09520	1,479,204.82180
KRY610	800,117.92440	1,479,494.82610
KRY612	800,244.53840	1,479,769.03340
KRY616	800,327.50110	1,479,809.52970
KRY617	800,311.28560	1,479,894.52710
KRY618	800,417.92440	1,479,894.82610
KRY622	799,617.92440	1,479,894.82610
KRY623	799,817.92440	1,479,894.82610
KRY624	799,428.83560	1,479,787.94890
KRY625	799,617.92440	1,479,794.82610
KRY626	799,417.92440	1,479,694.82610
KRY627	799,617.92440	1,479,694.82610
KRY628	799,817.92440	1,479,694.82610

KRY629	798,617.92440	1,479,594.82610
KRY630	798,717.92440	1,479,594.82610
KRY631	798,817.92440	1,479,594.82610
KRY632	798,917.92440	1,479,594.82610
KRY633	799,017.92440	1,479,594.82610
KRY634	799,217.92440	1,479,594.82610
KRY635	799,823.24150	1,479,501.97700
KRY636	799,017.92440	1,479,494.82610
KRY637	799,117.92440	1,479,494.82610
KRY638	799,217.92440	1,479,494.82610
KRY639	799,417.92440	1,479,494.82610
KRY640	799,623.89070	1,479,498.95000
KRY647	799,517.92440	1,479,194.82610
KRY650	799,817.92440	1,479,294.82610
KRY651	799,802.83970	1,479,395.99940
KRY652	799,617.92440	1,479,384.89800
KRY653	799,028.91390	1,479,293.88170
KRY654	799,172.83690	1,479,340.08570
KRY655	799,217.92440	1,479,794.82610
KRY656	799,206.73040	1,479,710.23790
KRY657	799,108.74690	1,479,705.29010
KRY658	798,995.66180	1,479,734.30620
KRY659	799,050.95950	1,479,713.90270
KRY660	799,017.92440	1,479,655.78710
KRY662	798,957.71230	1,479,751.09490
KRY663	798,926.75570	1,479,763.95550
KRY664	799,037.12650	1,479,771.79570
KRY665	799,045.98870	1,479,796.82670
KRY666	800,419.34250	1,478,739.78860
KRY667	798,955.75620	1,479,412.38540
KRY669	799,301.76600	1,479,406.56510
KRY670	798,837.40320	1,479,387.28820
KRY671	800,277.09900	1,479,784.72410
KRY672	800,364.60500	1,479,894.67660

MMA POINTNUMBER	NORTHING	EASTING	DESCRIPTION	ELEVATION-GROUND	ELEVATION-MARK	ELEVATION-CASING
1029	1480045.84963	799588.96824	3-in alu cap sec cor	2924.82		
1	1479148.33591	799569.80495	base	2934.26		
1068	1479795.67019	798681.21339	bldg kp&t	2939.80		
1065	1479616.64463	801036.37046	bldg Laquinta	2929.33		
1033	1480331.31475	798680.74353	bldg N/E	2932.12		
1050	1478835.21705	800485.17025	bldg office max	2933.93		
1066	1478959.03332	800493.28300	bldg office max	2933.93		
1064	1479114.29793	801675.57686	bldg wal-mart	2922.02		
1038	1480152.85258	798473.17523	kry100a surface	2936.71	2936.60	2936.92
1040	1479871.40392	798341.01454	kry101a surface	2941.32	2941.08	2941.34
1039	1479873.53474	798332.52536	kry101b surface	2941.30	2940.80	2941.35
1013	1479227.94765	798422.84576	kry102a	2942.72	2945.27	2946.16
1014	1479227.62778	798431.30756	kry102b	2942.79	2945.26	2945.63
1035	1480565.31196	798509.04568	kry103a	2937.33	2940.30	2940.80
1036	1480558.92503	798511.82993	kry103b	2937.25	2939.94	2940.55
1012	1479157.00195	798796.29854	kry104a	2944.11	2946.68	2947.40
1032	1480264.41571	798980.61413	kry105a	2929.38	2932.27	2932.91
1030	1480076.81035	799175.47778	kry106a	2929.44	2932.25	2933.13
1031	1480074.84283	799182.19322	kry106b	2929.58	2932.42	2932.71
1010	1479223.16462	799175.24597	kry107a	2936.32	2938.92	2939.84
1011	1479223.75807	799180.54799	kry107b	2936.17	2938.73	2939.08
1044	1479715.80638	798832.77967	kry108a	2938.50	2941.11	2941.99
1025	1480178.20356	799720.15764	kry109a	2925.65	2928.85	2929.39
1027	1480017.04371	799592.22972	kry110a	2924.29	2926.90	2927.93
1028	1480008.26329	799592.51558	kry110b	2924.33	2926.96	2927.40
1000	1479305.33211	799534.66845	kry111a	2934.43	2936.61	2937.77
1001	1479299.41267	799535.42224	kry111b	2934.64	2936.96	2937.44
1006	1478962.21190	799461.85776	kry112a	2932.84	2935.59	2936.49
1007	1478965.33652	799449.69302	kry112b	2933.09	2935.78	2936.19
1043	1479766.25381	798823.71560	kry113a	2938.17	2940.77	2941.32
1042	1479761.68975	798832.73058	kry113b	2938.07	2940.96	2941.23
1016	1479596.32355	799812.63628	kry114a	2931.65	2934.65	2935.25
1017	1479597.99814	799807.44598	kry114b	2931.63	2935.09	2935.38
1004	1479032.95793	799831.58222	kry115a	2933.91	2936.78	2937.47
1005	1479034.86424	799826.51529	kry115b	2933.85	2936.68	2937.09
1008	1478757.26712	799718.07228	kry116a	2929.33	2931.53	2932.60

MMA POINTNUMBER	NORTHING	EASTING	DESCRIPTION	ELEVATION-GROUND	ELEVATION-MARK	ELEVATION-CASING
1009	1478750.69776	799716.15153	kry116b	2929.32	2931.97	2932.38
1018	1479947.02292	800042.35685	kry117	2926.08	2929.25	2929.81
1023	1480222.70548	800277.91309	kry118a flush	2924.67	2924.44	2924.81
1024	1480220.75639	800289.70103	kry118b flush	2924.50	2924.21	2924.51
1019	1479945.70763	800233.64818	kry119	2926.45	2929.69	2929.97
1002	1479211.63975	800125.25313	kry121a	2934.25	2937.39	2937.75
1003	1479208.80364	800130.19500	kry121b	2934.02	2937.35	2937.60
1046	1478410.92749	799959.69598	kry122a flush	2930.48	2930.07	2930.39
1047	1478417.68998	799963.86628	kry122b flush	2930.40	2929.80	2930.36
1020	1479920.15674	800476.00120	kry123	2925.78	2928.93	2929.46
1049	1478742.31196	800531.19173	kry125a flush	2935.07	2934.75	2935.18
1048	1478733.96432	800529.17095	kry125b flush	2934.90	2934.40	2935.06
1021	1479831.10306	800569.50266	kry126a	2924.20	2927.54	2927.69
1022	1480095.75003	800673.96396	kry127a	2920.35	2923.05	2923.65
1056	1479471.19439	800742.88193	kry128a flush	2928.25	2928.07	2928.35
1055	1479463.32699	800741.81489	kry128b flush	2928.34	2928.05	2928.41
1061	1478777.32362	800810.83953	kry129a surface	2932.23	2931.84	2932.32
1060	1478783.10878	800818.67823	kry129b surface	2931.47	2931.10	2931.53
1058	1479242.15759	801057.77712	kry130a flush	2927.02	2926.68	2927.18
1057	1479238.46205	801046.49742	kry130b flush	2927.19	2926.85	2927.20
1500	1479905.71237	799319.12769	kry132a	2927.70	2930.75	2931.25
1045	1479398.69809	799019.85014	kry133	2936.01	2939.44	2939.81
1015	1479496.66564	799724.63685	kry134a	2932.15	2935.11	2935.87
1054	1479686.33789	800208.39507	kry135	2927.67	2931.22	2931.64
1052	1479482.37855	800009.34048	kry136	2932.42	2935.39	2936.20
1053	1479561.40995	800396.60200	kry137	2926.84	2929.90	2930.48
1051	1479338.79932	800304.98839	kry138a	2930.74	2934.14	2934.48
1062	1478871.67512	801567.28851	kry139a surface	2919.83	2919.51	2919.90
1063	1478872.69434	801555.32374	kry139b surface	2919.63	2919.24	2919.63
1041	1479712.33791	797590.87053	kry200	2933.08		
1037	1480138.64467	798366.55179	kry201	2930.05		
1034	1480627.31780	798947.73512	kry202	2925.78		
1026	1480193.26329	799709.94124	kry203	2925.01		
1059	1480975.48840	801521.55314	kry204	2911.96		
1067	1478618.96743	801062.18519	ntl-mw3	2912.27	2915.31	2915.66
1069	1478594.67754	801332.58889	ntl-mw4	2914.97	2917.76	2918.16

REMEDIAL INVESTIGATION DATA

(Please see attached compact disk)

Appendix G - 2006 Field Quality Control Samples
Equipment Rinsate Blank Samples
Other

STATION	GWRR-4	GWY-10	KRY111A	KRY111A	KRY121B	KRY122A	KRY125A	KRY130B	KRY130B	KRY200	KRY403
SAMPLE	KRYGWRR4QE001	KRYGWY10QE001	KRY111AQE001	KRY111AQE001	KRY121BQE001	KRY122AQE001	KRY125AQE001	KRY130QE001	KRY130QE001	KRY200QE001	KRY403QE001
COLLECTIONDATE	6/29/2006	7/7/2006	6/16/2006	6/16/2006	6/28/2006	6/26/2006	6/26/2006	4/27/2006	4/27/2006	7/14/2006	4/26/2006
SAMPLETYPE	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
LABUNITS	ug/L	pg/L	pg/L	ug/L	ug/L	ug/L	ug/L	pg/L	ug/L	ug/L	ug/L
1,2,3,4,6,7,8-HPCDD		19	8.8					1.5			
1,2,3,4,6,7,8-HPCDF		3	2.1					1.2			
1,2,3,4,7,8,9-HPCDF		6	3.3					1.4			
1,2,3,4,7,8-HXCDD		15	3.1					1.6			
1,2,3,4,7,8-HXCDF		3.9	1.4					0.87			
1,2,3,6,7,8-HXCDD		12	3.6					1.7			
1,2,3,6,7,8-HXCDF		3.5	1.2					1			
1,2,3,7,8,9-HXCDD		14	3.4					1.8			
1,2,3,7,8,9-HXCDF		2.7	2.1					1.5			
1,2,3,7,8-PECDD		9.3	3.7					1.3			
1,2,3,7,8-PECDF		13	5.7					1.5			
1,2,4-TRICHLOROBENZENE	10			10	10	10	10		10	10	10
1,4-DICHLOROBENZENE	10			10	10	10	10		10	10	10
2,3,4,6,7,8-HXCDF		2.4	1.2					1.8			
2,3,4,7,8-PECDF		7.2	3.7					0.91			
2,3,7,8-TCDD		4.7	3.2					1.5			
2,3,7,8-TCDF		4.4	2.3					0.76			
BIPHENYL	10			10	10	10	10		10	10	10
CARBAZOLE	10			10	10	10	10		10	10	10
HEXACHLOROBUTADIENE	10			10	10	10	10		10	10	10
NAPHTHALENE	1			1	1	1	1		1	1	1
NITROBENZENE	10			10	10	10	10		10	10	10
TAL EXTRACTABLE HYDROCARBONS											

Appendix G - 2006 Field Quality Control Samples
Equipment Rinsate Blank Samples
Other

STATION	KRY410	KRY430	KRY440	KRY440	KRY475	KRY507	KRY558	KRY558	KRY608	KRY612	KRY612	KRY636
SAMPLE	KRY410QE001	KRY430QE001	KRY440QE001	KRY440QE001	KRY475QE001	KRY507QE001	KRY558QE001	KRY558QE001	KRY608QE001	KRY612QE001	KRY612QE001	KRY636QE001
COLLECTIONDATE	4/24/2006	5/11/2006	5/3/2006	5/3/2006	5/17/2006	5/15/2006	5/31/2006	5/31/2006	5/25/2006	4/21/2006	4/21/2006	5/9/2006
SAMPLETYPE	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC	QC
LABUNITS	ug/L	ug/L	pg/L	ug/L	ug/L	ug/L	pg/L	ug/L	ug/L	pg/L	ug/L	mg/L
1,2,3,4,6,7,8-HPCDD			8.4				3.3			4.9		
1,2,3,4,6,7,8-HPCDF			6.7				0.76			1.2		
1,2,3,4,7,8,9-HPCDF			9.5				0.74			1.1		
1,2,3,4,7,8-HXCDD			8.3				0.74			0.71		
1,2,3,4,7,8-HXCDF			3.8				1			1.3		
1,2,3,6,7,8-HXCDD			6.8				0.37			0.91		
1,2,3,6,7,8-HXCDF			3.8				0.27			0.35		
1,2,3,7,8,9-HXCDD			4.8				0.28			0.83		
1,2,3,7,8,9-HXCDF			4.5				0.43			0.52		
1,2,3,7,8-PECDD			8.9				0.43			2.4		
1,2,3,7,8-PECDF			9.3				0.39			0.86		
1,2,4-TRICHLOROBENZENE	10	10		10	10	10		10	10		10	
1,4-DICHLOROBENZENE	10	10		10	10	10		10	10		10	
2,3,4,6,7,8-HXCDF			2.7				0.29			0.4		
2,3,4,7,8-PECDF			5.3				0.35			0.83		
2,3,7,8-TCDD			11				0.63			1.2		
2,3,7,8-TCDF			5.1				0.43			0.99		
BIPHENYL	10	10		10	10	10		10	10		10	
CARBAZOLE	10	10		10	10	10		10	10		10	
HEXACHLOROBUTADIENE	10	10		10	10	10		10	10		10	
NAPHTHALENE	1	1		1	1	1		1	1		1	
NITROBENZENE	10	10		10	10	10		10	10		10	
)TAL EXTRACTABLE HYDROCARBONS												0.32

Appendix G - 2006 Field Quality Control Samples
Equipment Rinsate Blank Samples
Other

STATION	KRY636	KRY636	KRY660	KRY662	NTL-MW-4
SAMPLE	KRY636QE001	KRY636QE001	KRY660QE001	KRY662QE001	KRYNTLMW4QE001
COLLECTIONDATE	5/9/2006	5/9/2006	5/23/2006	5/16/2006	6/29/2006
SAMPLETYPE	QC	QC	QC	QC	QC
LABUNITS	pg/L	ug/L	ug/L	ug/L	ug/L
1,2,3,4,6,7,8-HPCDD	120				
1,2,3,4,6,7,8-HPCDF	15				
1,2,3,4,7,8,9-HPCDF	10				
1,2,3,4,7,8-HXCDD	4				
1,2,3,4,7,8-HXCDF	2.4				
1,2,3,6,7,8-HXCDD	2.5				
1,2,3,6,7,8-HXCDF	2.5				
1,2,3,7,8,9-HXCDD	4.5				
1,2,3,7,8,9-HXCDF	3				
1,2,3,7,8-PECDD	3.2				
1,2,3,7,8-PECDF	4.8				
1,2,4-TRICHLOROBENZENE		10	10	10	10
1,4-DICHLOROBENZENE		10	10	10	10
2,3,4,6,7,8-HXCDF	1.8				
2,3,4,7,8-PECDF	2.7				
2,3,7,8-TCDD	3.4				
2,3,7,8-TCDF	2.7				
BIPHENYL		10	10	10	10
CARBAZOLE		10	10	10	10
HEXACHLOROBUTADIENE		10	10	10	10
NAPHTHALENE		1	1	1	1
NITROBENZENE		10	10	10	10
TAL EXTRACTABLE HYDROCARBONS					

Appendix G - 2006 Groundwater Data
Metals

Sample Station	KRY100A	KRY101A	KRY103A	KRY103B	KRY107A	KRY107B	KRY111A	KRY111B
Sample Identification	KRY100AGW001	KRY101AGW001	KRY103AGW001	KRY103BGW001	KRY107AGW001	KRY107BGW001	KRY111AGW001	KRY111BGW001
Sample Collection Date	6/15/2006	6/14/2006	6/15/2006	6/15/2006	6/16/2006	6/16/2006	6/16/2006	6/16/2006
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Antimony	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	11	7 U	17	3 U	3 U	3 U	9 U	3 U
Barium	293	260	590	107	143	120	512	122
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cobalt	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper	1 U	1 U	1 U	1 U	1 U	1 U	2	1 U
Iron	170	230	8240	30 U	30 U	30 U	450	30 U
Lead	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Manganese	2930	778	2930	69	5 U	47	5320	5 U
Mercury	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Nickel	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ	5 UJ
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Tin	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Vanadium	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Zinc	10 U	10 U	10	10 U	10 U	10	10 U	10 U

Appendix G - 2006 Groundwater Data
Metals

Sample Station	KRY114A	KRY114B	KRY118A	KRY118B	KRY121A	KRY121A	KRY121B	KRY123A
Sample Identification	KRY114AGW001	KRY114BGW001	KRY118AGW001	KRY118BGW001	KRY121AGW001	KRY121AGW701	KRY121BGW001	KRY123AGW001
Sample Collection Date	6/29/2006	7/5/2006	7/5/2006	7/5/2006	6/20/2006	6/20/2006	6/28/2006	6/21/2006
Sample Type	GW	GW	GW	GW	GW	DU	GW	GW
Duplicate of						KRY121AGW001		
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Antimony	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	6	3 U	3 U	3 U	3 U	3 U	3 U	3 U
Barium	329	108	104	101	225	220	1	130
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cobalt	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Iron	300 U	30 U	30 U	30 U	950	940	30 U	30 U
Lead	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Manganese	5290	5 U	5 U	24	698	690	177	5 U
Mercury	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Nickel	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Tin	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Vanadium	10 U	10 U	10 U	10 U	100 U	100 U	10 U	100 U
Zinc	10 U	10 U	10 U	10 U	10 U	10	90	10 U

Appendix G - 2006 Groundwater Data
Metals

Sample Station	KRY126A	KRY127A	KRY129A	KRY129B	GWRR-2	GWRR-5	GWRR-7	GWRR-9
Sample Identification	KRY126AGW001	KRY127AGW001	KRY129AGW001	KRY129BGW001	KRYGWRR2GW00	KRYGWRR5GW00	KRYGWRR7GW00	KRYGWRR9GW00
Sample Collection Date	6/21/2006	6/21/2006	6/27/2006	6/21/2006	7/5/2006	7/5/2006	7/6/2006	7/6/2006
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Antimony	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	3 U	3 U	3 U	3 U	3 U	3 U	9	3 U
Barium	397	**96 J**	178	207	247	144	184	282
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	1 U	1 U	3	10 U	1 U	1 U	2 U	1 U
Cobalt	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper	1 U	1 U	3	1 U	1 U	1 U	1 U	1 U
Iron	30 U	30 U	30 U	30 U	1610	300	18990	3360
Lead	0.5 U	0.5 U	0.5 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U
Manganese	13 U	20 U	628	195	478	774	12570	1679
Mercury	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Nickel	10 U	10 U	20	10 U	10 U	10 U	10 U	10 U
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U	5 U
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Tin	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Vanadium	100 U	100 U	10 U	1 U	10 U	10 U	10 U	10 U
Zinc	10 U	10 U	10 U	10 U	10 U	10	10 U	10 U

Appendix G - 2006 Groundwater Data
Metals

Sample Station	GWY-10	GWY-14	GWY-4	KPT-15	KPT-1	KPT-2	KPT-3	PW-1
Sample Identification	KRYGWY10GW00	KRYGWY14GW00	KRYGWY4GW001	KRYKPT15GW001	KRYKPT1GW001	KRYKPT2GW001	KRYKPT3GW001	KRYPW1GW001
Sample Collection Date	7/6/2006	7/6/2006	7/6/2006	6/28/2006	6/22/2006	6/28/2006	6/28/2006	7/7/2006
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Aluminum	30 U	30 U	30 U	30 U	30 U	30 U	30 U	30 U
Antimony	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Arsenic	3 U	3 U	3 U	3 U	3 U	70	3 U	55
Barium	233	167	307	108	132	388	250	1022
Beryllium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Chromium	1 U	1 U	1 U	10 U	10 U	10 U	10 U	2 U
Cobalt	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper	3 U	1 U	1 U	10 U	1 U	1 U	1 U	1 U
Iron	120	30 U	230	430	30 U	1930	50 U	18020
Lead	0.5 U	0.5 U	0.7	10 U	10 U	10 U	10 U	7.3
Manganese	460	391	539	19	5 U	6420	1234	2936
Mercury	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Nickel	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Selenium	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Silver	5 U	5 U	5 U	5 U	5 UJ	5 U	5 U	5 U
Thallium	0.2 U	0.2 U	0.2 U	0.2 U	10 U	0.2 U	0.2 U	0.2 U
Tin	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Vanadium	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Zinc	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Appendix G - 2006 Sediment Data
EPH and VPH

Sample Station	**KRY200**	**KRY201**	**KRY202**	**KRY203**	**KRY204**
Sample Identification	**KRY200SE001**	**KRY201SE001**	**KRY202SE001**	**KRY203SE001**	**KRY204SE001**
Sample Collection Date	**7/13/2006**	**7/13/2006**	**7/13/2006**	**7/13/2006**	**7/13/2006**
Sample Type	**SD**	**SD**	**SD**	**SD**	**SD**
Duplicate of					
Units	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
EPH					
C11-C22 Aromatics	15	NA	15 U	NA	NA
C19-C36 Aliphatics	14	NA	**10 J**	NA	NA
C9-C18 Aliphatics	15 U	NA	15 U	NA	NA
Total Extractable Hydrocarbons	71	NA	44	NA	NA
VPH					
C5-C8 Aliphatics	3.1 UJ	3 UJ	3.1 UJ	3 U	3.9 UJ
C9-C10 Aromatics	3.1 U	3 UJ	3.1 U	3 U	3.9 U
C9-C12 Aliphatics	3.1 UJ	3 UJ	3.1 UJ	3 U	3.9 UJ
Total Purgeable Hydrocarbons	3.1 U	3 UJ	3.1 U	3 U	3.9 U
Benzene	0.076 U	0.075 UJ	0.077 U	0.074 U	0.098 U
Ethylbenzene	0.076 U	0.075 UJ	0.077 U	0.074 U	0.098 U
M+P-Xylenes	0.076 U	0.075 UJ	0.077 U	0.074 U	0.098 U
Methyl Tert-Butyl Ether	0.15 UJ	0.15 UJ	0.15 UJ	0.15 U	0.2 UJ
Naphthalene	0.15 U	0.15 UJ	0.15 U	0.15 U	0.2 U
O-Xylene	0.076 U	0.075 UJ	0.077 U	0.074 U	0.098 U
Toluene	0.098	0.075 UJ	0.24	0.074 U	0.098 U
Xylenes (Total)	0.076 U	0.075 UJ	0.077 U	0.074 U	0.098 U
Petroleum Hydrocarbons					
Total Extractable Hydrocarbons - Screen	107	20	76	24	35

Appendix G - 2006 Subsurface Soil Data
Dioxins and Furans

Sample Station	KRY127A	KRY127A	KRY603	KRY603	KRY603	KRY610
Sample Identification	KRY127ASB001	KRY127ASB002	KRY603SB001	KRY603SB002	KRY603SB003	KRY610SB001
Sample Collection Date	5/31/2006	5/31/2006	4/26/2006	4/26/2006	4/26/2006	4/24/2006
Sample Type	SB	SB	SB	SB	SB	SB
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	3.5	8	4	8	19	4
Lower Depth	5	9.5	6	10	20	6
1,2,3,4,6,7,8,9-OCDD	200	630	49	1.6 U	3.7 J	2900 J
1,2,3,4,6,7,8,9-OCDF	8.2 J	25	2.2 J	0.11 U (0.24)	0.12 U (0.3)	50 J
1,2,3,4,6,7,8-HPCDD	28	94	9.5	0.32 J	0.17 U (0.84)	380
1,2,3,4,6,7,8-HPCDF	3.5 J	9.9	2.2 J	0.1 U	0.16 U	0.18 U (42)
1,2,3,4,7,8,9-HPCDF	0.28 J	0.63 J	0.3 J	0.11 U	0.094 J	1.8 J
1,2,3,4,7,8-HXCDD	0.1 U	0.36 J	0.21 U (0.42)	0.14 U	0.17 U	2.1 J
1,2,3,4,7,8-HXCDF	0.37 J	1 J	0.09 U (0.39)	0.073 U	0.3 J	3 J
1,2,3,6,7,8-HXCDD	1.5 J	4.9	1.2 J	0.17 U	0.17 U	23
1,2,3,6,7,8-HXCDF	0.055 U (0.26)	0.089 U (0.46)	0.11 U (0.34)	0.076 U	0.089 U	1.6 J
1,2,3,7,8,9-HXCDD	0.39 J	1.2 J	1.1 J	0.16 U	0.13 U	5 J
1,2,3,7,8,9-HXCDF	0.15 J	0.48 J	0.11 U	0.085 U	0.081 U	1.8 J
1,2,3,7,8-PECDD	0.15 J	0.41 J	0.49 J	0.13 U	0.1 U	1.3 J
1,2,3,7,8-PECDF	0.13 J	0.31 J	0.19 U (0.56)	0.26 U	0.098 U	0.32 U (0.85)
2,3,4,6,7,8-HXCDF	0.22 J	0.6 J	0.65 J	0.061 U	0.077 J	1.8 J
2,3,4,7,8-PECDF	0.23 J	0.7 J	1.1 J	0.13 U	0.12 J	0.2 U (1.4)
2,3,7,8-TCDD	0.064 J	0.062 U (0.15)	0.23 U	0.29 U	0.16 U	0.21 U
2,3,7,8-TCDF	0.04 U (0.094)	0.16 J	1.3 J	0.2 U	0.12 U	0.62 J
HPCDD (TOTAL)	47	160	19	0.32 J	0.96 J	680
HPCDF (TOTAL)	13	41	4.5 J	0.11 U	0.42 U	92
HXCDD (TOTAL)	5.6	18	12	0.15 U	1.4 J	87
HXCDF (TOTAL)	6.6	21	5.7	0.074 U	0.52 J	71
PECDD (TOTAL)	0.84 J	2.5 J	1.2 J	0.13 U	0.22 J	4.4 J
PECDF (TOTAL)	1.7 J	5.5	12	0.19 U	0.12 J	22
TCDD (TOTAL)	0.36 J	2.3	0.36 J	0.29 U	0.16 U	0.21 U
TCDF (TOTAL)	0.48 J	0.31 J	12	0.2 U	0.14 J	1.3
2,3,7,8-TCDD (TEQ) (WHO 2005)	0.95286	2.8391	1.56676	0.286176	0.250265	10.43275

Appendix G - 2006 Subsurface Soil Data
Dioxins and Furans

Sample Station	KRY610	KRY612	KRY612	KRY628	KRY628	KRY628
Sample Identification	KRY610SB002	KRY612SB001	KRY612SB002	KRY628SB001	KRY628SB003	KRY628SB004
Sample Collection Date	4/24/2006	4/21/2006	4/21/2006	5/12/2006	5/12/2006	5/12/2006
Sample Type	SB	SB	SB	SB	SB	SB
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	8	4	8	6	14	9.5
Lower Depth	10	6	10	7.5	15.5	14
1,2,3,4,6,7,8,9-OCDD	410 J	1900	240 J	150	1200000 J	310000 N2
1,2,3,4,6,7,8,9-OCDF	8 J	76	13 J	4.4 J	54000 N3	12000 N2
1,2,3,4,6,7,8-HPCDD	62	250	34	19	200000 N3	41000 N2
1,2,3,4,6,7,8-HPCDF	7.4	35	6.3	0.2 U (1.6)	27000	4900
1,2,3,4,7,8,9-HPCDF	0.41 J	2.7 J	0.52 U	0.36 U	1700	300
1,2,3,4,7,8-HXCDD	1 J	3.8 J	0.69 J	0.41 U	97	23
1,2,3,4,7,8-HXCDF	0.57 J	1.6 J	0.42 J	0.31 U (0.41)	2500	490
1,2,3,6,7,8-HXCDD	4.1 J	11	1.8 J	1.2 J	13000	2400
1,2,3,6,7,8-HXCDF	0.13 U (0.4)	1.8 J	0.3 J	0.28 U	660	140
1,2,3,7,8,9-HXCDD	1.5 J	6.8	1.1 J	0.34 U	830	150
1,2,3,7,8,9-HXCDF	0.29 J	1.6 J	0.17 U (0.26)	0.42 U	1200	210
1,2,3,7,8-PECDD	0.15 U (0.46)	1.7 J	0.37 U	0.56 U	23	5.9
1,2,3,7,8-PECDF	0.38 J	0.73 J	0.19 U	0.44 U	670	71
2,3,4,6,7,8-HXCDF	0.16 U (0.31)	2.5 J	0.46 J	0.36 U	0.84 U (850)	0.27 U (190)
2,3,4,7,8-PECDF	0.54 J	1.8 J	0.46 J	0.44 U	1.4 U (970)	240
2,3,7,8-TCDD	0.15 U	0.15 U (0.29)	0.25 U	0.53 U	0.83 U	0.37 J
2,3,7,8-TCDF	0.14 J	0.34 J	0.24 U	0.34 U	180 J	25 J
HPCDD (TOTAL)	110	460	68	32	320000 N3	65000 N2
HPCDF (TOTAL)	21	120	17	5.8	29000	5200
HXCDD (TOTAL)	18	89	18	2 J	31000	5800
HXCDF (TOTAL)	15	46	13	3.3 J	54000	9900
PECDD (TOTAL)	0.68 J	16	2.2 J	0.56 U	75	36
PECDF (TOTAL)	5.5	20	4.8	1.2 J	12000	1800
TCDD (TOTAL)	0.15 U	6.1	0.25 U	0.53 U	5.2	4.4
TCDF (TOTAL)	1.1	6.9	1.5	0.34 U	540	84
2,3,7,8-TCDD (TEQ) (WHO 2005)	2.0974	8.8207	1.43435	1.11172	4741.415	992.3

Appendix G - 2006 Subsurface Soil Data
Dioxins and Furans

Sample Station	KRY656	KRY656	KRY656	KRY666	KRY666
Sample Identification	KRY656SB001	KRY656SB002	KRY656SB003	KRY666SB001	KRY666SB002
Sample Collection Date	5/15/2006	5/15/2006	5/15/2006	4/27/2006	4/27/2006
Sample Type	SB	SB	SB	SB	SB
Duplicate of					
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	4.5	8	15.5	4	9
Lower Depth	5	9.5	17	5	10
1,2,3,4,6,7,8,9-OCDD	1400	3700	110000 N2	8 J	4.4 J
1,2,3,4,6,7,8,9-OCDF	78	190	3000 N2	0.5 J	0.32 J
1,2,3,4,6,7,8-HPCDD	180	490	17000 N2	1.5 J	0.64 J
1,2,3,4,6,7,8-HPCDF	26	72	1700	0.11 U (0.24)	0.23 U
1,2,3,4,7,8,9-HPCDF	0.53 U (1.4)	4.4	94	0.11 U	0.12 U
1,2,3,4,7,8-HXCDD	0.62 U	1.2 J	9.4	0.15 U	0.13 U
1,2,3,4,7,8-HXCDF	2.3 J	0.54 U (7.1)	170	0.08 U (0.14)	0.099 U
1,2,3,6,7,8-HXCDD	9.9	26	1300	0.18 U	0.14 U
1,2,3,6,7,8-HXCDF	0.51 U (0.55)	1.8 J	66	0.12 U	0.059 U (0.079)
1,2,3,7,8,9-HXCDD	0.44 U	2.9 J	82	0.14 U	0.086 U
1,2,3,7,8,9-HXCDF	0.43 U (1)	2.8 J	110	0.14 U	0.12 U
1,2,3,7,8-PECDD	0.31 U	0.4 J	2.6 J	0.12 U	0.18 U
1,2,3,7,8-PECDF	0.39 U (0.5)	0.43 U (1.5)	59	0.13 U	0.12 U
2,3,4,6,7,8-HXCDF	0.43 U (1.1)	3.1 J	99	0.15 J	0.092 J
2,3,4,7,8-PECDF	1.3 J	3.6 J	140	0.29 J	0.18 J
2,3,7,8-TCDD	0.34 U	0.28 U	0.16 U (0.16)	0.18 U	0.28 U
2,3,7,8-TCDF	0.19 U	0.76 J	17 J	0.14 U	0.16 U
HPCDD (TOTAL)	300	800	26000 N2	3 J	1.3 J
HPCDF (TOTAL)	82	270	1800	0.11 U	0.42 U
HXCDD (TOTAL)	25	71	3000	0.35 J	0.17 J
HXCDF (TOTAL)	43	100	2100	1.5 J	0.33 J
PECDD (TOTAL)	0.31 U	0.94 J	7.2	0.12 U	0.18 U
PECDF (TOTAL)	11	31	980	2 J	1.1 J
TCDD (TOTAL)	0.34 U	0.4 J	0.98	0.18 U	0.28 U
TCDF (TOTAL)	0.19 U	2.3	56	0.61 J	0.2 J
2,3,7,8-TCDD (TEQ) (WHO 2005)	4.6479	12.6845	453.63	0.32375	0.345266

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	**KRY103A**	**KRY103A**	**KRY103A**	**KRY105A**	**KRY111A**	**KRY111A**
Sample Identification	**KRY103ASS001**	**KRY103ASS002**	**KRY103ASS003**	**KRY105ASS002**	**KRY111ASS001**	**KRY111ASS002**
Sample Collection Date	**5/22/2006**	**5/22/2006**	**5/22/2006**	**5/22/2006**	**5/2/2006**	**5/2/2006**
Sample Type	**SS**	**SS**	**SS**	**SS**	**SS**	**SS**
Duplicate of						
Units	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**
Upper Depth	**0**	**0**	**0**	**0**	**0**	**0.5**
Lower Depth	**0.5**	**0.5**	**0.5**	**0.5**	**0.167**	**1**
1,2,3,4,6,7,8,9-OCDD	8700	7600	14000	7700	**230 J**	**380 J**
1,2,3,4,6,7,8,9-OCDF	320	300	540	490	**11 J**	**17 J**
1,2,3,4,6,7,8-HPCDD	1100	970	2000	980	23	46
1,2,3,4,6,7,8-HPCDF	160	140	210	180	1.6 U (3.6)	7.7
1,2,3,4,7,8,9-HPCDF	12	8	16	14	1.7 U	0.4 U (0.48)
1,2,3,4,7,8-HXCDD	18	14	58	7.7	1.3 U	0.46 U (1)
1,2,3,4,7,8-HXCDF	8.4	9.2	12	13	0.81 U	0.25 U (0.58)
1,2,3,6,7,8-HXCDD	63	51	150	54	1 U	**2.9 J**
1,2,3,6,7,8-HXCDF	6.6	5.8	9.3	6.4	0.59 U	0.31 U (0.39)
1,2,3,7,8,9-HXCDD	42	32	120	17	1.2 U	**1.5 J**
1,2,3,7,8,9-HXCDF	**3.9 J**	0.24 U (2.8)	**5.5 J**	**4.2 J**	0.86 U	0.37 U
1,2,3,7,8-PECDD	14	9	45	**3 J**	1 U	0.37 U (0.44)
1,2,3,7,8-PECDF	**2.5 J**	**2.3 J**	**4.1 J**	**3 J**	1.4 U	0.49 U
2,3,4,6,7,8-HXCDF	6.2	**5.1 J**	**6.4 J**	**3.8 J**	0.92 U	0.23 U (0.64)
2,3,4,7,8-PECDF	6.1	**5.2 J**	11	6.1	1.3 U	**0.49 J**
2,3,7,8-TCDD	1.7	1.3	9.5	0.37	0.86 U	0.2 U
2,3,7,8-TCDF	**0.88 J**	0.19 U (0.68)	**1.2 J**	**0.68 J**	0.68 U	0.28 U
HPCDD (TOTAL)	2200	1800	4800	1800	43	86
HPCDF (TOTAL)	450	400	700	630	6.7	21
HXCDD (TOTAL)	450	360	1800	210	7.5	13
HXCDF (TOTAL)	200	160	160	200	5.4	11
PECDD (TOTAL)	96	81	640	9	1 U	**0.41 J**
PECDF (TOTAL)	99	85	160	83	1.4 U	**4.6 J**
TCDD (TOTAL)	35	33	340	0.37	0.86 U	0.2 U
TCDF (TOTAL)	19	14 B	48	8.4 B	0.68 U	0.28 U
2,3,7,8-TCDD (TEQ) (WHO 2005)	47.929	37.363	120.785	30.165	1.8428	1.73585

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	KRY111A	KRY409	KRY409	KRY409	KRY415	KRY415
Sample Identification	KRY111ASS003	KRY409SS001	KRY409SS002	KRY409SS003	KRY415SS001	KRY415SS002
Sample Collection Date	5/2/2006	4/24/2006	4/24/2006	4/24/2006	4/24/2006	4/24/2006
Sample Type	SS	SS	SS	SS	SS	SS
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	1	0	0.5	1	0	0.5
Lower Depth	2	0.5	1	2	0.5	1
1,2,3,4,6,7,8,9-OCDD	**10000 J**	**1100 J**	**62 J**	6.6 J	**340 J**	**1100 J**
1,2,3,4,6,7,8,9-OCDF	330	**35 J**	**2.4 J**	0.59 UJ	**23 J**	**98 J**
1,2,3,4,6,7,8-HPCDD	620	140	6.7	0.95 J	53	170
1,2,3,4,6,7,8-HPCDF	82	20	**1.2 J**	0.24 J	2.1 U (9.5)	**30 J**
1,2,3,4,7,8,9-HPCDF	6.6	**1.5 J**	0.091 U	0.099 U	4.4 U	16 U
1,2,3,4,7,8-HXCDD	8.7	**2.6 J**	0.12 U	0.08 U	1.9 U	5.9 U
1,2,3,4,7,8-HXCDF	10	**1.1 J**	0.15 U	0.075 U (0.076)	1.7 U	5.8 U
1,2,3,6,7,8-HXCDD	25	6.8	0.1 U (0.35)	0.14 J	**3.9 J**	**12 J**
1,2,3,6,7,8-HXCDF	**4.3 J**	**1.8 J**	0.092 U (0.14)	0.084 U	1.8 U	7.7 U
1,2,3,7,8,9-HXCDD	**2.4 J**	**4.7 J**	**0.29 J**	0.081 U (0.087)	**2.5 J**	8.6 U
1,2,3,7,8,9-HXCDF	**3.7 J**	**0.7 J**	0.14 U	0.079 U	2.3 U	5.2 U
1,2,3,7,8-PECDD	**0.47 J**	**1.4 J**	0.11 U	0.067 U	3.3 U	7.7 U
1,2,3,7,8-PECDF	**2.1 J**	**0.93 J**	0.12 U	0.066 U	4.1 U	8.6 U
2,3,4,6,7,8-HXCDF	4.9	**2.6 J**	**0.21 J**	0.072 U	2.5 U	5.9 U
2,3,4,7,8-PECDF	5.2	**2.4 J**	0.09 U (0.18)	0.051 J	2.7 U	7.2 U
2,3,7,8-TCDD	0.18 U	**0.29 J**	0.079 U	0.078 U	3.6 U	10 U
2,3,7,8-TCDF	0.23 U (0.69)	**0.94 J**	**0.16 J**	0.085 U	2.1 U	8.8 U
HPCDD (TOTAL)	1000	330	15	2.1 J	110	320 U
HPCDF (TOTAL)	470	51	**2.9 J**	0.24 U	19	100
HXCDD (TOTAL)	87	57	**2.7 J**	1 J	21	110
HXCDF (TOTAL)	200	38	**2 J**	0.31 U	**15 J**	**38 J**
PECDD (TOTAL)	**0.47 J**	7.6	0.32 U	0.07 U	3.3	7.7
PECDF (TOTAL)	23	35	**0.94 J**	0.39 J	3.4	7.9
TCDD (TOTAL)	0.18	2.5	1.3	0.078 U	3.6	10
TCDF (TOTAL)	**0.34 J**	19	1.7	0.085 U	2.1	8.8
2,3,7,8-TCDD (TEQ) (WHO 2005)	18.3025	6.5174	0.333075	0.1454035	5.8799	16.0934

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	KRY415	KRY422	KRY429	KRY429	KRY429	KRY430
Sample Identification	KRY415SS003	KRY422SS001	KRY429SS001	KRY429SS002	KRY429SS003	KRY430SS001
Sample Collection Date	4/24/2006	4/24/2006	5/11/2006	5/11/2006	5/11/2006	5/11/2006
Sample Type	SS	SS	SS	SS	SS	SS
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	1	0	0	0	0	0
Lower Depth	2	0.5	0.167	0.5	0.5	0.167
1,2,3,4,6,7,8,9-OCDD	**520 J**	**940 J**	87	220	1400	1200
1,2,3,4,6,7,8,9-OCDF	**38 J**	**31 J**	**6 J**	10	61	54
1,2,3,4,6,7,8-HPCDD	86	130	10	31	180	170
1,2,3,4,6,7,8-HPCDF	**18 J**	17	**2.5 J**	**3.9 J**	22	27
1,2,3,4,7,8,9-HPCDF	10 U	**1.1 J**	**0.33 J**	**0.26 J**	**1.3 J**	**1.3 J**
1,2,3,4,7,8-HXCDD	4.7 U	**2.7 J**	**0.21 J**	**0.49 J**	**1.9 J**	**1.8 J**
1,2,3,4,7,8-HXCDF	5.1 U	0.13 U (1.7)	**0.32 J**	**0.28 J**	**1.8 J**	**1.5 J**
1,2,3,6,7,8-HXCDD	6.4 U	6.6	**0.44 J**	**1.5 J**	7.2	7.3
1,2,3,6,7,8-HXCDF	5 U	**0.95 J**	0.037 U (0.34)	0.044 U (0.45)	0.077 U (3.2)	0.035 U (2)
1,2,3,7,8,9-HXCDD	6.1 U	**4.9 J**	**0.35 J**	**1.1 J**	**4.9 J**	**4.2 J**
1,2,3,7,8,9-HXCDF	6.7 U	**0.48 J**	**0.08 J**	**0.1 J**	**0.5 J**	**0.41 J**
1,2,3,7,8-PECDD	5 U	**1 J**	**0.1 J**	0.043 U (0.27)	**0.86 J**	**0.83 J**
1,2,3,7,8-PECDF	5.7 U	**0.45 J**	**0.083 J**	0.097 U	**0.39 J**	**0.33 J**
2,3,4,6,7,8-HXCDF	5.7 U	**1.3 J**	**0.22 J**	**0.26 J**	**1.5 J**	**1.4 J**
2,3,4,7,8-PECDF	4.9 U	**0.93 J**	**0.1 J**	0.051 U (0.13)	**0.85 J**	**0.81 J**
2,3,7,8-TCDD	3.1 U	0.12 U (0.17)	0.065 U	0.08 U	0.057 U (0.15)	0.078 U (0.094)
2,3,7,8-TCDF	3.5 U	**0.24 J**	**0.081 J**	**0.078 J**	**0.34 J**	**0.27 J**
HPCDD (TOTAL)	170	260	18	55	320	300
HPCDF (TOTAL)	56	41	7	12	75	80
HXCDD (TOTAL)	43	57	**3.6 J**	11	54	53
HXCDF (TOTAL)	**10 J**	25	**3.4 J**	5.7	33	35
PECDD (TOTAL)	5 U	8.1	**0.41 J**	**1.3 J**	8.7	6.7
PECDF (TOTAL)	5.3 U	11	**1.5 J**	**1.9 J**	12	12
TCDD (TOTAL)	3.1 U	3.2	**0.18 J**	**0.36 J**	2	**0.95 J**
TCDF (TOTAL)	3.5 U	3.7	**0.84 J**	1.4	5.7	5
2,3,7,8-TCDD (TEQ) (WHO 2005)	8.2879	4.9518	0.50829	1.019855	5.647	5.2771

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	KRY430	KRY430	KRY440	KRY440	KRY482	KRY482
Sample Identification	KRY430SS002	KRY430SS003	KRY440SS001	KRY440SS002	KRY482SS001	KRY482SS002
Sample Collection Date	5/11/2006	5/11/2006	5/3/2006	5/3/2006	5/10/2006	5/10/2006
Sample Type	SS	SS	SS	SS	SS	SS
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	0	0	0	0	0	0
Lower Depth	0.5	0.5	0.5	0.5	0.5	0.5
1,2,3,4,6,7,8,9-OCDD	67	7.9 U	**4100 J**	**720 J**	8500	2100
1,2,3,4,6,7,8,9-OCDF	**3.5 J**	0.67 U	**220 J**	**43 J**	510	120
1,2,3,4,6,7,8-HPCDD	9.3	1.1 U	460	92	910	220
1,2,3,4,6,7,8-HPCDF	**1.9 J**	0.075 U (0.22)	81	14	150	36
1,2,3,4,7,8,9-HPCDF	0.095 U (0.14)	0.088 U	1.2 U (4.5)	0.34 U (0.87)	11	**2.5 J**
1,2,3,4,7,8-HXCDD	0.081 U (0.12)	0.071 U	1.1 U (3.5)	**0.94 J**	6.9	**1.7 J**
1,2,3,4,7,8-HXCDF	**0.18 J**	0.04 U (0.06)	5.1	**1.1 J**	9.8	**2.6 J**
1,2,3,6,7,8-HXCDD	**0.4 J**	0.053 U	1.3 U (22)	0.13 U (4.4)	36	8.6
1,2,3,6,7,8-HXCDF	0.041 U (0.18)	**0.041 J**	**2 J**	0.29 U (1.2)	0.032 U (5.9)	0.068 U (2.1)
1,2,3,7,8,9-HXCDD	**0.27 J**	0.064 U	8.8	**1.9 J**	16	**4 J**
1,2,3,7,8,9-HXCDF	0.046 U	0.06 U	1.1 U (2.1)	**0.48 J**	**2.7 J**	**0.79 J**
1,2,3,7,8-PECDD	**0.059 J**	0.043 U	**2.1 J**	**0.55 J**	**2.2 J**	**0.62 J**
1,2,3,7,8-PECDF	0.088 U	0.043 U	1.2 U	0.55 U	**1.5 J**	**0.44 J**
2,3,4,6,7,8-HXCDF	0.044 U (0.072)	0.039 U	6.3	0.28 U (1)	6.6	**1.6 J**
2,3,4,7,8-PECDF	**0.11 J**	0.038 U	**3.4 J**	**0.73 J**	**3.8 J**	**1 J**
2,3,7,8-TCDD	0.071 U	0.073 U	0.64 U	0.21 U	**0.22 J**	0.071 U (0.074)
2,3,7,8-TCDF	0.051 U (0.063)	**0.058 J**	0.49 U (0.6)	**0.31 J**	**0.45 J**	0.046 U (0.15)
HPCDD (TOTAL)	16	1.1 U	860	160	1700	410
HPCDF (TOTAL)	**1.9 J**	0.081 U	220	50	580	140
HXCDD (TOTAL)	**3 J**	0.063 U	90	18	190	44
HXCDF (TOTAL)	**2.2 J**	**0.36 J**	96	19	220	54
PECDD (TOTAL)	**0.39 J**	0.073 U	**2.1 J**	**0.55 J**	11	**3.1 J**
PECDF (TOTAL)	**1.1 J**	**0.089 J**	38	5.6	48	12
TCDD (TOTAL)	**0.098 J**	0.073 U	2	0.21	2.1	**0.56 J**
TCDF (TOTAL)	**0.4 J**	**0.12 J**	5	**0.72 J**	5.9	1.5
2,3,7,8-TCDD (TEQ) (WHO 2005)	0.37172	0.0999205	13.8165	2.9785	25.158	6.2627

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	**KRY482**	**KRY483**	**KRY483**	**KRY483**	**KRY499**	**KRY505**
Sample Identification	**KRY482SS003**	**KRY483SS001**	**KRY483SS002**	**KRY483SS003**	**KRY499SS001**	**KRY505SS001**
Sample Collection Date	**5/10/2006**	**5/31/2006**	**5/31/2006**	**5/31/2006**	**5/22/2006**	**5/16/2006**
Sample Type	**SS**	**SS**	**SS**	**SS**	**SS**	**SS**
Duplicate of						
Units	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**
Upper Depth	**0**	**0**	**0**	**0**	**0**	**0**
Lower Depth	**0.5**	**0.167**	**0.5**	**0.5**	**0.5**	**0.5**
1,2,3,4,6,7,8,9-OCDD	580	2100	240	39	48000 N2	620000 N2
1,2,3,4,6,7,8,9-OCDF	31	120	14	**2.4 J**	2100	36000 N2
1,2,3,4,6,7,8-HPCDD	62	310	36	6.1	7400	79000 N2
1,2,3,4,6,7,8-HPCDF	9.9	56	6.8	1 J	1300	12000 N2
1,2,3,4,7,8,9-HPCDF	**0.82 J**	**2.6 J**	**0.23 J**	0.079	75	950 N2
1,2,3,4,7,8-HXCDD	0.058 U (0.46)	**3.7 J**	**0.61 J**	**0.13 J**	100	420
1,2,3,4,7,8-HXCDF	**0.8 J**	**2.9 J**	0.1 U (0.38)	**0.11 J**	55	930
1,2,3,6,7,8-HXCDD	**2.5 J**	12	**1.6 J**	0.053 U (0.25)	500	4700
1,2,3,6,7,8-HXCDF	0.088 U (0.94)	0.16 U (4.4)	0.087 U (0.3)	**0.068 J**	0.75 U (57)	0.54 U (370)
1,2,3,7,8,9-HXCDD	**1.1 J**	9	**1.2 J**	**0.2 J**	290	1100
1,2,3,7,8,9-HXCDF	**0.25 J**	**0.72 J**	0.12	0.053	28	390
1,2,3,7,8-PECDD	0.07 U (0.23)	**1.5 J**	**0.3 J**	0.047 U (0.07)	63	120
1,2,3,7,8-PECDF	**0.15 J**	**0.48 J**	0.086	0.046	19	230
2,3,4,6,7,8-HXCDF	**0.55 J**	**2.6 J**	0.091 U (0.34)	**0.071 J**	51	420
2,3,4,7,8-PECDF	**0.37 J**	**1.1 J**	**0.19 J**	0.032 U (0.044)	44	560
2,3,7,8-TCDD	0.063	**0.21 J**	0.12	0.053	4	4.5
2,3,7,8-TCDF	**0.13 J**	**0.24 J**	**0.086 J**	0.035 U (0.053)	**4.4 J**	**55 J**
HPCDD (TOTAL)	110	580	67	12	13000	130000 N2
HPCDF (TOTAL)	37	160	19	**2.9 J**	4100	47000 N2
HXCDD (TOTAL)	12	120	14	**2.4 J**	2500	14000
HXCDF (TOTAL)	14	67	7.8	**1.6 J**	1600	9200
PECDD (TOTAL)	**0.93 J**	15	**1.4 J**	**0.39 J**	220	310
PECDF (TOTAL)	**3.8 J**	20	**3.3 J**	**0.47 J**	860	3800
TCDD (TOTAL)	**0.13 J**	3.4	**0.16 J**	**0.09 J**	25	24
TCDF (TOTAL)	**0.64 J**	5.3	**0.66 J**	**0.18 J**	150	190
2,3,7,8-TCDD (TEQ) (WHO 2005)	1.807	9.7424	1.39868	0.25854	289.24	2235.7

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	KRY549	KRY550	KRY551	KRY552	KRY553	KRY554
Sample Identification	KRY549SS001	KRY550SS001	KRY551SS001	KRY552SS001	KRY553SS001	KRY554SS001
Sample Collection Date	5/11/2006	5/11/2006	5/11/2006	5/11/2006	5/11/2006	5/18/2006
Sample Type	SS	SS	SS	SS	SS	SS
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	0	0	0	0	0	0
Lower Depth	0.167	0.167	0.167	0.167	0.167	0.167
1,2,3,4,6,7,8,9-OCDD	90	510	1300	190	580	570
1,2,3,4,6,7,8,9-OCDF	**5 J**	27	160	**7.1 J**	49	34
1,2,3,4,6,7,8-HPCDD	13	79	170	29	75	62
1,2,3,4,6,7,8-HPCDF	**2.1 J**	9.8	59	**3.8 J**	16	13
1,2,3,4,7,8,9-HPCDF	0.15 U (0.18)	**0.58 J**	**2.3 J**	**0.29 J**	**1.1 J**	**3.6 J**
1,2,3,4,7,8-HXCDD	**0.33 J**	**1.4 J**	**1.6 J**	**0.63 J**	**0.96 J**	**0.77 J**
1,2,3,4,7,8-HXCDF	**0.18 J**	**0.68 J**	**1.6 J**	**0.42 J**	**0.98 J**	0.62 U (1.4)
1,2,3,6,7,8-HXCDD	**0.6 J**	**3.7 J**	6	**1.6 J**	**2.7 J**	0.59 U (2.5)
1,2,3,6,7,8-HXCDF	0.054 U (0.27)	0.036 U (1.4)	0.11 U (2.9)	0.054 U (1.4)	0.046 U (2.3)	0.71 U
1,2,3,7,8,9-HXCDD	**0.58 J**	**3.4 J**	**4 J**	**1.2 J**	**2.2 J**	0.6 U (1.5)
1,2,3,7,8,9-HXCDF	0.079 U	**0.21 J**	**0.41 J**	**0.18 J**	**0.2 J**	0.73 U
1,2,3,7,8-PECDD	**0.16 J**	**0.82 J**	**0.85 J**	**0.4 J**	**0.43 J**	0.74 U
1,2,3,7,8-PECDF	0.056 U	**0.27 J**	**0.34 J**	**0.21 J**	**0.16 J**	0.78 U
2,3,4,6,7,8-HXCDF	**0.18 J**	**1.2 J**	**2.2 J**	**0.75 J**	**1.1 J**	0.48 U
2,3,4,7,8-PECDF	**0.13 J**	**1.6 J**	**1.5 J**	**1.1 J**	**0.71 J**	0.55 U
2,3,7,8-TCDD	0.068 U	4.6	**0.34 J**	0.12 U	0.041 U (0.06)	0.75 U
2,3,7,8-TCDF	**0.14 J**	**0.48 J**	**0.29 J**	**0.26 J**	**0.19 J**	0.39 U
HPCDD (TOTAL)	25	150	310	61	140	110
HPCDF (TOTAL)	5.7	32	190	10	49	53
HXCDD (TOTAL)	6.5	33	54	19	26	12
HXCDF (TOTAL)	**3.3 J**	22	54	12	20	6.1
PECDD (TOTAL)	**1 J**	6.1	8.7	**4.4 J**	**3.8 J**	0.74 U
PECDF (TOTAL)	**1.8 J**	24	26	15	12	0.66 U
TCDD (TOTAL)	**0.51 J**	7.3	2.9	2.8	**0.96 J**	0.75 U
TCDF (TOTAL)	1.7	16	11	9.7	5.3	0.39 U
2,3,7,8-TCDD (TEQ) (WHO 2005)	0.63269	8.14	6.1562	1.76033	2.7355	2.2689

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	KRY555	KRY556	KRY557	KRY558	KRY559	KRY560
Sample Identification	KRY555SS001	KRY556SS001	KRY557SS001	KRY558SS001	KRY559SS001	KRY560BKDSS001
Sample Collection Date	5/16/2006	5/11/2006	5/11/2006	5/31/2006	6/2/2006	7/14/2006
Sample Type	SS	SS	SS	SS	SS	SS
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	0	0	0	0	0	0
Lower Depth	0.167	0.167	0.167	0.167	0.167	0.167
1,2,3,4,6,7,8,9-OCDD	160	1000	**71 J**	1700	520	250 UJ
1,2,3,4,6,7,8,9-OCDF	**8.2 J**	28	**3.5 J**	44	14	13 UJ
1,2,3,4,6,7,8-HPCDD	23	130	9.5	260	87	**32 J**
1,2,3,4,6,7,8-HPCDF	**3.4 J**	15	**1.5 J**	29	11	**4.8 J**
1,2,3,4,7,8,9-HPCDF	0.36 U (0.46)	**0.9 J**	**0.096 J**	**1.5 J**	**0.62 J**	0.18 UJ (0.36)
1,2,3,4,7,8-HXCDD	**0.68 J**	**1.7 J**	**0.18 J**	**3.4 J**	**1.5 J**	0.64 U
1,2,3,4,7,8-HXCDF	0.46 U	**1.4 J**	0.07 U (0.13)	**2.1 J**	0.23 U (0.73)	**0.36 J**
1,2,3,6,7,8-HXCDD	**1.3 J**	5.4	0.051 U (0.39)	12	**4.4 J**	**1.4 J**
1,2,3,6,7,8-HXCDF	**0.41 J**	0.082 U (2)	0.1 U (0.18)	0.19 U (2.2)	0.1 U (0.94)	**0.24 J**
1,2,3,7,8,9-HXCDD	0.24 U (0.84)	**4.1 J**	0.074 U (0.31)	7.8	**3.3 J**	**1.2 J**
1,2,3,7,8,9-HXCDF	**0.4 J**	**0.55 J**	0.074 U	**0.83 J**	**0.36 J**	0.088 U
1,2,3,7,8-PECDD	**0.39 J**	**0.76 J**	**0.14 J**	**1.8 J**	**0.85 J**	0.13 U (0.4)
1,2,3,7,8-PECDF	**0.25 J**	**0.4 J**	0.026 U (0.037)	**0.69 J**	**0.24 J**	0.12 U
2,3,4,6,7,8-HXCDF	**0.54 J**	**1.1 J**	**0.13 J**	**2.7 J**	**0.93 J**	**0.41 J**
2,3,4,7,8-PECDF	**0.38 J**	**0.83 J**	0.021 U (0.073)	**2 J**	**0.83 J**	**0.27 J**
2,3,7,8-TCDD	0.22 U	**0.16 J**	0.045 U	0.14 U (0.29)	**0.17 J**	0.16 U
2,3,7,8-TCDF	**0.22 J**	**0.23 J**	**0.056 J**	**0.49 J**	**0.23 J**	0.26 U
HPCDD (TOTAL)	41	250	18	510	160	**63 J**
HPCDF (TOTAL)	13	45	**4 J**	75	29	**13 J**
HXCDD (TOTAL)	8.1	43	**3.3 J**	110	36	15
HXCDF (TOTAL)	**3.9 J**	26	**1.7 J**	49	20	6.9
PECDD (TOTAL)	**2 J**	6.1	**0.94 J**	18	**4.2 J**	**2.6 J**
PECDF (TOTAL)	**1.8 J**	8.8	**0.67 J**	31	13	4 J
TCDD (TOTAL)	0.22	1.6	**0.048 J**	6.2	1.8	**0.63 J**
TCDF (TOTAL)	**0.64 J**	3.7	**0.54 J**	14	4	1.6 U
2,3,7,8-TCDD (TEQ) (WHO 2005)	1.35826	4.4964	0.398115	9.0359	3.5781	1.18245

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	KRY561	KRY562	KRY605	KRY605	KRY605	KRY607
Sample Identification	KRY561BKDSS001	KRY562BKDSS001	KRY605SS001	KRY605SS002	KRY605SS003	KRY607SS001
Sample Collection Date	7/14/2006	7/14/2006	4/26/2006	4/26/2006	4/26/2006	4/21/2006
Sample Type	SS	SS	SS	SS	SS	SS
Duplicate of						
Units	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg	ng/kg
Upper Depth	0	0	0	0.5	1	0
Lower Depth	0.167	0.167	0.5	1	2	0.5
1,2,3,4,6,7,8,9-OCDD	**330 J**	**650 J**	**480 J**	290	140	**700 J**
1,2,3,4,6,7,8,9-OCDF	**17 J**	**22 J**	**30 J**	24	12	**52 J**
1,2,3,4,6,7,8-HPCDD	**36 J**	**110 J**	110	56	29	170
1,2,3,4,6,7,8-HPCDF	**5.4 J**	**15 J**	69	27	14	99
1,2,3,4,7,8,9-HPCDF	0.22 UJ (0.35)	0.23 UJ (0.69)	6.7	**2.6 J**	**1.3 J**	20
1,2,3,4,7,8-HXCDD	0.58 U	**2.3 J**	5.3	**2.4 J**	**1 J**	8
1,2,3,4,7,8-HXCDF	0.27 U	**0.65 J**	12	**3.7 J**	**2.1 J**	46
1,2,3,6,7,8-HXCDD	**1.4 J**	5.4	21	7.7	**4.2 J**	22
1,2,3,6,7,8-HXCDF	**0.22 J**	**0.98 J**	22	7.7	**4.3 J**	60
1,2,3,7,8,9-HXCDD	**1.3 J**	**4.2 J**	13	5.7	**2.9 J**	17
1,2,3,7,8,9-HXCDF	0.1 U	**0.3 J**	6.8	**2 J**	**1.1 J**	16
1,2,3,7,8-PECDD	**0.35 J**	**1.3 J**	8.3	**2.8 J**	**1.4 J**	10
1,2,3,7,8-PECDF	0.14 U	**0.43 J**	**2 J**	**2.5 J**	**0.68 J**	6.4
2,3,4,6,7,8-HXCDF	**0.38 J**	**0.85 J**	46	11	6.4	62
2,3,4,7,8-PECDF	**0.19 J**	**1 J**	86	28	15	240
2,3,7,8-TCDD	0.13 U	**0.2 J**	1.4	**0.51 J**	0.3 U	3
2,3,7,8-TCDF	0.21 U	0.4 U	**4 J**	**2.5 J**	**0.76 J**	28
HPCDD (TOTAL)	**77 J**	**240 J**	230	110	56	340
HPCDF (TOTAL)	**15 J**	**33 J**	180	72	39	270
HXCDD (TOTAL)	14	68	200	66	34	250
HXCDF (TOTAL)	6.7	24	990	190	150	1900
PECDD (TOTAL)	**2.5 J**	11	47	14	6.6	77
PECDF (TOTAL)	**3.2 J**	17	1000	360	190	2400
TCDD (TOTAL)	**0.72 J**	5.2	7.4	2.1	**0.41 J**	31
TCDF (TOTAL)	1.6 U	9	210	86	41	750
2,3,7,8-TCDD (TEQ) (WHO 2005)	1.38195	4.75595	50.58	17.0052	8.835	114.2076

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	**KRY607**	**KRY607**	**KRY628**	**KRY628**	**KRY628**	**KRY658**
Sample Identification	**KRY607SS002**	**KRY607SS003**	**KRY628SS001**	**KRY628SS002**	**KRY628SS003**	**KRY658SS001**
Sample Collection Date	**4/21/2006**	**4/21/2006**	**5/12/2006**	**5/12/2006**	**5/12/2006**	**5/16/2006**
Sample Type	**SS**	**SS**	**SS**	**SS**	**SS**	**SS**
Duplicate of						
Units	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**	**ng/kg**
Upper Depth	**0.5**	**1**	**0**	**0**	**0**	**0**
Lower Depth	**1**	**2**	**0.5**	**0.5**	**0.5**	**0.5**
1,2,3,4,6,7,8,9-OCDD	**390 J**	**140 J**	600	19	95	50000 N2
1,2,3,4,6,7,8,9-OCDF	**25 J**	**7.6 J**	27	0.78 U	**4.3 J**	2800 N2
1,2,3,4,6,7,8-HPCDD	76	27	72	**3.7 J**	12	**5100 J**
1,2,3,4,6,7,8-HPCDF	48	13	12	**0.36 J**	**1.6 J**	1000
1,2,3,4,7,8,9-HPCDF	13	**3.1 J**	**0.93 J**	0.15 U	0.32 U	77
1,2,3,4,7,8-HXCDD	**3.1 J**	**0.99 J**	**0.94 J**	0.15 U	0.15 U (0.23)	29
1,2,3,4,7,8-HXCDF	30	6.7	0.15 U (1.2)	0.17 U	0.22 U (0.41)	1.3 U (130)
1,2,3,6,7,8-HXCDD	9.4	**3.1 J**	**3.6 J**	0.21 U	**0.62 J**	260
1,2,3,6,7,8-HXCDF	32	8.2	**0.57 J**	0.15 U	0.11 U	30
1,2,3,7,8,9-HXCDD	8.3	**2.4 J**	**2.4 J**	0.3 U	0.19 U (0.41)	83
1,2,3,7,8,9-HXCDF	8.8	**2.5 J**	0.24 U	0.18 U	0.25 U	22
1,2,3,7,8-PECDD	**3.8 J**	**1.4 J**	**0.67 J**	0.19 U	0.3 U	**15 J**
1,2,3,7,8-PECDF	5.6	**1.4 J**	0.24 U	0.2 U	0.3 U	14
2,3,4,6,7,8-HXCDF	32	17	0.14 U (0.62)	0.17 U	0.14 U	43
2,3,4,7,8-PECDF	110	28	**0.49 J**	0.17 U	0.2 U	35
2,3,7,8-TCDD	2.6	**0.58 J**	0.22 U	0.28 U	0.22 U	**0.75 J**
2,3,7,8-TCDF	**22 J**	**5.7 J**	**0.24 J**	0.18 U	0.16 U	**3.5 J**
HPCDD (TOTAL)	140	52	130	5.7	21	8500
HPCDF (TOTAL)	120	16	34	**0.36 J**	5.5	3900
HXCDD (TOTAL)	100	31	23	**0.62 J**	**1.5 J**	900
HXCDF (TOTAL)	490	150	14	**0.23 J**	**1.2 J**	670
PECDD (TOTAL)	37	11	**2.1 J**	0.19 U	0.3 U	31
PECDF (TOTAL)	1300	330	6.3	0.19 U	**0.96 J**	550
TCDD (TOTAL)	21	2.5	0.22 U	0.28 U	0.22 U	3.2
TCDF (TOTAL)	480	110	3.1	0.18 U	0.16 U	20
2,3,7,8-TCDD (TEQ) (WHO 2005)	55.6225	15.55628	2.846	0.386167	0.60939	157.83

Appendix G - 2006 Surface Soil Data
Dioxins and Furans

Sample Station	**KRY662**
Sample Identification	**KRY662SS001**
Sample Collection Date	**5/16/2006**
Sample Type	**SS**
Duplicate of	
Units	**ng/kg**
Upper Depth	**0**
Lower Depth	**0.5**
1,2,3,4,6,7,8,9-OCDD	370000 N2
1,2,3,4,6,7,8,9-OCDF	65000 N2
1,2,3,4,6,7,8-HPCDD	85000 N2
1,2,3,4,6,7,8-HPCDF	12000 N2
1,2,3,4,7,8,9-HPCDF	920 N2
1,2,3,4,7,8-HXCDD	780
1,2,3,4,7,8-HXCDF	1500
1,2,3,6,7,8-HXCDD	5600
1,2,3,6,7,8-HXCDF	460
1,2,3,7,8,9-HXCDD	980
1,2,3,7,8,9-HXCDF	610
1,2,3,7,8-PECDD	86
1,2,3,7,8-PECDF	270
2,3,4,6,7,8-HXCDF	230
2,3,4,7,8-PECDF	900
2,3,7,8-TCDD	4.1
2,3,7,8-TCDF	70 J
HPCDD (TOTAL)	140000 N2
HPCDF (TOTAL)	46000 N2
HXCDD (TOTAL)	17000
HXCDF (TOTAL)	29000
PECDD (TOTAL)	310
PECDF (TOTAL)	5700
TCDD (TOTAL)	24
TCDF (TOTAL)	230
2,3,7,8-TCDD (TEQ) (WHO 2005)	2500.9

Appendix G - 2006 Surface Water Data
SVOC

Sample Station	KRY200	KRY201	KRY202	KRY203	KRY204
Sample Identification	KRY200SW001	KRY201SW001	KRY202SW001	KRY203SW001	KRY204SW001
Sample Collection Date	7/13/2006	7/13/2006	7/13/2006	7/13/2006	7/13/2006
Sample Type	SW	SW	SW	SW	SW
Duplicate of					
Units	ug/L	ug/L	ug/L	ug/L	ug/L
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U
2,3,4,5-Tetrachlorophenol	10 U	10 U	10 U	10 U	10 U
2,3,4,6-Tetrachlorophenol	10 U	10 U	10 U	10 U	10 U
2,3,4-Trichlorophenol	10 U	10 U	10 U	10 U	10 U
2,3,5,6-Tetrachlorophenol	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	50 U	50 U	50 U	50 U	50 U
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U
2,6-Dimethylnaphthalene	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	10 U	10 U	10 U	10 U	10 U
2-Nitrophenol	5 U	5 U	5 U	5 U	5 U
3,3'-Dichlorobenzidine	20 U	20 U	20 U	20 U	20 U
3-Nitroaniline	10 U	10 U	10 U	10 U	10 U
4,6-Dinitro-2-Methylphenol	50 U	50 U	50 U	50 U	50 U
4-Bromophenylphenylether	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-Methylphenol	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U
4-Chlorophenylphenylether	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	10 U	10 U	10 U	10 U	10 U
4-Nitrophenol	50 U	50 U	50 U	50 U	50 U
Acenaphthene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Anthracene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)Anthracene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(a)Pyrene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(b)Fluoranthene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzo(e)Pyrene	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	10 U	10 U	10 U
Benzo(k)Fluoranthene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Benzoic Acid	10 U	10 U	10 U	10 U	10 U
Benzyl Alcohol	10 U	10 U	10 U	10 U	10 U
Biphenyl	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)Methane	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)Ether	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl)Ether	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)Adipate	6 U	6 U	6 U	6 U	6 U
bis(2-Ethylhexyl)Phthalate	6 U	6 U	6 U	6 U	6 U
Butyl Benzyl Phthalate	10 U	10 U	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U	10 U	10 U
Chrysene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Dibenzo(a,h)Anthracene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U
Diethyl Phthalate	10 U	10 U	10 U	10 U	10 U
Dimethyl Phthalate	10 U	10 U	10 U	10 U	10 U
Di-n-Butylphthalate	10 U	10 U	10 U	10 U	10 U

Appendix G - 2006 Surface Water Data
SVOC

Sample Station	KRY200	KRY201	KRY202	KRY203	KRY204
Sample Identification	KRY200SW001	KRY201SW001	KRY202SW001	KRY203SW001	KRY204SW001
Sample Collection Date	7/13/2006	7/13/2006	7/13/2006	7/13/2006	7/13/2006
Sample Type	SW	SW	SW	SW	SW
Duplicate of					
Units	ug/L	ug/L	ug/L	ug/L	ug/L
Di-n-Octylphthalate	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U
Fluorene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U	10 U
M+P-Cresols	10 U	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U	10 U	10 U
N-Nitrosodi-N-Propylamine	10 U	10 U	10 U	10 U	10 U
N-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U
Phenanthrene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Phenol	10 U	10 U	10 U	10 U	10 U
Pyrene	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Tetraethyllead	10 U	10 U	10 U	10 U	10 U

HISTORICAL DATA

(Please see attached compact disk)

Appendix G - KRY Historical Data
AES Groundwater SVOC Data, 1985

Sample Station	GWY-1	GWY-12	GWY-13	GWY-14	GWY-4
Sample Identification	MW-1	MW-12	MW-13	MW-14	MW-4
Sample Collection Date	9/25/1985	9/25/1985	9/25/1985	9/25/1985	9/25/1985
Sample Type	GW	GW	GW	GW	GW
Units	ug/L	ug/L	ug/L	ug/L	ug/L
1,2,4-Trichlorobenzene	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U
1,2-Diphenylhydrazine	2 U	2 U	2 U	2 U	2 U
1,3-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U
1,4-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U
2,4-Dinitrotoluene	5 U	5 U	5 U	5 U	5 U
2,6-Dinitrotoluene	5 U	5 U	5 U	5 U	5 U
2-Chloronaphthalene	1 U	1 U	1 U	1 U	1 U
3,3'-Dichlorobenzidine	5 U	5 U	5 U	5 U	5 U
4-Bromophenylphenylether	3 U	3 U	3 U	3 U	3 U
4-Chlorophenylphenylether	2 U	2 U	2 U	2 U	2 U
Acenaphthene	1 U	1 U	1 U	1 U	1 U
Acenaphthylene	1 U	1 U	1 U	1 U	1 U
Anthracene	1 U	1 U	1 U	1 U	1 U
Benzidine	50 U	50 U	50 U	50 U	50 U
Benzo(a)Anthracene	1 U	1 U	1 U	1 U	1 U
Benzo(a)Pyrene	2 U	2 U	2 U	2 U	2 U
Benzo(b,k)Fluoranthene	2 U	2 U	2 U	2 U	2 U
Benzo(g,h,i)Perylene	3 U	3 U	3 U	3 U	3 U
bis(2-Chloroethoxy)Methane	1 U	1 U	1 U	1 U	1 U
bis(2-Chloroethyl)Ether	1 U	1 U	1 U	1 U	1 U
bis(2-Chloroisopropyl)Ether	1 U	1 U	1 U	1 U	1 U
bis(2-Ethylhexyl)Phthalate	10 U	10 U	10 U	10 U	10 U
Butyl Benzyl Phthalate	1 U	1 U	1 U	1 U	1 U
Chrysene	1 U	1 U	1 U	1 U	1 U
Dibenzo(a,h)Anthracene	3 U	3 U	3 U	3 U	3 U
Diethyl Phthalate	1 U	1 U	1 U	1 U	1 U
Dimethyl Phthalate	1 U	1 U	1 U	1 U	1 U
Di-N-Butylphthalate	1 U	1 U	1 U	1 U	1 U
Di-N-Octylphthalate	1 U	1 U	1 U	1 U	1 U
Fluoranthene	1 U	1 U	1 U	1 U	1 U
Fluorene	1 U	1 U	1 U	1 U	**2**
Hexachlorobenzene	2 U	2 U	2 U	2 U	2 U
Hexachlorobutadiene	2 U	2 U	2 U	2 U	2 U
Hexachlorocyclopentadiene	5 U	5 U	5 U	5 U	5 U
Hexachloroethane	1 U	1 U	1 U	1 U	1 U
Indeno(1,2,3-cd)Pyrene	3 U	3 U	3 U	3 U	3 U
Isophorone	1 U	1 U	1 U	1 U	1 U
Naphthalene	1 U	1 U	**4**	1 U	**5**
Nitrobenzene	2 U	2 U	2 U	2 U	2 U
N-Nitroso-Di-Methylamine	3 U	3 U	3 U	3 U	3 U
N-Nitrosodi-N-Propylamine	2 U	2 U	2 U	2 U	2 U
N-Nitrosodiphenylamine	1 U	1 U	1 U	1 U	1 U
Phenanthrene	1 U	1 U	1 U	1 U	1 U
Pyrene	1 U	1 U	1 U	1 U	1 U

Notes:
Detected values are shown in bold.
AES = Applied Environmental Services
GW = Groundwater sample
SVOC = Semi-volatile organic compound
ug/L = micrograms per liter
U = The analyte was analyzed for but was not detected above the listed sample quantitation limit.

Appendix G - KRY Historical Data
Corwin Groundwater Petroleum Hydrocarbons, 2005

Sample Station	GWRM-1	GWRM-2
Sample Identification	MW1-01	MW2-01
Sample Collection Date	4/14/2005	4/14/2005
Sample Type	GW	GW
Units	ug/L	ug/L
EPH Screen	**2100**	**4100**

Notes:

Detected values are shown in bold
EPH = Extractable Petroleum Hydrocarbons
GW = Groundwater sample
ug/L = Micrograms per liter

Appendix G - KRY Historical Data
EPA, FIT Groundwater SVOC Notes

Notes:

Detected values are shown in bold
B = Compound detected in method blank
DU = Duplicate sample
GW = Groundwater sample
J = The analyte was detected, but the concentration is considered estimated for quality control reasons.
R = Quality control indicates data is not useable
SVOC = Semi-volatile organic compound
ug/L = Micrograms per liter
U = Analyte analyzed for but not detected; reported with detection limit value
UJ = The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.

Appendix G - KRY Historical Data
LWC Groundwater PCP, 2002

Sample Station	GWRR-1	GWRR-1	GWRR-1	GWRR-1	GWRR-3	GWRR-3	GWRR-3	GWRR-6	GWRR-6
Sample Identification	RRW-0702-1	RRW-1002-202	GWRR-1	RRW-1002-201	RRW-0702-4	RRW-0702-3	RRW-1002-204	RRW-0702-2	GWRR-6
Sample Collection Date	7/10/2002	10/1/2002	10/1/2002	10/1/2002	7/10/2002	7/10/2002	10/1/2002	7/10/2002	10/1/2002
Sample Type	GW	DU	GW	GW	DU	GW	GW	GW	GW
Duplicate of		GWRR-1			GWRR-3				
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Pentachlorophenol	ND	ND	ND	ND	ND	ND	ND	ND	ND

Appendix G - KRY Historical Data
LWC Groundwater PCP, 2002

Sample Station	GWRR-6	GWRR-8	GWRR-8	GWRR-9
Sample Identification	RRW-1002-203	MCW-0402-3	MCW-0402-2	MCW-0402-1
Sample Collection Date	10/1/2002	4/24/2002	4/24/2002	4/24/2002
Sample Type	GW	DU	GW	GW
Duplicate of		GWRR-8		
Units	ug/L	ug/L	ug/L	ug/L
Pentachlorophenol	ND	**0.57**	**0.35**	**4.7**

Notes:

Detected values are shown in bold.
DU = Duplicate sample
GW = Groundwater sample
LWC = Land and Water consulting
ND = Analyte not detected; reporting limit information unavailable

Appendix G - KRY Historical Data
Maxim Groundwater VPH, 2000

Sample Station	GWY-10	GWY-12	GWY-13	GWY-14	GWY-3	GWY-4
Sample Identification	**MW-10**	**MW-12**	**MW-13**	**MW-14**	**MW-3**	**MW-4**
Sample Collection Date	**11/29/2000**	**11/29/2000**	**11/29/2000**	**11/29/2000**	**11/29/2000**	**11/29/2000**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
C5-C8 Aliphatics	ND	ND	46 U	ND	ND	78 U
C9-C10 Aromatics	ND	27 U	179 U	ND	ND	201 U
C9-C12 Aliphatics	ND	93 U	965 U	ND	ND	1010 U
Total Petroleum Hydrocarbons	ND	72 U	464 U	ND	ND	509 U
Benzene	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	0.2 U	ND	ND	1.5 U
Methyl Tert-Butyl Ether	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	4.1 U	ND	ND	5.5 U
Toluene	ND	ND	ND	ND	ND	ND
Xylenes (Total)	---	ND	3.3 U	ND	ND	5.2 U

Notes:

GW = Groundwater sample
ND = Analyte not detected; reporting limit information unavailable
U = The analyte was analyzed for but was not detected above the listed sample quantitation limit.
ug/L = Micrograms per liter
VPH = Volatile petroleum hydrocarbons

Appendix G - KRY Historical Data
MDHES (DEQ) Groundwater Herbicides, 1993-1998

Sample Station	**GW-5**	**GWY-12**	**GWY-12**	**KPT-5**	**RW-1**	**RW-1**	**RW-1**	**RW-1**	**RW-1**	**RW-1**
Sample Identification	**96-55967**	**GWY-12**	**97-50865**	**96-55966**	**SW5052**	**95-45765**	**96-36705**	**97-14861**	**97-50863**	**98-26860**
Sample Collection Date	**9/13/1996**	**12/19/1996**	**8/21/1997**	**9/13/1996**	**2/9/1993**	**7/26/1995**	**6/4/1996**	**1/29/1997**	**8/20/1997**	**4/8/1998**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
2,4,5-T	---	---	---	---	0.1 U	---	---	---	---	---
2,4,5-TP (SILVEX)	10 U	0.2 U	0.2 U	2 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4-D	50 U	1 U	1 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U
2,4-DB	---	---	---	---	1 U	2.5 U	---	---	---	2.5 U
Dalapon	500 U	10 U	10 U	100 U	2 U	10 U	10 U	10 U	10 U	10 U
Dicamba	12 U	0.25 U	0.25 U	2.5 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Dichloroprop	---	---	---	---	1 U	1 U	---	---	---	1 U
Dinoseb	50 U	1 U	1 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U
MCPA	---	---	---	---	110 U	---	---	---	---	---
MCPP	---	---	---	---	110 U	---	---	---	---	---
Pentachlorophenol	**514 D**	**47 D**	**1.3**	**64 D**	0.05 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Picloram	25 U	1 U	0.5 U	5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Appendix G - KRY Historical Data
MDHES (DEQ) Groundwater Herbicides, 1993-1998

Sample Station	**RW-10**	**RW-10**	**RW-11**	**RW-2**	**RW-2**	**RW-2**	**RW-2**	**RW-2**	**RW-4**	**RW-7**
Sample Identification	**SW5051**	**95-45764**	**SW5053**	**96-31882**	**96-36706**	**96-55968**	**97-14862**	**97-22973**	**98-18360**	**SW5050**
Sample Collection Date	**2/8/1993**	**7/26/1995**	**2/9/1993**	**5/10/1996**	**6/4/1996**	**9/13/1996**	**1/29/1997**	**3/18/1997**	**2/19/1998**	**2/8/1993**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
2,4,5-T	0.1 U	---	0.1 U	---	---	---	---	---	---	0.1 U
2,4,5-TP (SILVEX)	1 U	0.2 U	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	1 U
2,4-D	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,4-DB	1 U	2.5 U	1 U	---	---	---	---	---	2.5 U	1 U
Dalapon	2 U	10 U	2 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U
Dicamba	0.5 U	0.25 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.5 U
Dichloroprop	1 U	1 U	1 U	---	---	---	---	---	1 U	1 U
Dinoseb	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
MCPA	110 U	---	110 U	---	---	---	---	---	---	110 U
MCPP	110 U	---	110 U	---	---	---	---	---	---	110 U
Pentachlorophenol	0.05 U	0.1 U	0.05 U	**0.068 J**	**0.17**	**0.26**	0.1 U	**1 J**	0.1 U	0.05 U
Picloram	1 U	0.5 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U

Appendix G - KRY Historical Data
MDHES (DEQ) Groundwater Herbicides, 1993-1998

Sample Station	**RW-7**	**RW-7**	**RW-7**	**RW-7**	**RW-7**	**UNKNOWN**
Sample Identification	**95-45763**	**96-36704**	**97-14863**	**97-50864**	**98-18358**	**98-18359**
Sample Collection Date	**7/26/1995**	**6/4/1996**	**1/29/1997**	**8/20/1997**	**2/19/1998**	**2/19/1998**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
2,4,5-T	---	---	---	---	---	---
2,4,5-TP (SILVEX)	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4-D	1 U	1 U	1 U	1 U	1 U	1 U
2,4-DB	2.5 U	---	---	---	2.5 U	2.5 U
Dalapon	10 U	10 U	10 U	10 U	10 U	10 U
Dicamba	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Dichloroprop	1 U	---	---	---	1 U	1 U
Dinoseb	1 U	1 U	1 U	1 U	1 U	1 U
MCPA	---	---	---	---	---	---
MCPP	---	---	---	---	---	---
Pentachlorophenol	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Picloram	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:

Detected values are shown in bold
D = Sample dilution
DEQ = Dept. of Environmental Quality
GW = Groundwater sample
J = The analyte was detected, but the concentration is considered estimated for quality control reasons
MDHES = Montana Department of Health and Environmental Sciences
U = Analyte analyzed for but not detected; reported with detection limit value
ug/L = Micrograms per liter
VOC = Volatile organic compound

Appendix G - KRY Historical Data
MDHES (DEQ) Waste TPH, 1998

Sample Station	GWRR-5	GWRR-7
Sample Identification	98-24690	98-24689
Sample Collection Date	3/31/1998	3/31/1998
Sample Type	WS	WS
Units	mg/kg	mg/kg
Diesel Range Organics	**535000**	**614000**
Diesel Range Organics As Diesel	30000 U	30000 U
Total Extractable Hydrocarbons	**703000**	**773000**

Notes:

Detected values are shown in bold
DEQ = Dept. of Environmental Quality
MDHES = Montana Department of Health and Environmental Sciences
mg/kg = Milligrams per kilogram
U = Analyte analyzed for but not detected; reported with detection limit value
WS = Waste sample

Appendix G - KRY Historical Data
MSE Groundwater TPH, 1991

Sample Station	**RW-5**
Sample Identification	**KPT-RW-5**
Sample Collection Date	**6/20/1991**
Sample Type	**GW**
Units	**ug/L**
Total Petroleum Hydrocarbons	741 U

Notes:

Detected values are shown in bold
GW = Groundwater sample
TPH = Total petroleum hydrocarbons
U = The analyte was analyzed for but was not detected above the listed sample quantitation limit.
ug/L = Micrograms per liter

Appendix G - KRY Historical Data
NTL Soil Petroleum Hydrocarbons 1992 and 2005

Sample Station	**EH-1**	**EH-4**	**EH-3**	**NTL-MW-1**	**NTL-MW-2**	**NTL-MW-3**	**NTL-MW-4**
Sample Identification	**92-4155**	**92-4156**	**92-4157**	**MW-1**	**MW-2**	**MW-3**	**MW-4**
Sample Collection Date	**1/20/1992**	**1/20/1992**	**1/20/1992**	**12/20/2005**	**12/20/2005**	**12/20/2005**	**12/20/2005**
Sample Type	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**	**SB**
Upper Depth (ft)	**2.5**	**17.5**	**12.5**	**12**	**11.5**	**8**	**9**
Lower Depth (ft)	**4.5**	**19.5**	**14.5**	**15**	**15.4**	**10**	**13**
Units	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**
C5-C8 Aromatics	---	---	---	ND	ND	ND	ND
C9-C10 Aromatics	---	---	---	ND	ND	ND	ND
C9-C12 Aliphatics	---	---	---	ND	ND	ND	ND
EPH Screen	---	---	---	**25**	**9.5**	**9**	ND
Benzene	---	---	---	ND	ND	ND	ND
Ethylbenzene	---	---	---	ND	ND	ND	ND
Methyl-T-Butyl Benzene	---	---	---	ND	ND	ND	ND
Naphthalene	---	---	---	ND	ND	ND	ND
Toluene	---	---	---	ND	ND	ND	ND
Xylenes (Total)	---	---	---	ND	ND	ND	ND
Total Petroleum Hydrocarbons	**925**	10 U	**1575**	ND	ND	ND	ND

Notes:

Detected values are shown in bold
ft = Feet
mg/kg = Milligrams per kilogram
ND = Value not detected, but reprting limit information is unavailable
SB = Subsurface soil sample
U = Analyte analyzed for but not detected; reported with detection limit value

Appendix G - KRY Historical Data
Pioneer Groundwater SVOC, 1996

Sample Station	GWRR-1	GWRR-2	GWRR-3	GWRR-4	GWRR-5	GWRR-6	GWRR-7	GWRR-7	GWRR-9	GWY-12	GW-5
Sample Identification	**GWRR-1**	**GWRR-2**	**GWRR-3**	**GWRR-4**	**GWRR-5**	**GWRR-6**	**GWRR-7**	**GWRR-7**	**GWRR-9**	**GWY-12**	**KPT-GW-5**
Sample Collection Date	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**	**4/10/1996**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**DU**	**GW**	**GW**	**GW**	**GW**
Duplicate of							**GWRR-7**				
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
1,2-Dichlorobenzene	1 U	1 U	1 U	1 U	1 U	1 U	---	1 U	1 U	1 U	1 U
1,3-Dichlorobenzene	1 U	1 U	5 U	1 U	1 U	1 U	---	1 U	1 U	5 U	1 U
1,4-Dichlorobenzene	1 U	1 U	5 U	1 U	1 U	1 U	---	1 U	1 U	5 U	1 U
1-Methylnaphthalene	**12**	10 U	10 U	10 U	**30**	20 U	**11**	**21**	**11**	10 U	10 U
2-Methylnaphthalene	**12**	10 U	10 U	10 U	**28**	20 U	10 U	10 U	10 U	10 U	10 U
Bis(2-Ethylhexyl)Phthalate	10 UJ	**1.5 J**	10 U	10 U	**4.5 J**	**9.6 J**	10 U	10 U	10 U	10 U	10 U
Di-N-Butylphthalate	10 U	10 U	10 U	**1.3 J**	10 U	20 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	**5.8 J**	10 U	10 U	10 U	**8.8 J**	20 U	10 U	10 U	10 U	10 U	10 U

Notes:

Detected values are shown in bold
DU - Duplicate sample
GW = Groundwater sample
J = The analyte was detected, but the concentration is considered estimated for quality control reasons.
SVOC = Semi-volatile organic compound
U = Analyte analyzed for but not detected; reported with detection limit value.
ug/L = Micrograms per liter

Appendix G - KRY Historical Data
Pioneer Soil Metals, 1996

Sample Station	A1	A3	A5	B3	D15	F12	G13	G9	H6
Sample Identification	A1A	A3A	A5A	B3A	D15A	F12B	G13C	G9B	H6A
Sample Collection Date	4/1/1996	4/1/1996	4/1/1996	4/1/1996	4/1/1996	4/1/1996	4/1/1996	4/1/1996	4/1/1996
Sample Type	SS	SS	SS	SS	SS	SB	SB	SB	SS
Upper Depth (ft)	0	0	0	0	0	2	10	8.5	0
Lower Depth (ft)	1	1	1	1	1	3	10.5	9	1
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	5 UJ	**15 J**	5 UJ	5 UJ	**78 J**	5 UJ	**110 J**	**16 J**	**25 J**

Appendix G - KRY Historical Data
Pioneer Soil Metals, 1996

Sample Station	I1	I5	J15	J6	J8	K11	K5	K7	K9
Sample Identification	I1B	I5B	J15A	J6C	J8A	K11A	K5B	K7A	K9A
Sample Collection Date	4/1/1996	4/1/1996	4/3/1996	4/1/1996	4/1/1996	4/5/1996	4/2/1996	4/3/1996	4/5/1996
Sample Type	SS	SB	SS	SB	SS	SS	SS	SS	SS
Upper Depth (ft)	1	2	0	6.5	0	0	1	0	0
Lower Depth (ft)	2	3.5	1	7	1	1	2	1	1
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	11 J	10 J	10 J	5 UJ	51 J	490 J	380 J	140 J	680 J

Appendix G - KRY Historical Data
Pioneer Soil Metals, 1996

Sample Station	L14	L6	M3	M3	M9	N4	N4	N4	N6
Sample Identification	L14A	L6B	M3A	M3B	M9B	N4A	N4B	N4C	N6B
Sample Collection Date	4/4/1996	4/2/1996	4/1/1996	4/1/1996	4/5/1996	4/1/1996	4/1/1996	4/1/1996	4/2/1996
Sample Type	SS	SB	SB	SB	SB	SS	SB	SB	SB
Upper Depth (ft)	0	7.5	5	11	3	0	2	12	1.5
Lower Depth (ft)	1	8	8	11.5	6	1	3	13	3.5
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	85 J	140 J	5 UJ	5 UJ	18 J	50 J	170 J	5 UJ	220 J

Appendix G - KRY Historical Data
Pioneer Soil Metals, 1996

Sample Station	N8	O5	O7	P12	P4	P4	Q11	Q1	Q3
Sample Identification	N8B	O5A	O7B	P12A	P4A	P4B	Q11B	Q1A	Q3A
Sample Collection Date	4/5/1996	4/1/1996	4/5/1996	4/4/1996	4/1/1996	4/1/1996	4/5/1996	4/1/1996	4/2/1996
Sample Type	SB	SS	SS	SS	SS	SB	SB	SS	SS
Upper Depth (ft)	3	0	0	0	0	2	2	1	1
Lower Depth (ft)	5	1	3	1	1	4.5	3	2	2
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Lead	5 UJ	6990 J	350 J	380 J	11 J	4190 J	370 J	100 J	260 J

Appendix G - KRY Historical Data
Pioneer Soil Metals, 1996

Sample Station	Q5	Q7	X18
Sample Identification	Q5A	Q7B	X18A
Sample Collection Date	4/2/1996	4/5/1996	4/3/1996
Sample Type	SS	SB	SS
Upper Depth (ft)	0	5	0
Lower Depth (ft)	1	6	1
Units	mg/kg	mg/kg	mg/kg
Lead	**1580 J**	**94 J**	**14 J**

Notes:

Detected values are shown in bold.
ft = feet
J = The analyte was detected, but the concentration is considered estimated for quality control reasons.
mg/kg = Milligrams per kilogram
SB = Subsurface soil sample
SS = Surface soil sample
U = The analyte was analyzed for but was not detected above the listed sample quantitation limit.
UJ = The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.

Appendix G - KRY Historical Data
EPAFIT & MSE Sludge Results, 1986 1989

Sample Station	SL-1-89	RR-SL-1	RR-SL-2
Sample Identification	KPP-SL-1	MHC-551/HC-395	MHC-552/HC-396
Sample Collection Date	11/15/1988	3/2/1986	3/2/1986
Sample Type	SL	SL	SL
Sampler	MSE	EPAFIT	EPAFIT
Upper Depth (ft)	0		
Lower Depth (ft)	0.25		
Units	mg/kg	mg/kg	mg/kg
Metals, Total			
ALUMINUM	20 U	**1890**	**1360**
ANTIMONY	0.6 U	3.3 U	3.1 U
ARSENIC	0.6 U	0.55 UR	**25 R**
BARIUM	1 U	---	---
BERYLLIUM	0.2 U	**0.94**	**0.36**
CADMIUM	0.8 U	0.22 U	0.21 U
CALCIUM	30 U	**3100**	**5740**
CHROMIUM	1.5 U	**33**	**14**
COBALT	2 U	**2.8**	**2.6**
COPPER	4 U	**9.4**	**65**
IRON	**36**	**2890 J**	**13200 J**
LEAD	**10.5**	**33 J**	**151 RJ**
MAGNESIUM	20 U	**1040**	**779**
MANGANESE	**2 B**	**82**	**155**
MERCURY	0.05 U	---	---
NICKEL	5 U	**51 R**	**25 R**
POTASSIUM	**261 B**	**1040**	**992**
SELENIUM	0.7 U	---	---
SILVER	**0.2 B**	0.52 U	0.57 U
SODIUM	**30 B**	275 U	**416**
THALLIUM	0.1 U	0.55 U	0.52 U
TIN	10 U	---	---
VANADIUM	3 U	**123 R**	**49 R**
ZINC	1 U	**9.9**	**39**
SVOC			
1,2,4-TRICHLOROBENZENE	410 U	---	---
1,2-DICHLOROBENZENE	410 U	---	---
1,3-DICHLOROBENZENE	410 U	---	---
1,4-DICHLOROBENZENE	410 U	---	---
2,4,5-TRICHLOROPHENOL	2100 U	---	---
2,4,6-TRICHLOROPHENOL	410 U	---	---
2,4-DICHLOROPHENOL	410 U	---	---
2,4-DIMETHYLPHENOL	410 U	---	---
2,4-DINITROPHENOL	2100 U	---	---
2,4-DINITROTOLUENE	410 U	---	---
2,6-DINITROTOLUENE	410 U	---	---
2-CHLORONAPHTHALENE	410 U	---	---
2-CHLOROPHENOL	410 U	---	---
2-METHYLNAPHTHALENE	**130 J**	0.33 U	0.33 U
2-METHYLPHENOL	410 U	---	---
2-NITROANILINE	2100 U	---	---
2-NITROPHENOL	410 U	---	---
3,3'-DICHLOROBENZIDINE	830 U	---	---
3-NITROANILINE	2100 U	---	---
4,6-DINITRO-2-METHYLPHENOL	2100 U	---	---
4-BROMOPHENYLPHENYLETHER	410 U	---	---
4-CHLORO-3-METHYLPHENOL	410 U	---	---
4-CHLOROANILINE	410 U	---	---
4-CHLOROPHENYLPHENYLETHER	410 U	---	---
4-METHYLPHENOL	410 U	---	---
4-NITROANILINE	2100 U	---	---
4-NITROPHENOL	2100 U	---	---
ACENAPHTHENE	410 U	---	---

Appendix G - KRY Historical Data
EPAFIT & MSE Sludge Results, 1986 1989

Sample Station	SL-1-89	RR-SL-1	RR-SL-2
Sample Identification	KPP-SL-1	MHC-551/HC-395	MHC-552/HC-396
Sample Collection Date	11/15/1988	3/2/1986	3/2/1986
Sample Type	SL	SL	SL
Sampler	MSE	EPAFIT	EPAFIT
Upper Depth (ft)	0		
Lower Depth (ft)	0.25		
Units	mg/kg	mg/kg	mg/kg
ACENAPHTHYLENE	410 U	---	---
ANTHRACENE	410 U	**43 J**	**47 J**
BENZO(A)ANTHRACENE	**1400 J**	---	---
BENZO(A)PYRENE	**2900 J**	---	---
BENZO(B)FLUORANTHENE	410 U	---	---
BENZO(G,H,I)PERYLENE	**1100 J**	---	---
BENZO(K)FLUORANTHENE	410 U	---	---
BENZOIC ACID	2100 U	---	---
BENZYL ALCOHOL	410 U	---	---
BIS(2-CHLOROETHOXY)METHANE	410 U	---	---
BIS(2-CHLOROETHYL)ETHER	410 U	---	---
BIS(2-CHLOROISOPROPYL)ETHER	410 U	---	---
BIS(2-ETHYLHEXYL)PHTHALATE	410 U	---	---
BUTYL BENZYL PHTHALATE	410 U	---	---
CHRYSENE	**3400 J**	---	---
DIBENZO(A,H)ANTHRACENE	410 U	---	---
DIBENZOFURAN	410 U	---	---
DIETHYL PHTHALATE	410 U	0.33 U	0.33 U
DIMETHYL PHTHALATE	410 U	---	---
DI-N-BUTYLPHTHALATE	410 U	---	---
DI-N-OCTYLPHTHALATE	410 U	0.33 U	0.33 U
FLUORANTHENE	410 U	---	---
FLUORENE	410 U	0.33 U	**42 J**
HEXACHLOROBENZENE	410 U	---	---
HEXACHLOROBUTADIENE	410 U	---	---
HEXACHLOROCYCLOPENTADIENE	410 U	---	---
HEXACHLOROETHANE	410 U	---	---
INDENO(1,2,3-CD)PYRENE	410 U	---	---
ISOPHORONE	410 U	---	---
NAPHTHALENE	410 U	---	---
NITROBENZENE	410 U	---	---
N-NITROSODI-N-PROPYLAMINE	410 U	---	---
N-NITROSODIPHENYLAMINE	410 U	0.33 U	**890**
PENTACHLOROPHENOL	2100 U	**0.038 J**	**1.2 J**
PHENANTHRENE	**1200**	**40 J**	**350**
PHENOL	410 U	---	---
PYRENE	**6000**	---	---
VOC			
1,1,1-TRICHLOROETHANE	0.8 U	---	---
1,1,2,2-TETRACHLOROETHANE	0.8 U	---	---
1,1,2-TRICHLOROETHANE	0.8 U	---	---
1,1-DICHLOROETHANE	0.8 U	---	---
1,1-DICHLOROETHENE	0.8 U	---	---
1,2-DICHLOROETHANE	0.8 U	---	---
1,2-DICHLOROETHENE	0.8 U	---	---
1,2-DICHLOROPROPANE	0.8 U	---	---
2-BUTANONE	1.6 U	1 UJ	13 UB
2-HEXANONE	1.6 U	1 UJ	1 U
4-METHYL-2-PENTANONE	1.6 U	---	---
ACETONE	1.6 U	4.1 UB	8.2 UB
BENZENE	0.8 U	0.5 U	0.5 U
BROMOFORM	0.8 U	---	---
BROMOMETHANE	1.6 U	---	---
CARBON DISULFIDE	0.8 U	0.5 U	0.5 U

Appendix G - KRY Historical Data
EPAFIT & MSE Sludge Results, 1986 1989

Sample Station	SL-1-89	RR-SL-1	RR-SL-2
Sample Identification	KPP-SL-1	MHC-551/HC-395	MHC-552/HC-396
Sample Collection Date	11/15/1988	3/2/1986	3/2/1986
Sample Type	SL	SL	SL
Sampler	MSE	EPAFIT	EPAFIT
Upper Depth (ft)	0		
Lower Depth (ft)	0.25		
Units	mg/kg	mg/kg	mg/kg
CARBON TETRACHLORIDE	0.8 U	---	---
CHLOROBENZENE	0.8 U	---	---
CHLOROETHANE	1.6 U	---	---
CHLOROFORM	0.8 U	---	---
CHLOROMETHANE	1.6 U	---	---
CIS-1,3-DICHLOROPROPENE	0.8 U	---	---
DIBROMOCHLOROMETHANE	0.8 U	---	---
DICHLOROBROMOMETHANE	0.8 U	---	---
ETHYLBENZENE	0.8 U	---	---
METHYLENE CHLORIDE	0.8 U	4.7 UB	7.4 UB
STYRENE	0.8 U	---	---
TETRACHLOROETHENE	0.8 U	---	---
TOLUENE	0.8 U	0.5 U	0.5 U
TRANS-1,3-DICHLOROPROPENE	0.8 U	---	---
TRICHLOROETHENE	0.8 U	---	---
VINYL ACETATE	1.6 U	---	---
VINYL CHLORIDE	1.6 U	---	---
XYLENE	0.8 U	---	---
XYLENES (TOTAL)	---	0.5 U	0.5 U

Sample Station	SL-1-89
Sample Identification	KPP-SL-1
Sample Collection Date	11/15/1988
Sample Type	SL
Sampler	MSE
Upper Depth (ft)	0
Lower Depth (ft)	0.25
Units	ng/kg
Dioxins & Furans	
1,2,3,4,6,7,8,9-OCDD	**11000**
1,2,3,4,6,7,8,9-OCDF	6900 U
HPCDD (TOTAL)	1900 U
HPCDF (TOTAL)	1400 U
HXCDD (TOTAL)	2500 U
HXCDF (TOTAL)	5000 U

Notes:
Detected values are shown in bold
ft = Feet
mg/kg = Milligrams per kilogram
ng/kg = Nanograms per kilogram
PCB = Polychlorinated biphenyl
SL = Sludge sample
SVOC = Semi-volatile organic compounds
U = Analyte analyzed for but not detected; reported with detection limit value
VOC = Volatile organic compounds

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	GW-1	GW-5	GW-5	GWRR-1	GWRR-2	GWRR-3	GWRR-4	GWRR-5
Sample Identification	GW-1	GW-5	GW-50	GWRR-1	GWRR-2	GWRR-3	GWRR-4	GWRR-5
Sample Collection Date	8/22/1997	8/20/1997	8/20/1997	8/21/1997	8/22/1997	8/21/1997	8/22/1997	8/22/1997
Sample Type	GW	GW	DU	GW	GW	GW	GW	GW
Duplicate of			GW-5					
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	2700	3100	2800	2300	2200	5800	27000	1500

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	GWRR-6	GWRR-7	GWY-10	GWY-12	GWY-13	GWY-14	GWY-3	GWY-4
Sample Identification	GWRR-6	GWRR-7	GWY-10	GWY-12	GWY-13	GWY-14	GWY-3	GWY-4
Sample Collection Date	8/22/1997	8/21/1997	8/21/1997	8/21/1997	8/20/1997	8/20/1997	8/20/1997	8/21/1997
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	7600	3700	4800	1800	3900	5500	8100	5100

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	KPT-1	KPT-10	KPT-11	KPT-12	KPT-13	KPT-14	KPT-15	KPT-15
Sample Identification	KPT-1	KPT-10	KPT-11	KPT-12	KPT-13	KPT-14	KPT-15	KPT-150
Sample Collection Date	8/22/1997	8/20/1997	8/22/1997	8/22/1997	8/23/1997	8/21/1997	8/20/1997	8/20/1997
Sample Type	GW	GW	GW	GW	GW	GW	GW	DU
Duplicate of								KPT-15
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	**4300**	**2000**	1000 U	**4700**	1000 U	**1200**	**2300**	**2500**

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	KPT-2	KPT-4	KPT-5	KPT-7	KPT-7	KPT-7	KPT-7	KPT-7
Sample Identification	KPT-20	KPT-4	KPT-5	KPT-7	KPT-7	KPT-7	KPT-7	KPT-7
Sample Collection Date	11/6/1996	8/23/1997	8/22/1997	9/12/1996	11/6/1996	12/18/1996	1/17/1997	2/20/1997
Sample Type	DU	GW	GW	GW	GW	GW	GW	GW
Duplicate of	KPT-2							
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	2500	1200	3200	1800	2600	2500	2600	1900

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	KPT-7	KPT-7	KPT-7	KPT-7	KPT-7	KPT-7	KPT-8	KPT-9
Sample Identification	KPT-7	KPT-7	KPT-7	KPT-7	KPT-7-898	KPT-7-299	KPT-8	KPT-9
Sample Collection Date	3/18/1997	4/18/1997	6/16/1997	8/20/1997	8/27/1998	2/22/1999	8/23/1997	11/6/1996
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	1600	2000	3100	3400	1300	2200	1000 U	2600

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9
Sample Identification	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9	KPT-9-898	KPT-9-299
Sample Collection Date	1/17/1997	2/20/1997	3/18/1997	4/18/1997	6/16/1997	8/21/1997	8/27/1998	2/22/1999
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	3000	2100	1700	2400	2200	1700	2400	2200

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1
Sample Identification	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1	OSW-1
Sample Collection Date	9/12/1996	11/6/1996	12/18/1996	1/17/1997	2/20/1997	3/18/1997	4/18/1997	6/16/1997
Sample Type	GW	GW	GW	GW	GW	GW	GW	GW
Duplicate of								
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	2900	1900	2200	2400	2100	2400	3200	4300

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	OSW-1	OSW-1	OSW-1	OSW-1	OSW-2	OSW-2	OSW-2	OSW-2
Sample Identification	OSW-1	OSW-1-898	OSW-101-898	OSW-1-299	OSW-2	OSW-2	OSW-2	OSW-2
Sample Collection Date	8/20/1997	8/27/1998	8/27/1998	2/22/1999	9/12/1996	11/6/1996	12/18/1996	1/17/1997
Sample Type	GW	GW	DU	GW	GW	GW	GW	GW
Duplicate of			OSW-1					
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	5900	2800	3700	3000	2500	2600	3800	3200

Appendix G - KRY Historical Data
Retec Groundwater Chloride, 1996-2005

Sample Station	OSW-2	OSW-2	OSW-2	OSW-2	OSW-2	OSW-2	OSW-2	OSW-2
Sample Identification	KPT-20	OSW-2	KPT-20	OSW-2	KPT-20	OSW-2	KPT-20	OSW-2
Sample Collection Date	1/17/1997	2/20/1997	2/20/1997	3/18/1997	3/18/1997	4/18/1997	4/18/1997	6/16/1997
Sample Type	DU	GW	DU	GW	DU	GW	DU	GW
Duplicate of	OSW-2		OSW-2		OSW-2		OSW-2	
Units	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
Chloride	3200	4500	4500	3300	3500	4700	4700	4300

Appendix G - KRY Historical Data
Retec Sediment SVOC, 2005

Sample Station	SED05-1	SED05-2
Sample Identification	SED05-1	SED05-2
Sample Collection Date	11/6/2005	11/6/2005
Sample Type	SD	SD
Units	mg/kg	mg/kg
1,2,4-Trichlorobenzene	0.581 U	0.763 U
1,2-Dichlorobenzene	0.581 U	0.763 U
1,3-Dichlorobenzene	0.581 U	0.763 U
1,4-Dichlorobenzene	0.581 U	0.763 U
2,4,5-Trichlorophenol	0.581 U	0.763 U
2,4,6-Trichlorophenol	0.581 U	0.763 U
2,4-Dichlorophenol	0.581 U	0.763 U
2,4-Dimethylphenol	0.581 U	0.763 U
2,4-Dinitrophenol	2.82 U	3.7 U
2,4-Dinitrotoluene	0.581 U	0.763 U
2,6-Dinitrotoluene	0.581 U	0.763 U
2-Chloronaphthalene	0.581 U	0.763 U
2-Chlorophenol	0.581 U	0.763 U
2-Methylphenol	0.581 U	0.763 U
2-Nitroaniline	1.16 U	1.53 U
2-Nitrophenol	0.581 U	0.763 U
3,3'-Dichlorobenzidine	1.16 U	1.53 UJ
3-Nitroaniline	1.16 U	1.53 U
4,6-Dinitro-2-Methylphenol	2.32 U	3.05 U
4-Bromophenylphenylether	0.581 U	0.763 U
4-Chloro-3-Methylphenol	1.16 U	1.53 U
4-Chloroaniline	1.16 U	1.53 U
4-Chlorophenylphenylether	0.581 U	0.763 U
4-Methylphenol/3-Methylphenol	0.581 U	0.763 U
4-Nitroaniline	1.16 U	1.53 U
4-Nitrophenol	2.82 U	3.7 U
Acenaphthene	0.581 U	0.763 U
Acenaphthylene	0.581 U	0.763 U
Benzoic Acid	2.32 U	3.05 U
Benzyl Alcohol	1.16 U	1.53 U
Bis(2-Chloroethoxy)Methane	0.581 U	0.763 U
Bis(2-Chloroethyl)Ether	0.581 U	0.763 U
Bis(2-Chloroisopropyl)Ether	0.581 U	0.763 U
Bis(2-Ethylhexyl)Phthalate	0.581 U	0.763 U
Butyl Benzyl Phthalate	0.581 U	0.763 U
Dibenzofuran	0.581 U	0.763 U
Diethyl Phthalate	0.581 U	0.763 U
Dimethyl Phthalate	0.581 U	0.763 U
Di-N-Butylphthalate	0.581 U	0.763 U
Di-N-Octylphthalate	0.581 U	0.763 U
Hexachlorobenzene	0.581 U	0.763 U
Hexachlorobutadiene	0.581 U	0.763 U
Hexachlorocyclopentadiene	0.581 U	0.763 U
Hexachloroethane	0.581 U	0.763 U
Isophorone	0.581 U	0.763 U
Nitrobenzene	0.581 U	0.763 U
N-Nitrosodi-N-Propylamine	0.581 U	0.763 U
N-Nitrosodiphenylamine	0.581 U	0.763 U
Pentachlorophenol	1.16 U	1.53 U
Phenol	0.581 U	0.763 U
Pyrene	0.581 U	0.763 U
Quinoline	0.581 U	0.763 U

Notes:

Detected values are shown in bold
mg/kg = Milligrams per kilogram
SD = Sediment sample
U = The analyte was analyzed for but was not detected above the listed sample quantitation limit.

Appendix G - KRY Historical Data
Secor Groundwater Herbicides, 1995

Sample Station	CLCW-1	GWY-10	GWY-11	GWY-12	GWY-13	GWY-14	GWY-3	GWY-4	GWY-7	GWY-8	GWY-9
Sample Identification	**CLCW-1**	**GWY-10**	**GWY-11**	**GWY-12**	**GWY-13**	**GWY-14**	**MW-3**	**GWY-4**	**GWY-7**	**GWY-8**	**GWY-9**
Sample Collection Date	**10/23/1995**	**10/23/1995**	**10/23/1995**	**10/26/1995**	**10/23/1995**	**10/23/1995**	**10/23/1995**	**10/23/1995**	**10/25/1995**	**10/23/1995**	**10/24/1995**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**	**GW**
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
2,4,5-TP (SILVEX)	1 U	1 U	1 U	**2.1**	**1.9**	1 U	1 U	1 U	1 U	1 U	1 U
2,4-D	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2,4-DB	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Bentazon	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dalapon	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
DCPA	0.5 U	0.5 U	0.5 U	0.5 U	**1.4**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dinoseb	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Pentachlorophenol	**4.8**	1 U	1 U	**12**	**12**	**16**	1 U	1 U	1 U	1 U	1 U
Picloram	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U

Notes:

Detected values are shown in bold
GW = Groundwater sample
ug/L = Micrograms per liter
U = Analyte analyzed for but not detected; reported with detection limit value

Appendix G - KRY Historical Data
Spratt Groundwater Petroleum Hydrocarbons, 1993

Sample Station	PW-1	PW-2C	PW-2D	PW-3
Sample Identification	PW1-TPH	PW2C-TPH	PW2D-TPH	PW3-TPH
Sample Collection Date	3/23/1993	3/23/1993	3/23/1993	3/23/1993
Sample Type	GW	GW	GW	GW
Units	ug/L	ug/L	ug/L	ug/L
Benzene	**140 D**	**17**	**200 D**	**66 D**
Ethylbenzene	**210 D**	**14**	**150 D**	**150 D**
Toluene	**830 D**	**40**	**640 D**	**330 D**
Xylenes (Total)	**1000 D**	**53**	**670 D**	**750 D**
Gasoline Range Organics	**6600 D**	**320**	**5000 D**	**4500 D**

Notes:

Detected values are shown in bold
D = Sample dilution
GW = Groundwater sample
ug/L = Micrograms per liter

Appendix G - KRY Historical Data
Weston Groundwater SVOC, 1991

Sample Station	**GW-1**	**GW-2**	**GW-3**	**GW-4**	**GW-5**	**GW-5**	**GWRR-1**	**GWRR-2**	**GWRR-2**	**GWRR-3**
Sample Identification	**GW-1**	**GW-2**	**GW-3**	**GW-4**	**GW-5**	**GW-5**	**GWRR-1**	**GWRR-2**	**GWRR-2**	**GWRR-3**
Sample Collection Date	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**	**8/20/1991**
Sample Type	**GW**	**GW**	**GW**	**GW**	**GW**	**DU**	**GW**	**GW**	**DU**	**GW**
Duplicate of									**GWRR-2**	
Units	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**	**ug/L**
1,2,4-Trichlorobenzene	---	---	---	---	---	---	---	---	---	---
1,2-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---
1,2-Diphenylhydrazine	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---
2,3,4,6-Tetrachlorophenol	10 U	10 U	**150**	11 U	**82**	**81**	10 U	**66**	---	10 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	11 U	10 U	10 U	---	10 U	---	10 U
2,4-Dichlorophenol	---	---	---	---	---	---	---	---	---	---
2,4-Dimethylphenol	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
2,4-Dinitrophenol	53 U	52 U	51 U	53 U	51 U	51 U	50 U	50 U	---	50 U
2,4-Dinitrotoluene	---	---	---	---	---	---	---	---	---	---
2,6-Dinitrotoluene	---	---	---	---	---	---	---	---	---	---
2-Chloronaphthalene	---	---	---	---	---	---	---	---	---	---
2-Chlorophenol	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
2-Nitrophenol	---	---	---	---	---	---	---	---	---	---
3,3'-Dichlorobenzidine	---	---	---	---	---	---	---	---	---	---
4,6-Dinitro-2-Methylphenol	---	---	---	---	---	---	---	---	---	---
4-Bromophenylphenylether	---	---	---	---	---	---	---	---	---	---
4-Chloro-3-Methylphenol	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
4-Chlorophenylphenylether	---	---	---	---	---	---	---	---	---	---
4-Nitrophenol	---	---	---	---	---	---	---	---	---	---
Acenaphthene	---	---	---	---	---	---	---	---	---	---
Acenaphthylene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Anthracene	---	---	---	---	---	---	---	---	---	---
Benzidine	---	---	---	---	---	---	---	---	---	---
Benzo(a)Anthracene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Benzo(a)Pyrene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Benzo(b)Fluoranthene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Benzo(g,h,i)Perylene	---	---	---	---	---	---	---	---	---	---
Benzo(k)Fluoranthene	---	---	---	---	---	---	---	---	---	---
bis(2-Chloroethoxy)Methane	---	---	---	---	---	---	---	---	---	---
bis(2-Chloroethyl)Ether	---	---	---	---	---	---	---	---	---	---
bis(2-Chloroisopropyl)Ether	---	---	---	---	---	---	---	---	---	---
bis(2-Ethylhexyl)Phthalate	---	---	---	---	---	---	---	---	---	---
Butyl Benzyl Phthalate	---	---	---	---	---	---	---	---	---	---
Carbazole	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Chrysene	---	---	---	---	---	---	---	---	---	---
Dibenzo(a,h)Anthracene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Diethyl Phthalate	---	---	---	---	---	---	---	---	---	---
Dimethyl Phthalate	---	---	---	---	---	---	---	---	---	---
Di-n-Butylphthalate	---	---	---	---	---	---	---	---	---	---
Di-n-Octylphthalate	---	---	---	---	---	---	---	---	---	---
Fluoranthene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Fluorene	---	---	---	---	---	---	---	---	---	---
Hexachlorobenzene	---	---	---	---	---	---	---	---	---	---
Hexachlorobutadiene	---	---	---	---	---	---	---	---	---	---
Hexachlorocyclopentadiene	---	---	---	---	---	---	---	---	---	---
Hexachloroethane	---	---	---	---	---	---	---	---	---	---
Indeno(1,2,3-cd)Pyrene	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Isophorone	---	---	---	---	---	---	---	---	---	---
Naphthalene	10 U	10 U	**87**	11 U	10 U	10 U	10 U	10 U	---	10 U
Nitrobenzene	---	---	---	---	---	---	---	---	---	---
N-Nitroso-di-Methylamine	---	---	---	---	---	---	---	---	---	---
N-Nitrosodi-n-Propylamine	---	---	---	---	---	---	---	---	---	---
N-Nitrosodiphenylamine	---	---	---	---	---	---	---	---	---	---
Pentachlorophenol	21 U	21 U	**5400**	**17 J**	**1400**	**1300**	20 U	**950**	---	20 U
Phenanthrene	10 U	10 U	**420**	11 U	10 U	10 U	10 U	10 U	---	10 U
Phenol	10 U	10 U	10 U	11 U	10 U	10 U	10 U	10 U	---	10 U
Pyrene	---	---	---	---	---	---	---	---	---	---

Appendix G - KRY Historical Data
Weston Groundwater SVOC, 1991

Sample Station	GWY-10	GWY-12	GWY-14	GWY-8
Sample Identification	GWY-10	GWY-12	GWY-14	GWY-8
Sample Collection Date	8/20/1991	8/20/1991	8/20/1991	8/20/1991
Sample Type	GW	GW	GW	GW
Duplicate of				
Units	ug/L	ug/L	ug/L	ug/L
1,2,4-Trichlorobenzene	---	---	---	---
1,2-Dichlorobenzene	---	---	---	---
1,2-Diphenylhydrazine	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---
2,3,4,6-Tetrachlorophenol	10 U	**39**	**11**	10 U
2,4,6-Trichlorophenol	10 U	11 U	11 U	10 U
2,4-Dichlorophenol	---	---	---	---
2,4-Dimethylphenol	10 U	11 U	11 U	10 U
2,4-Dinitrophenol	50 U	53 U	53 U	50 U
2,4-Dinitrotoluene	---	---	---	---
2,6-Dinitrotoluene	---	---	---	---
2-Chloronaphthalene	---	---	---	---
2-Chlorophenol	10 U	11 U	11 U	10 U
2-Nitrophenol	---	---	---	---
3,3'-Dichlorobenzidine	---	---	---	---
4,6-Dinitro-2-Methylphenol	---	---	---	---
4-Bromophenylphenylether	---	---	---	---
4-Chloro-3-Methylphenol	10 U	11 U	11 U	10 U
4-Chlorophenylphenylether	---	---	---	---
4-Nitrophenol	---	---	---	---
Acenaphthene	---	---	---	---
Acenaphthylene	10 U	11 U	11 U	10 U
Anthracene	---	---	---	---
Benzidine	---	---	---	---
Benzo(a)Anthracene	10 U	11 U	11 U	10 U
Benzo(a)Pyrene	10 U	11 U	11 U	10 U
Benzo(b)Fluoranthene	10 U	11 U	11 U	10 U
Benzo(g,h,i)Perylene	---	---	---	---
Benzo(k)Fluoranthene	---	---	---	---
bis(2-Chloroethoxy)Methane	---	---	---	---
bis(2-Chloroethyl)Ether	---	---	---	---
bis(2-Chloroisopropyl)Ether	---	---	---	---
bis(2-Ethylhexyl)Phthalate	---	---	---	---
Butyl Benzyl Phthalate	---	---	---	---
Carbazole	10 U	10 U	11 U	10 U
Chrysene	---	---	---	---
Dibenzo(a,h)Anthracene	10 U	11 U	11 U	10 U
Diethyl Phthalate	---	---	---	---
Dimethyl Phthalate	---	---	---	---
Di-n-Butylphthalate	---	---	---	---
Di-n-Octylphthalate	---	---	---	---
Fluoranthene	10 U	11 U	11 U	10 U
Fluorene	---	---	---	---
Hexachlorobenzene	---	---	---	---
Hexachlorobutadiene	---	---	---	---
Hexachlorocyclopentadiene	---	---	---	---
Hexachloroethane	---	---	---	---
Indeno(1,2,3-cd)Pyrene	10 U	11 U	11 U	10 U
Isophorone	---	---	---	---
Naphthalene	10 U	11 U	11 U	10 U
Nitrobenzene	---	---	---	---
N-Nitroso-di-Methylamine	---	---	---	---
N-Nitrosodi-n-Propylamine	---	---	---	---
N-Nitrosodiphenylamine	---	---	---	---
Pentachlorophenol	20 U	**360**	**470**	20 U
Phenanthrene	10 U	11 U	11 U	10 U
Phenol	10 U	11 U	11 U	10 U
Pyrene	---	---	---	---

Notes:

Detected values are shown in bold
DU = Duplicate sample
GW = Groundwater sample
J = The analyte was detected, but the concentration is considered estimated for quality control reasons.
SVOC = Semi-volatile organic compound
U = Analyte analyzed for but not detected; reported with detection limit value
ug/L = Micrograms per liter

Appendix G - KRY Historical Data
Weston Soil Metals, 1991

Sample Station	**SS-4-91**	**SS-6-91**	**SS-10-91**
Sample Identification	**B8354**	**B8356**	**B8359**
Sample Collection Date	**9/27/1991**	**9/27/1991**	**9/27/1991**
Sample Type	**SS**	**SS**	**SS**
Upper Depth (ft)	**0**	**0**	**0**
Lower Depth (ft)	**0.5**	**0.5**	**0.5**
Units	**mg/kg**	**mg/kg**	**mg/kg**
Antimony	6 U	6 U	6 U
Arsenic	**7.7**	**4.1**	**3.7**
Beryllium	**0.36**	**0.5**	**0.41**
Cadmium	0.5 U	0.5 U	0.5 U
Chromium	**7.4**	**8.8**	**8.3**
Copper	**20.7**	**22.8**	**42.9**
Lead	**471**	**117**	**262**
Mercury	0.2 U	0.2 U	0.2 U
Nickel	**9.5**	**8.8**	**12**
Selenium	1 U	0.5 U	1 U
Silver	1 U	1 U	1 U
Thallium	0.5 U	0.5 U	1 U
Zinc	**117**	**44**	**185**

Notes:

Detected values are shown in bold.
ft = feet
mg/kg = milligrams per kilogram
U = The analyte was analyzed for but was not detected above the listed sample quantitation limit.

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1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

DETERMINATION OF PCDD/PCDF LEVELS

Prepared for:
Montana DEQ
Attn: Moriah Bucy
PO Box 200901
Helena, MT 59620

ACCREDITED IN ACCORDANCE WITH nelac

This report contains 20 pages.

The results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

Project: K/R/Y Residential Sampling

Client Purchase Order Number: NA

REPORT OF LABORATORY ANALYSIS

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REPORT OF: CHEMICAL ANALYSES

Pace Analytical Services, Inc.
1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

PROJECT: **PCDD/PCDF ANALYSES**

DATE: October 25, 2006

ISSUED TO: Montana DEQ
Attn: Moriah Bucy
PO Box 200901
Helena, MT 59620

REPORT NO: 06-1039901

INTRODUCTION

This report presents the results from the analyses performed on five samples submitted by a representative of Montana DEQ. The samples were analyzed for the presence or absence of polychlorodibenzo-p-dioxins (PCDDs) and polychlorodibenzofurans (PCDFs) using a modified version of USEPA Method 8290.

SAMPLE IDENTIFICATION

Client ID	Sample Type	Date Received	PACE ID
RW-1-1006	Water	10/11/06	1039901001
RW-7-1006	Water	10/11/06	1039901002
RW-10-1006	Water	10/11/06	1039901003
RW-12-1006	Water	10/11/06	1039901004
RW-13-1006	Water	10/11/06	1039901005

RESULTS

The results are included in the following:

Appendix A – Chain of Custody Documentation
Appendix B – PCDD/PCDF Analysis Results

REPORT OF LABORATORY ANALYSIS

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1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

REPORT OF: CHEMICAL ANALYSES

PROJECT: **PCDD/PCDF ANALYSES**

DATE: October 25, 2006

REPORT NO: 06-1039901

DISCUSSION

The recoveries of the isotopically-labeled PCDD/PCDF internal standards in the sample extracts ranged from 59-130%. All of the labeled standard recoveries obtained for this project were within the 40-135% Method 8290 target range. Also, since the quantification of the native 2,3,7,8-substituted congeners was based on isotope dilution, the data were automatically corrected for variation in recovery and accurate values were obtained.

A laboratory method blank was prepared and analyzed with each sample batch as part of our routine quality control procedures. The results, found at the beginning of Appendix B, show the blanks to be free of PCDDs and PCDFs at the reporting limits, with the exceptions of trace levels of OCDD. These were below the calibration range of the method. Sample levels similar to the corresponding blank levels were flagged "B" on the results tables and may be, at least partially, attributed to the background. It should be noted that levels less than ten times the background are not generally considered to be statistically different from the background.

Laboratory spike samples were also prepared with the sample batches using clean water that had been fortified with native standard materials. Recoveries of the spiked native compounds ranged from 86-126%, with relative percent differences of 0.9-11.1%. These results indicate high degrees of accuracy and precision for these determinations.

REMARKS

The sample extracts will be retained for a period of 15 days from the date of this report and then discarded unless other arrangements are made. The raw mass spectral data will be archived on magnetic tape for a period of not less than one year. Questions regarding the data contained in this report may be directed to the author at the number provided below.

Pace Analytical Services, Inc.

Scott C. Unze
Project Manager, HRMS
(612) 607-6383

REPORT OF LABORATORY ANALYSIS

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TABLE 1. 2,3,7,8-TCDD Equivalency Factors (TEFs) for the Polychlorinated Dibenzo-p-dioxins and Dibenzofurans

Number	Compound(s)	TEF
1	2,3,7,8-TCDD	1.00
2	1,2,3,7,8-PeCDD	0.50
3	1,2,3,6,7,8-HxCDD	0.1
4	1,2,3,7,8,9-HxCDD	0.1
5	1,2,3,4,7,8-HxCDD	0.1
6	1,2,3,4,6,7,8-HpCDD	0.01
7	OCDD	0.001
8	* Total - TCDD	0.0
9	* Total - PeCDD	0.0
10	* Total - HxCDD	0.0
11	* Total - HpCDD	0.0
12	2,3,7,8-TCDF	0.10
13	1,2,3,7,8-PeCDF	0.05
14	2,3,4,7,8-PeCDF	0.5
15	1,2,3,6,7,8-HxCDF	0.1
16	1,2,3,7,8,9-HxCDF	0.1
17	1,2,3,4,7,8-HxCDF	0.1
18	2,3,4,6,7,8-HxCDF	0.1
19	1,2,3,4,6,7,8-HpCDF	0.01
20	1,2,3,4,7,8,9-HpCDF	0.01
21	OCDF	0.001
22	* Total - TCDF	0.0
23	* Total - PeCDF	0.0
24	* Total - HxCDF	0.0
25	* Total - HpCDF	0.0

*Excluding the 2,3,7,8-substituted congeners.

Reference: 1989 ITEFs

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Minneapolis, MN 55414
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Fax: 612.607.6444

APPENDIX A

REPORT OF LABORATORY ANALYSIS
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1039901

FROM: MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY CECRA PROGRAM ~~2209 PHOENIX AVENUE~~ P.O. Box 200901 HELENA, MT 59620 TELEPHONE: ~~(406)444-1420~~ 406-841-5064	CONTRACT #: invoice	TO: Pace Analytical Services, Inc. 1700 Elm St., Suite 100 Minneapolis, MN 55414

SEND BILL, COOLER, CHAIN OF CUSTODY FORM AND RESULTS TO: Moriah Bucy AT THE ABOVE ADDRESS

PROJECT NAME AND SITE LOCATION: KIBN Residential Sampling

SAMPLER (SIGNATURE): Moriah Bucy

DATE	TIME	SAMPLE NUMBER AND ID	FILT Y/N	PRES.	# OF CONTAINERS	MATRIX	ANALYSES REQUESTED (SPECIFY METHOD #)	
10/4/06	1442	RW-1-1006	N	N	2	W	EPA 8290	001
10/4/06	1523	RW-7-1006	N	N	2	W	EPA 8290	002
10/4/06	1205	RW-10-1006	N	N	2	W	EPA 8290	Dioxin/Furan
10/4/06	1345	RW-12-1006	N	N	2	W	EPA 8290	004
10/4/06	1405	RW-13-1006	N	N	2	W	EPA 8290	005

COMMENTS:

Relinquished by (signature)	Date	Time	Received by (signature)	Name of Receiving Laboratory
Moriah Bucy	10/10/06 (MB)	1230		Pace Analytical Services
Relinquished by (signature)	Date	Time	Received by (signature)	Received for Lab. by (signature) 10/11/06 9:30
				Seal Number

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Sampler Copy = Yellow
CECRA File Copy = Pink

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Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

APPENDIX B

REPORT OF LABORATORY ANALYSIS
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Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Blank Analysis Results

Client - Montana Dept. Of Env. Quality

Lab Sample ID	BLANK-11219	Matrix	Water
Filename	U61018A_07	Dilution	NA
Total Amount Extracted	980 mL	Extracted	10/17/2006
ICAL Date	09/19/2006	Analyzed	10/18/2006 22:01
CCal Filename(s)	U61018A_03 & U61018A_19	Injected By	BAL

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L	Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	0.0020	2,3,7,8-TCDF-13C	2.00	109
Total TCDF	ND	-----	0.0020	2,3,7,8-TCDD-13C	2.00	87
				1,2,3,7,8-PeCDF-13C	2.00	94
2,3,7,8-TCDD	ND	-----	0.0020	2,3,4,7,8-PeCDF-13C	2.00	97
Total TCDD	ND	-----	0.0020	1,2,3,7,8-PeCDD-13C	2.00	102
				1,2,3,4,7,8-HxCDF-13C	2.00	88
1,2,3,7,8-PeCDF	ND	-----	0.0100	1,2,3,6,7,8-HxCDF-13C	2.00	94
2,3,4,7,8-PeCDF	ND	-----	0.0100	2,3,4,6,7,8-HxCDF-13C	2.00	88
Total PeCDF	ND	-----	0.0100	1,2,3,7,8,9-HxCDF-13C	2.00	85
				1,2,3,4,7,8-HxCDD-13C	2.00	77
1,2,3,7,8-PeCDD	ND	-----	0.0100	1,2,3,6,7,8-HxCDD-13C	2.00	89
Total PeCDD	ND	-----	0.0100	1,2,3,4,6,7,8-HpCDF-13C	2.00	74
				1,2,3,4,7,8,9-HpCDF-13C	2.00	66
1,2,3,4,7,8-HxCDF	ND	-----	0.0100	1,2,3,4,6,7,8-HpCDD-13C	2.00	102
1,2,3,6,7,8-HxCDF	ND	-----	0.0100	OCDD-13C	4.00	100
2,3,4,6,7,8-HxCDF	ND	-----	0.0100			
1,2,3,7,8,9-HxCDF	ND	-----	0.0100	1,2,3,4-TCDD-13C	2.00	NA
Total HxCDF	ND	-----	0.0100	1,2,3,7,8,9-HxCDD-13C	2.00	NA
1,2,3,4,7,8-HxCDD	ND	-----	0.0100	2,3,7,8-TCDD-37Cl4	0.20	85
1,2,3,6,7,8-HxCDD	ND	-----	0.0100			
1,2,3,7,8,9-HxCDD	ND	-----	0.0100			
Total HxCDD	ND	-----	0.0100			
1,2,3,4,6,7,8-HpCDF	ND	-----	0.0100	Total 2,3,7,8-TCDD		
1,2,3,4,7,8,9-HpCDF	ND	-----	0.0100	Equivalence: 0.000037 ng/L		
Total HpCDF	ND	-----	0.0100	(Using ITE Factors)		
1,2,3,4,6,7,8-HpCDD	ND	-----	0.0100			
Total HpCDD	ND	-----	0.0100			
OCDF	ND	-----	0.0200			
OCDD	0.037	-----	0.0200 J			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
LRL = Lower Reporting Limit
J = Concentration detected is below the calibration range
P = Recovery outside of target range
A = Detection Limit based on signal-to-noise measurement

I = Interference
E = PCDE Interference
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....1039901

REPORT OF LABORATORY ANALYSIS

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Blank Analysis Results

Client - Montana Dept. Of Env. Quality

Lab Sample ID	BLANK-11237	Matrix	Water
Filename	P61023A_09	Dilution	NA
Total Amount Extracted	986 mL	Extracted	10/20/2006
ICAL Date	08/16/2006	Analyzed	10/23/2006 13:51
CCal Filename(s)	P61023A_05 & P61023A_21	Injected By	SMT

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L	
2,3,7,8-TCDF	ND	-----	0.00200	
Total TCDF	ND	-----	0.00200	
2,3,7,8-TCDD	ND	-----	0.00200	
Total TCDD	ND	-----	0.00200	
1,2,3,7,8-PeCDF	ND	-----	0.01000	
2,3,4,7,8-PeCDF	ND	-----	0.01000	
Total PeCDF	ND	-----	0.01000	
1,2,3,7,8-PeCDD	ND	-----	0.01000	
Total PeCDD	ND	-----	0.01000	
1,2,3,4,7,8-HxCDF	ND	-----	0.01000	
1,2,3,6,7,8-HxCDF	ND	-----	0.01000	
2,3,4,6,7,8-HxCDF	ND	-----	0.01000	
1,2,3,7,8,9-HxCDF	ND	-----	0.01000	
Total HxCDF	ND	-----	0.01000	
1,2,3,4,7,8-HxCDD	ND	-----	0.01000	
1,2,3,6,7,8-HxCDD	ND	-----	0.01000	
1,2,3,7,8,9-HxCDD	ND	-----	0.01000	
Total HxCDD	ND	-----	0.01000	
1,2,3,4,6,7,8-HpCDF	ND	-----	0.01000	
1,2,3,4,7,8,9-HpCDF	ND	-----	0.01000	
Total HpCDF	ND	-----	0.01000	
1,2,3,4,6,7,8-HpCDD	ND	-----	0.01000	
Total HpCDD	ND	-----	0.01000	
OCDF	ND	-----	0.02000	
OCDD	0.025	-----	0.02000	J

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	82
2,3,7,8-TCDD-13C	2.00	61
1,2,3,7,8-PeCDF-13C	2.00	75
2,3,4,7,8-PeCDF-13C	2.00	83
1,2,3,7,8-PeCDD-13C	2.00	95
1,2,3,4,7,8-HxCDF-13C	2.00	78
1,2,3,6,7,8-HxCDF-13C	2.00	82
2,3,4,6,7,8-HxCDF-13C	2.00	78
1,2,3,7,8,9-HxCDF-13C	2.00	73
1,2,3,4,7,8-HxCDD-13C	2.00	70
1,2,3,6,7,8-HxCDD-13C	2.00	76
1,2,3,4,6,7,8-HpCDF-13C	2.00	77
1,2,3,4,7,8,9-HpCDF-13C	2.00	68
1,2,3,4,6,7,8-HpCDD-13C	2.00	80
OCDD-13C	4.00	72
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	52

Total 2,3,7,8-TCDD
Equivalence: 0.000025 ng/L
(Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers).
EMPC = Estimated Maximum Possible Concentration
LRL = Lower Reporting Limit
J = Concentration detected is below the calibration range
P = Recovery outside of target range
A = Detection Limit based on signal-to-noise measurement

I = Interference
E = PCDE Interference
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....1039901

REPORT OF LABORATORY ANALYSIS

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Fax: 612- 607-6444

Method 8290 Analysis Results

Client - Montana Dept. Of Env. Quality

Client's Sample ID	RW-1-1006		
Lab Sample ID	1039901001		
Filename	F61019A_09		
Injected By	BAL		
Total Amount Extracted	978 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	10/04/2006
ICAL Date	09/10/2006	Received	10/11/2006
CCal Filename(s)	F61018B_18 & F61019A_18	Extracted	10/17/2006
Method Blank ID	BLANK-11219	Analyzed	10/19/2006 22:01

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L		Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF	ND	-----	0.00200		2,3,7,8-TCDF-13C	2.00	112
Total TCDF	ND	-----	0.00200		2,3,7,8-TCDD-13C	2.00	98
2,3,7,8-TCDD	ND	-----	0.00230	A	1,2,3,7,8-PeCDF-13C	2.00	117
Total TCDD	ND	-----	0.00200		2,3,4,7,8-PeCDF-13C	2.00	117
1,2,3,7,8-PeCDF	ND	-----	0.01000		1,2,3,7,8-PeCDD-13C	2.00	130
2,3,4,7,8-PeCDF	ND	-----	0.01000		1,2,3,4,7,8-HxCDF-13C	2.00	90
Total PeCDF	ND	-----	0.01000		1,2,3,6,7,8-HxCDF-13C	2.00	84
1,2,3,7,8-PeCDD	ND	-----	0.01000		2,3,4,6,7,8-HxCDF-13C	2.00	101
Total PeCDD	ND	-----	0.01000		1,2,3,7,8,9-HxCDF-13C	2.00	95
1,2,3,4,7,8-HxCDF	ND	-----	0.01000		1,2,3,4,7,8-HxCDD-13C	2.00	92
1,2,3,6,7,8-HxCDF	ND	-----	0.01000		1,2,3,6,7,8-HxCDD-13C	2.00	81
2,3,4,6,7,8-HxCDF	ND	-----	0.01000		1,2,3,4,6,7,8-HpCDF-13C	2.00	76
1,2,3,7,8,9-HxCDF	ND	-----	0.01000		1,2,3,4,7,8,9-HpCDF-13C	2.00	71
Total HxCDF	ND	-----	0.01000		1,2,3,4,6,7,8-HpCDD-13C	2.00	82
1,2,3,4,7,8-HxCDD	ND	-----	0.01000		OCDD-13C	4.00	82
1,2,3,6,7,8-HxCDD	ND	-----	0.01000		1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD	ND	-----	0.01000		1,2,3,7,8,9-HxCDD-13C	2.00	NA
Total HxCDD	ND	-----	0.01000				
1,2,3,4,6,7,8-HpCDF	ND	-----	0.01000		2,3,7,8-TCDD-37Cl4	0.20	95
1,2,3,4,7,8,9-HpCDF	ND	-----	0.01000				
Total HpCDF	ND	-----	0.01000				
1,2,3,4,6,7,8-HpCDD	0.010	-----	0.01000	J	Total 2,3,7,8-TCDD		
Total HpCDD	0.010	-----	0.01000	J	Equivalence: 0.00018 ng/L		
					(Using ITE Factors)		
OCDF	ND	-----	0.02000				
OCDD	0.072	-----	0.02000	BJ			

Conc = Concentration (Totals include 2,3,7,8-substituted isomers)
EMPC = Estimated Maximum Possible Concentration
A = Detection Limit based on signal-to-noise measurement
J = Concentration detected is below the calibration range
B = Less than 10 times higher than method blank level
P = Recovery outside of target range
Nn = Value obtained from additional analysis
EMPC values were excluded from the TEQ calculations.

LRL = Lower Reporting Limit
I = Interference
E = PCDE Interference
S = Saturated signal
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....1039901

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Minneapolis, MN 55414

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Fax: 612- 607-6444

Method 8290 Analysis Results

Client - Montana Dept. Of Env. Quality

Client's Sample ID	RW-7-1006		
Lab Sample ID	1039901002		
Filename	F61019A_10		
Injected By	BAL		
Total Amount Extracted	986 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	10/04/2006
ICAL Date	09/10/2006	Received	10/11/2006
CCal Filename(s)	F61018B_18 & F61019A_18	Extracted	10/17/2006
Method Blank ID	BLANK-11219	Analyzed	10/19/2006 22:50

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L
2,3,7,8-TCDF	ND	-----	0.00200
Total TCDF	ND	-----	0.00200
2,3,7,8-TCDD	ND	-----	0.00200
Total TCDD	ND	-----	0.00200
1,2,3,7,8-PeCDF	ND	-----	0.01000
2,3,4,7,8-PeCDF	ND	-----	0.01000
Total PeCDF	ND	-----	0.01000
1,2,3,7,8-PeCDD	ND	-----	0.01000
Total PeCDD	ND	-----	0.01000
1,2,3,4,7,8-HxCDF	ND	-----	0.01000
1,2,3,6,7,8-HxCDF	ND	-----	0.01000
2,3,4,6,7,8-HxCDF	ND	-----	0.01000
1,2,3,7,8,9-HxCDF	ND	-----	0.01000
Total HxCDF	ND	-----	0.01000
1,2,3,4,7,8-HxCDD	ND	-----	0.01000
1,2,3,6,7,8-HxCDD	ND	-----	0.01000
1,2,3,7,8,9-HxCDD	ND	-----	0.01000
Total HxCDD	ND	-----	0.01000
1,2,3,4,6,7,8-HpCDF	ND	-----	0.01000
1,2,3,4,7,8,9-HpCDF	ND	-----	0.01000
Total HpCDF	ND	-----	0.01000
1,2,3,4,6,7,8-HpCDD	ND	-----	0.01000
Total HpCDD	ND	-----	0.01000
OCDF	ND	-----	0.02000
OCDD	ND	-----	0.02000

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	105
2,3,7,8-TCDD-13C	2.00	92
1,2,3,7,8-PeCDF-13C	2.00	101
2,3,4,7,8-PeCDF-13C	2.00	105
1,2,3,7,8-PeCDD-13C	2.00	112
1,2,3,4,7,8-HxCDF-13C	2.00	102
1,2,3,6,7,8-HxCDF-13C	2.00	92
2,3,4,6,7,8-HxCDF-13C	2.00	101
1,2,3,7,8,9-HxCDF-13C	2.00	95
1,2,3,4,7,8-HxCDD-13C	2.00	99
1,2,3,6,7,8-HxCDD-13C	2.00	85
1,2,3,4,6,7,8-HpCDF-13C	2.00	81
1,2,3,4,7,8,9-HpCDF-13C	2.00	75
1,2,3,4,6,7,8-HpCDD-13C	2.00	90
OCDD-13C	4.00	92
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	91

Total 2,3,7,8-TCDD
Equivalence: 0.00 ng/L
(Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers)
EMPC = Estimated Maximum Possible Concentration
A = Detection Limit based on signal-to-noise measurement
J = Concentration detected is below the calibration range
B = Less than 10 times higher than method blank level
P = Recovery outside of target range
Nn = Value obtained from additional analysis
EMPC values were excluded from the TEQ calculations.

LRL = Lower Reporting Limit
I = Interference
E = PCDE Interference
S = Saturated signal
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....1039901

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Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Analysis Results

Client - Montana Dept. Of Env. Quality

Client's Sample ID	RW-10-1006		
Lab Sample ID	1039901003		
Filename	F61019A_11		
Injected By	BAL		
Total Amount Extracted	1010 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	10/04/2006
ICAL Date	09/10/2006	Received	10/11/2006
CCal Filename(s)	F61018B_18 & F61019A_18	Extracted	10/17/2006
Method Blank ID	BLANK-11219	Analyzed	10/19/2006 23:40

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L	
2,3,7,8-TCDF	ND	-----	0.0020	
Total TCDF	ND	-----	0.0020	
2,3,7,8-TCDD	ND	-----	0.0027	A
Total TCDD	ND	-----	0.0020	
1,2,3,7,8-PeCDF	ND	-----	0.0099	
2,3,4,7,8-PeCDF	ND	-----	0.0099	
Total PeCDF	ND	-----	0.0099	
1,2,3,7,8-PeCDD	ND	-----	0.0099	
Total PeCDD	ND	-----	0.0099	
1,2,3,4,7,8-HxCDF	ND	-----	0.0099	
1,2,3,6,7,8-HxCDF	ND	-----	0.0099	
2,3,4,6,7,8-HxCDF	ND	-----	0.0099	
1,2,3,7,8,9-HxCDF	ND	-----	0.0099	
Total HxCDF	ND	-----	0.0099	
1,2,3,4,7,8-HxCDD	ND	-----	0.0099	
1,2,3,6,7,8-HxCDD	ND	-----	0.0099	
1,2,3,7,8,9-HxCDD	ND	-----	0.0099	
Total HxCDD	ND	-----	0.0099	
1,2,3,4,6,7,8-HpCDF	ND	-----	0.0099	
1,2,3,4,7,8,9-HpCDF	ND	-----	0.0099	
Total HpCDF	ND	-----	0.0099	
1,2,3,4,6,7,8-HpCDD	ND	-----	0.0099	
Total HpCDD	ND	-----	0.0099	
OCDF	ND	-----	0.0200	
OCDD	ND	-----	0.0200	

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	108
2,3,7,8-TCDD-13C	2.00	94
1,2,3,7,8-PeCDF-13C	2.00	103
2,3,4,7,8-PeCDF-13C	2.00	107
1,2,3,7,8-PeCDD-13C	2.00	116
1,2,3,4,7,8-HxCDF-13C	2.00	96
1,2,3,6,7,8-HxCDF-13C	2.00	96
2,3,4,6,7,8-HxCDF-13C	2.00	104
1,2,3,7,8,9-HxCDF-13C	2.00	100
1,2,3,4,7,8-HxCDD-13C	2.00	102
1,2,3,6,7,8-HxCDD-13C	2.00	86
1,2,3,4,6,7,8-HpCDF-13C	2.00	79
1,2,3,4,7,8,9-HpCDF-13C	2.00	74
1,2,3,4,6,7,8-HpCDD-13C	2.00	88
OCDD-13C	4.00	87
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	95

Total 2,3,7,8-TCDD
Equivalence: 0.00 ng/L
(Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers)
EMPC = Estimated Maximum Possible Concentration
A = Detection Limit based on signal-to-noise measurement
J = Concentration detected is below the calibration range
B = Less than 10 times higher than method blank level
P = Recovery outside of target range
Nn = Value obtained from additional analysis
EMPC values were excluded from the TEQ calculations.

LRL = Lower Reporting Limit
I = Interference
E = PCDE Interference
S = Saturated signal
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....1039901

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Analysis Results

Client - Montana Dept. Of Env. Quality

Client's Sample ID	RW-12-1006		
Lab Sample ID	1039901004-R		
Filename	P61023A_12		
Injected By	SMT		
Total Amount Extracted	978 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	10/04/2006
ICAL Date	08/16/2006	Received	10/11/2006
CCal Filename(s)	P61023A_05 & P61023A_21	Extracted	10/20/2006
Method Blank ID	BLANK-11237	Analyzed	10/23/2006 16:08

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L
2,3,7,8-TCDF	ND	-----	0.00200
Total TCDF	ND	-----	0.00200
2,3,7,8-TCDD	ND	-----	0.00200
Total TCDD	ND	-----	0.00200
1,2,3,7,8-PeCDF	ND	-----	0.01000
2,3,4,7,8-PeCDF	ND	-----	0.01000
Total PeCDF	ND	-----	0.01000
1,2,3,7,8-PeCDD	ND	-----	0.01000
Total PeCDD	ND	-----	0.01000
1,2,3,4,7,8-HxCDF	ND	-----	0.01000
1,2,3,6,7,8-HxCDF	ND	-----	0.01000
2,3,4,6,7,8-HxCDF	ND	-----	0.01000
1,2,3,7,8,9-HxCDF	ND	-----	0.01000
Total HxCDF	ND	-----	0.01000
1,2,3,4,7,8-HxCDD	ND	-----	0.01000
1,2,3,6,7,8-HxCDD	ND	-----	0.01000
1,2,3,7,8,9-HxCDD	ND	-----	0.01000
Total HxCDD	ND	-----	0.01000
1,2,3,4,6,7,8-HpCDF	ND	-----	0.01000
1,2,3,4,7,8,9-HpCDF	ND	-----	0.01000
Total HpCDF	ND	-----	0.01000
1,2,3,4,6,7,8-HpCDD	ND	-----	0.01000
Total HpCDD	ND	-----	0.01000
OCDF	ND	-----	0.02000
OCDD	ND	-----	0.02000

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	72
2,3,7,8-TCDD-13C	2.00	64
1,2,3,7,8-PeCDF-13C	2.00	72
2,3,4,7,8-PeCDF-13C	2.00	77
1,2,3,7,8-PeCDD-13C	2.00	87
1,2,3,4,7,8-HxCDF-13C	2.00	71
1,2,3,6,7,8-HxCDF-13C	2.00	75
2,3,4,6,7,8-HxCDF-13C	2.00	72
1,2,3,7,8,9-HxCDF-13C	2.00	67
1,2,3,4,7,8-HxCDD-13C	2.00	60
1,2,3,6,7,8-HxCDD-13C	2.00	70
1,2,3,4,6,7,8-HpCDF-13C	2.00	69
1,2,3,4,7,8,9-HpCDF-13C	2.00	59
1,2,3,4,6,7,8-HpCDD-13C	2.00	71
OCDD-13C	4.00	68
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	62

Total 2,3,7,8-TCDD
Equivalence: 0.00 ng/L
(Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers)
EMPC = Estimated Maximum Possible Concentration
A = Detection Limit based on signal-to-noise measurement
J = Concentration detected is below the calibration range
B = Less than 10 times higher than method blank level
P = Recovery outside of target range
Nn = Value obtained from additional analysis
EMPC values were excluded from the TEQ calculations.

LRL = Lower Reporting Limit
I = Interference
E = PCDE Interference
S = Saturated signal
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Analysis Results

Client - Montana Dept. Of Env. Quality

Client's Sample ID	RW-13-1006		
Lab Sample ID	1039901005-R		
Filename	P61023A_13		
Injected By	SMT		
Total Amount Extracted	982 mL	Matrix	Water
% Moisture	NA	Dilution	NA
Dry Weight Extracted	NA	Collected	10/04/2006
ICAL Date	08/16/2006	Received	10/11/2006
CCal Filename(s)	P61023A_05 & P61023A_21	Extracted	10/20/2006
Method Blank ID	BLANK-11237	Analyzed	10/23/2006 16:54

Native Isomers	Conc ng/L	EMPC ng/L	LRL ng/L
2,3,7,8-TCDF	ND	-----	0.00200
Total TCDF	ND	-----	0.00200
2,3,7,8-TCDD	ND	-----	0.00200
Total TCDD	ND	-----	0.00200
1,2,3,7,8-PeCDF	ND	-----	0.01000
2,3,4,7,8-PeCDF	ND	-----	0.01000
Total PeCDF	ND	-----	0.01000
1,2,3,7,8-PeCDD	ND	-----	0.01000
Total PeCDD	ND	-----	0.01000
1,2,3,4,7,8-HxCDF	ND	-----	0.01000
1,2,3,6,7,8-HxCDF	ND	-----	0.01000
2,3,4,6,7,8-HxCDF	ND	-----	0.01000
1,2,3,7,8,9-HxCDF	ND	-----	0.01000
Total HxCDF	ND	-----	0.01000
1,2,3,4,7,8-HxCDD	ND	-----	0.01000
1,2,3,6,7,8-HxCDD	ND	-----	0.01000
1,2,3,7,8,9-HxCDD	ND	-----	0.01000
Total HxCDD	ND	-----	0.01000
1,2,3,4,6,7,8-HpCDF	ND	-----	0.01000
1,2,3,4,7,8,9-HpCDF	ND	-----	0.01000
Total HpCDF	ND	-----	0.01000
1,2,3,4,6,7,8-HpCDD	ND	-----	0.01000
Total HpCDD	ND	-----	0.01000
OCDF	ND	-----	0.02000
OCDD	ND	-----	0.02000

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	83
2,3,7,8-TCDD-13C	2.00	72
1,2,3,7,8-PeCDF-13C	2.00	84
2,3,4,7,8-PeCDF-13C	2.00	94
1,2,3,7,8-PeCDD-13C	2.00	107
1,2,3,4,7,8-HxCDF-13C	2.00	81
1,2,3,6,7,8-HxCDF-13C	2.00	86
2,3,4,6,7,8-HxCDF-13C	2.00	81
1,2,3,7,8,9-HxCDF-13C	2.00	80
1,2,3,4,7,8-HxCDD-13C	2.00	72
1,2,3,6,7,8-HxCDD-13C	2.00	77
1,2,3,4,6,7,8-HpCDF-13C	2.00	83
1,2,3,4,7,8,9-HpCDF-13C	2.00	72
1,2,3,4,6,7,8-HpCDD-13C	2.00	84
OCDD-13C	4.00	76
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	66

Total 2,3,7,8-TCDD
Equivalence: 0.00 ng/L
(Using ITE Factors)

Conc = Concentration (Totals include 2,3,7,8-substituted isomers)
EMPC = Estimated Maximum Possible Concentration
A = Detection Limit based on signal-to-noise measurement
J = Concentration detected is below the calibration range
B = Less than 10 times higher than method blank level
P = Recovery outside of target range
Nn = Value obtained from additional analysis
EMPC values were excluded from the TEQ calculations.

LRL = Lower Reporting Limit
I = Interference
E = PCDE Interference
S = Saturated signal
ND = Not Detected
NA = Not Applicable
NC = Not Calculated
* = See Discussion

Report No.....1039901

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

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Method 8290 Laboratory Control Spike Results

Client - Montana Dept. Of Env. Quality

Lab Sample ID	LCS-11220		
Filename	U61018A_04	Matrix	Water
Total Amount Extracted	972 mL	Dilution	NA
ICAL Date	09/19/2006	Extracted	10/17/2006
CCal Filename(s)	U61018A_03 & U61018A_19	Analyzed	10/18/2006 19:39
Method Blank ID	BLANK-11219	Injected By	BAL

Native Isomers	Qs (ng)	Qm (ng)	% Rec.
2,3,7,8-TCDF	0.20	0.20	100
2,3,7,8-TCDD	0.20	0.20	100
1,2,3,7,8-PeCDF	1.00	1.21	121
2,3,4,7,8-PeCDF	1.00	1.09	109
1,2,3,7,8-PeCDD	1.00	1.06	106
1,2,3,4,7,8-HxCDF	1.00	1.06	106
1,2,3,6,7,8-HxCDF	1.00	1.11	111
2,3,4,6,7,8-HxCDF	1.00	1.13	113
1,2,3,7,8,9-HxCDF	1.00	1.10	110
1,2,3,4,7,8-HxCDD	1.00	1.10	110
1,2,3,6,7,8-HxCDD	1.00	1.19	119
1,2,3,7,8,9-HxCDD	1.00	1.20	120
1,2,3,4,6,7,8-HpCDF	1.00	1.24	124
1,2,3,4,7,8,9-HpCDF	1.00	1.26	126
1,2,3,4,6,7,8-HpCDD	1.00	1.07	107
OCDF	2.00	2.24	112
OCDD	2.00	2.22	111

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	114
2,3,7,8-TCDD-13C	2.00	91
1,2,3,7,8-PeCDF-13C	2.00	98
2,3,4,7,8-PeCDF-13C	2.00	101
1,2,3,7,8-PeCDD-13C	2.00	107
1,2,3,4,7,8-HxCDF-13C	2.00	90
1,2,3,6,7,8-HxCDF-13C	2.00	98
2,3,4,6,7,8-HxCDF-13C	2.00	92
1,2,3,7,8,9-HxCDF-13C	2.00	89
1,2,3,4,7,8-HxCDD-13C	2.00	79
1,2,3,6,7,8-HxCDD-13C	2.00	93
1,2,3,4,6,7,8-HpCDF-13C	2.00	78
1,2,3,4,7,8,9-HpCDF-13C	2.00	69
1,2,3,4,6,7,8-HpCDD-13C	2.00	105
OCDD-13C	4.00	104
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	94

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
P = Recovery outside of target range
X = Background subtracted value
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

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1700 Elm Street - Suite 200
Minneapolis, MN 55414

Tel: 612-607-1700
Fax: 612- 607-6444

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Method 8290 Laboratory Control Spike Results

Client - Montana Dept. Of Env. Quality

Lab Sample ID	LCSD-11221		
Filename	U61018A_05	Matrix	Water
Total Amount Extracted	969 mL	Dilution	NA
ICAL Date	09/19/2006	Extracted	10/17/2006
CCal Filename(s)	U61018A_03 & U61018A_19	Analyzed	10/18/2006 20:24
Method Blank ID	BLANK-11219	Injected By	BAL

Native Isomers	Qs (ng)	Qm (ng)	% Rec.
2,3,7,8-TCDF	0.20	0.19	97
2,3,7,8-TCDD	0.20	0.19	93
1,2,3,7,8-PeCDF	1.00	1.12	112
2,3,4,7,8-PeCDF	1.00	1.01	101
1,2,3,7,8-PeCDD	1.00	0.98	98
1,2,3,4,7,8-HxCDF	1.00	0.99	99
1,2,3,6,7,8-HxCDF	1.00	1.05	105
2,3,4,6,7,8-HxCDF	1.00	1.03	103
1,2,3,7,8,9-HxCDF	1.00	1.05	105
1,2,3,4,7,8-HxCDD	1.00	1.05	105
1,2,3,6,7,8-HxCDD	1.00	1.09	109
1,2,3,7,8,9-HxCDD	1.00	1.15	115
1,2,3,4,6,7,8-HpCDF	1.00	1.11	111
1,2,3,4,7,8,9-HpCDF	1.00	1.21	121
1,2,3,4,6,7,8-HpCDD	1.00	0.98	98
OCDF	2.00	2.08	104
OCDD	2.00	2.01	101

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	120
2,3,7,8-TCDD-13C	2.00	96
1,2,3,7,8-PeCDF-13C	2.00	101
2,3,4,7,8-PeCDF-13C	2.00	106
1,2,3,7,8-PeCDD-13C	2.00	112
1,2,3,4,7,8-HxCDF-13C	2.00	93
1,2,3,6,7,8-HxCDF-13C	2.00	98
2,3,4,6,7,8-HxCDF-13C	2.00	94
1,2,3,7,8,9-HxCDF-13C	2.00	91
1,2,3,4,7,8-HxCDD-13C	2.00	81
1,2,3,6,7,8-HxCDD-13C	2.00	96
1,2,3,4,6,7,8-HpCDF-13C	2.00	79
1,2,3,4,7,8,9-HpCDF-13C	2.00	70
1,2,3,4,6,7,8-HpCDD-13C	2.00	109
OCDD-13C	4.00	103
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	105

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
P = Recovery outside of target range
X = Background subtracted value
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

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1700 Elm Street
Minneapolis, MN 55414
Phone: 612.607.1700
Fax: 612.607.6444

SPIKE RECOVERY RELATIVE PERCENT DIFFERENCE (RPD) RESULTS

Client..... Montana DEQ

SPIKE 1 ID..... LCS-11220
SPIKE 1 Filename..... U61018A_04
SPIKE 2 ID..... LCSD-11221
SPIKE 2 Filename..... U61018A_05

COMPOUND	SPIKE 1 REC,%	SPIKE 2 REC,%	RPD,%
2378-TCDF	100	97	3.0
2378-TCDD	100	93	7.3
12378-PeCDF	121	112	7.7
23478-PeCDF	109	101	7.6
12378-PeCDD	106	98	7.8
123478-HxCDF	106	99	6.8
123678-HxCDF	111	105	5.6
234678-HxCDF	113	103	9.3
123789-HxCDF	110	105	4.7
123478-HxCDD	110	105	4.7
123678-HxCDD	119	109	8.8
123789-HxCDD	120	115	4.3
1234678-HpCDF	124	111	11.1
1234789-HpCDF	126	121	4.0
1234678-HpCDD	107	98	8.8
OCDF	112	104	7.4
OCDD	111	101	9.4

REC = Percent Recovered
RPD = The difference between the two values divided by the average.
NA = Not Applicable
NC = Not Calculated

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Tel: 612-607-1700
Fax: 612- 607-6444

Method 8290 Laboratory Control Spike Results

Client - Montana Dept. Of Env. Quality

Lab Sample ID	LCS-11238		
Filename	P61023A_06	Matrix	Water
Total Amount Extracted	951 mL	Dilution	NA
ICAL Date	08/16/2006	Extracted	10/20/2006
CCal Filename(s)	P61023A_05 & P61023A_21	Analyzed	10/23/2006 11:36
Method Blank ID	BLANK-11237	Injected By	SMT

Native Isomers	Qs (ng)	Qm (ng)	% Rec.
2,3,7,8-TCDF	0.20	0.17	86
2,3,7,8-TCDD	0.20	0.18	92
1,2,3,7,8-PeCDF	1.00	1.02	102
2,3,4,7,8-PeCDF	1.00	0.95	95
1,2,3,7,8-PeCDD	1.00	0.87	87
1,2,3,4,7,8-HxCDF	1.00	0.92	92
1,2,3,6,7,8-HxCDF	1.00	0.99	99
2,3,4,6,7,8-HxCDF	1.00	0.98	98
1,2,3,7,8,9-HxCDF	1.00	0.96	96
1,2,3,4,7,8-HxCDD	1.00	1.09	109
1,2,3,6,7,8-HxCDD	1.00	1.04	104
1,2,3,7,8,9-HxCDD	1.00	1.11	111
1,2,3,4,6,7,8-HpCDF	1.00	1.03	103
1,2,3,4,7,8,9-HpCDF	1.00	1.06	106
1,2,3,4,6,7,8-HpCDD	1.00	0.92	92
OCDF	2.00	2.00	100
OCDD	2.00	1.90	95

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	85
2,3,7,8-TCDD-13C	2.00	71
1,2,3,7,8-PeCDF-13C	2.00	84
2,3,4,7,8-PeCDF-13C	2.00	91
1,2,3,7,8-PeCDD-13C	2.00	106
1,2,3,4,7,8-HxCDF-13C	2.00	80
1,2,3,6,7,8-HxCDF-13C	2.00	80
2,3,4,6,7,8-HxCDF-13C	2.00	81
1,2,3,7,8,9-HxCDF-13C	2.00	79
1,2,3,4,7,8-HxCDD-13C	2.00	70
1,2,3,6,7,8-HxCDD-13C	2.00	80
1,2,3,4,6,7,8-HpCDF-13C	2.00	78
1,2,3,4,7,8,9-HpCDF-13C	2.00	69
1,2,3,4,6,7,8-HpCDD-13C	2.00	77
OCDD-13C	4.00	77
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	66

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
P = Recovery outside of target range
X = Background subtracted value
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

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Fax: 612- 607-6444

Method 8290 Laboratory Control Spike Results

Client - Montana Dept. Of Env. Quality

Lab Sample ID	LCSD-11239		
Filename	P61023A_07	Matrix	Water
Total Amount Extracted	974 mL	Dilution	NA
ICAL Date	08/16/2006	Extracted	10/20/2006
CCal Filename(s)	P61023A_05 & P61023A_21	Analyzed	10/23/2006 12:19
Method Blank ID	BLANK-11237	Injected By	SMT

Native Isomers	Qs (ng)	Qm (ng)	% Rec.
2,3,7,8-TCDF	0.20	0.18	91
2,3,7,8-TCDD	0.20	0.20	98
1,2,3,7,8-PeCDF	1.00	1.07	107
2,3,4,7,8-PeCDF	1.00	1.01	101
1,2,3,7,8-PeCDD	1.00	0.91	91
1,2,3,4,7,8-HxCDF	1.00	0.96	96
1,2,3,6,7,8-HxCDF	1.00	1.05	105
2,3,4,6,7,8-HxCDF	1.00	1.02	102
1,2,3,7,8,9-HxCDF	1.00	1.01	101
1,2,3,4,7,8-HxCDD	1.00	1.07	107
1,2,3,6,7,8-HxCDD	1.00	1.14	114
1,2,3,7,8,9-HxCDD	1.00	1.12	112
1,2,3,4,6,7,8-HpCDF	1.00	1.08	108
1,2,3,4,7,8,9-HpCDF	1.00	1.08	108
1,2,3,4,6,7,8-HpCDD	1.00	0.95	95
OCDF	2.00	2.03	102
OCDD	2.00	1.97	98

Internal Standards	ng's Added	Percent Recovery
2,3,7,8-TCDF-13C	2.00	79
2,3,7,8-TCDD-13C	2.00	58
1,2,3,7,8-PeCDF-13C	2.00	82
2,3,4,7,8-PeCDF-13C	2.00	85
1,2,3,7,8-PeCDD-13C	2.00	98
1,2,3,4,7,8-HxCDF-13C	2.00	85
1,2,3,6,7,8-HxCDF-13C	2.00	84
2,3,4,6,7,8-HxCDF-13C	2.00	79
1,2,3,7,8,9-HxCDF-13C	2.00	72
1,2,3,4,7,8-HxCDD-13C	2.00	75
1,2,3,6,7,8-HxCDD-13C	2.00	75
1,2,3,4,6,7,8-HpCDF-13C	2.00	76
1,2,3,4,7,8,9-HpCDF-13C	2.00	67
1,2,3,4,6,7,8-HpCDD-13C	2.00	78
OCDD-13C	4.00	75
1,2,3,4-TCDD-13C	2.00	NA
1,2,3,7,8,9-HxCDD-13C	2.00	NA
2,3,7,8-TCDD-37Cl4	0.20	55

Qs = Quantity Spiked
Qm = Quantity Measured
Rec. = Recovery (Expressed as Percent)
P = Recovery outside of target range
X = Background subtracted value
Nn = Value obtained from additional analysis
NA = Not Applicable
* = See Discussion

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1700 Elm Street
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Fax: 612.607.6444

SPIKE RECOVERY RELATIVE PERCENT DIFFERENCE (RPD) RESULTS

Client..... Montana DEQ

SPIKE 1 ID..... LCS-11238
SPIKE 1 Filename..... P61023A_06
SPIKE 2 ID..... LCSD-11139
SPIKE 2 Filename..... P61023A_07

COMPOUND	SPIKE 1 REC,%	SPIKE 2 REC,%	RPD,%
2378-TCDF	86	91	5.6
2378-TCDD	92	98	6.3
12378-PeCDF	102	107	4.8
23478-PeCDF	95	101	6.1
12378-PeCDD	87	91	4.5
123478-HxCDF	92	96	4.3
123678-HxCDF	99	105	5.9
234678-HxCDF	98	102	4.0
123789-HxCDF	96	101	5.1
123478-HxCDD	109	107	1.9
123678-HxCDD	104	114	9.2
123789-HxCDD	111	112	0.9
1234678-HpCDF	103	108	4.7
1234789-HpCDF	106	108	1.9
1234678-HpCDD	92	95	3.2
OCDF	100	102	2.0
OCDD	95	98	3.1

REC = Percent Recovered
RPD = The difference between the two values divided by the average.
NA = Not Applicable
NC = Not Calculated

Report No..... 1039901

REPORT OF LABORATORY ANALYSIS

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** REPORT **

MT DEQ
Moriah Bucy
PO Box 200901
Helena MT 59620

RECEIVED
OCT 20 2006
Dept. of Environmental Quality
Remediation Division

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ANALYTICAL SUMMARY REPORT

October 18, 2006

Moriah Bucy
MT DEQ
PO Box 200901
Helena, MT 59620

Workorder No.: H06100059

Project Name: KRY Residential Well Sampling

Energy Laboratories Inc received the following 5 samples from MT DEQ on 10/5/2006 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H06100059-001	RW-1-1006	10/04/06 14:42	10/05/06	Drinking Water	EPH-Sep Funnel Extraction Hydrocarbons, Extractable Petroleum Screen 515-Herbicides, Chlorinated SDWA Seperatory Funnel Liquid Liquid Ext.
H06100059-002	RW-7-1006	10/04/06 15:23	10/05/06	Drinking Water	Same As Above
H06100059-003	RW-10-1006	10/04/06 12:05	10/05/06	Drinking Water	Same As Above
H06100059-004	RW-12-1006	10/04/06 13:45	10/05/06	Drinking Water	Same As Above
H06100059-005	RW-13-1006	10/04/06 14:05	10/05/06	Drinking Water	Same As Above

There were no problems with the analyses and all data for associated QC met EPA or laboratory specifications except where noted in the Case Narrative or Report.

If you have any questions regarding these tests results, please call.

Report Approved By: Jonathan Hager
Assistant Lab Manager

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: KRY Residential Well Sampling
Lab ID: H06100059-001
Client Sample ID: RW-1-1006

Report Date: 10/18/06
Collection Date: 10/04/06 14:42
DateReceived: 10/05/06
Matrix: Drinking Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
HERBICIDES, BY HPLC (CONTRACT LAB MT00005)							
Pentachlorophenol	ND	ug/L		0.040	1	E515.1	10/17/06 01:36 / eli-b
Surr: DCAA	78.0	%REC			70-130	E515.1	10/17/06 01:36 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: KRY Residential Well Sampling
Lab ID: H06100059-002
Client Sample ID: RW-7-1006

Report Date: 10/18/06
Collection Date: 10/04/06 15:23
DateReceived: 10/05/06
Matrix: Drinking Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
HERBICIDES, BY HPLC (CONTRACT LAB MT00005)							
Pentachlorophenol	ND	ug/L		0.040	1	E515.1	10/17/06 02:06 / eli-b
Surr: DCAA	84.0	%REC			70-130	E515.1	10/17/06 02:06 / eli-b

Report Definitions:
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MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: KRY Residential Well Sampling
Lab ID: H06100059-003
Client Sample ID: RW-10-1006

Report Date: 10/18/06
Collection Date: 10/04/06 12:05
DateReceived: 10/05/06
Matrix: Drinking Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
HERBICIDES, BY HPLC (CONTRACT LAB MT00005)							
Pentachlorophenol	ND	ug/L		0.040	1	E515.1	10/17/06 04:04 / eli-b
Surr: DCAA	84.0	%REC			70-130	E515.1	10/17/06 04:04 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: KRY Residential Well Sampling
Lab ID: H06100059-004
Client Sample ID: RW-12-1006

Report Date: 10/18/06
Collection Date: 10/04/06 13:45
DateReceived: 10/05/06
Matrix: Drinking Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
HERBICIDES, BY HPLC (CONTRACT LAB MT00005)							
Pentachlorophenol	ND	ug/L		0.040	1	E515.1	10/17/06 04:33 / eli-b
Surr: DCAA	84.0	%REC			70-130	E515.1	10/17/06 04:33 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: KRY Residential Well Sampling
Lab ID: H06100059-005
Client Sample ID: RW-13-1006

Report Date: 10/18/06
Collection Date: 10/04/06 14:05
DateReceived: 10/05/06
Matrix: Drinking Water

Analyses	Result	Units	Qualifiers	RL	MCL/ QCL	Method	Analysis Date / By
HERBICIDES, BY HPLC (CONTRACT LAB MT00005)							
Pentachlorophenol	ND	ug/L		0.040	1	E515.1	10/17/06 05:03 / eli-b
Surr: DCAA	84.0	%REC			70-130	E515.1	10/17/06 05:03 / eli-b

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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QA/QC Summary Report

Client: MT DEQ
Project: KRY Residential Well Sampling

Report Date: 10/18/06
Work Order: H06100059

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: E515.1									
								Batch: B_23580P	
Sample ID: MB-23580	Method Blank				Run: SUB-B83676			10/16/06 18:14	
Pentachlorophenol	ND	ug/L	0.040						
Surr: DCAA			0.10	82	70	130			
Sample ID: LCS-23580	Laboratory Control Sample				Run: SUB-B83676			10/17/06 10:51	
Pentachlorophenol	3.70	ug/L	0.040	74	70	130			
Surr: DCAA			0.10	70	70	130			
Sample ID: B06100403-001AMS	Sample Matrix Spike				Run: SUB-B83676			10/16/06 21:40	
Pentachlorophenol	4.36	ug/L	0.040	87	65	135			
Surr: DCAA			0.10	81	70	130			
Sample ID: B06100403-001AMSD	Sample Matrix Spike Duplicate				Run: SUB-B83676			10/16/06 22:10	
Pentachlorophenol	4.35	ug/L	0.040	87	65	135	0.0	40	
Surr: DCAA			0.10	81	70	130			
Method: E515.1									
								Analytical Run: SUB-B83670	
Sample ID: 8151CK8	Continuing Calibration Verification Standard							10/16/06 17:44	
Pentachlorophenol	0.508	ug/L	0.040	102	80	120			
Surr: DCAA			0.10	102	80	120			
Sample ID: 8151CK8	Continuing Calibration Verification Standard							10/16/06 23:09	
Pentachlorophenol	0.517	ug/L	0.040	103	80	120			
Surr: DCAA			0.10	102	80	120			
Sample ID: 8151CK8	Continuing Calibration Verification Standard							10/17/06 03:34	
Pentachlorophenol	0.532	ug/L	0.040	106	80	120			
Surr: DCAA			0.10	107	80	120			
Sample ID: 8151CK8	Continuing Calibration Verification Standard							10/17/06 08:00	
Pentachlorophenol	0.533	ug/L	0.040	107	80	120			
Surr: DCAA			0.10	107	80	120			
Sample ID: 8151CK8	Continuing Calibration Verification Standard							10/17/06 10:22	
Pentachlorophenol	0.519	ug/L	0.040	104	80	120			
Surr: DCAA			0.10	104	80	120			
Sample ID: 8151CK8	Continuing Calibration Verification Standard							10/17/06 14:18	
Pentachlorophenol	0.529	ug/L	0.040	106	80	120			
Surr: DCAA			0.10	105	80	120			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Site Name: KRY Residential Well Sampling
Report Date: 10/10/06

Lab ID: H06100059-001
Client Sample ID: RW-1-1006
Matrix: Drinking Water
Collection Date: 10/04/06 14:42
DateReceived: 10/05/06

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
EXTRACTABLE PETROLEUM HYDROCARBONS-SCREEN ANALYSIS							
Total Extractable Hydrocarbons	ND	mg/L		0.30	0.3	SW8015M	10/09/06 21:54 / raf
Surr: o-Terphenyl	67.0	%REC			40-140	SW8015M	10/09/06 21:54 / raf

- Note: Total Extractable Hydrocarbons are defined as the total hydrocarbon responses regardless of elution time.

Lab ID: H06100059-002
Client Sample ID: RW-7-1006
Matrix: Drinking Water
Collection Date: 10/04/06 15:23
DateReceived: 10/05/06

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
EXTRACTABLE PETROLEUM HYDROCARBONS-SCREEN ANALYSIS							
Total Extractable Hydrocarbons	ND	mg/L		0.31	0.3	SW8015M	10/09/06 22:35 / raf
Surr: o-Terphenyl	73.0	%REC			40-140	SW8015M	10/09/06 22:35 / raf

- Note: Total Extractable Hydrocarbons are defined as the total hydrocarbon responses regardless of elution time.

Lab ID: H06100059-003
Client Sample ID: RW-10-1006
Matrix: Drinking Water
Collection Date: 10/04/06 12:05
DateReceived: 10/05/06

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
EXTRACTABLE PETROLEUM HYDROCARBONS-SCREEN ANALYSIS							
Total Extractable Hydrocarbons	ND	mg/L		0.31	0.3	SW8015M	10/09/06 23:16 / raf
Surr: o-Terphenyl	71.0	%REC			40-140	SW8015M	10/09/06 23:16 / raf

- Note: Total Extractable Hydrocarbons are defined as the total hydrocarbon responses regardless of elution time.

Lab ID: H06100059-004
Client Sample ID: RW-12-1006
Matrix: Drinking Water
Collection Date: 10/04/06 13:45
DateReceived: 10/05/06

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
EXTRACTABLE PETROLEUM HYDROCARBONS-SCREEN ANALYSIS							
Total Extractable Hydrocarbons	ND	mg/L		0.30	0.3	SW8015M	10/10/06 00:39 / raf
Surr: o-Terphenyl	71.0	%REC			40-140	SW8015M	10/10/06 00:39 / raf

- Note: Total Extractable Hydrocarbons are defined as the total hydrocarbon responses regardless of elution time.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Site Name: KRY Residential Well Sampling
Report Date: 10/10/06

Lab ID: H06100059-005
Client Sample ID: RW-13-1006
Matrix: Drinking Water
Collection Date: 10/04/06 14:05
DateReceived: 10/05/06

Analyses	Result	Units	Qualifier	RL	MCL/ QCL	Method	Analysis Date / By
EXTRACTABLE PETROLEUM HYDROCARBONS-SCREEN ANALYSIS							
Total Extractable Hydrocarbons	ND	mg/L		0.30	0.3	SW8015M	10/10/06 01:20 / raf
Surr: o-Terphenyl	74.0	%REC			40-140	SW8015M	10/10/06 01:20 / raf

- Note: Total Extractable Hydrocarbons are defined as the total hydrocarbon responses regardless of elution time.

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit.

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QA/QC Summary Report

Client: MT DEQ
Project: KRY Residential Well Sampling

Report Date: 10/10/06
Work Order: H06100059

Analyte	Result	Units	RL	%REC	Low Limit	High Limit	RPD	RPDLimit	Qual
Method: SW8015M									
Sample ID: MB-2675	Method Blank				Run: HHP_061002B				Batch: 2675
Total Extractable Hydrocarbons	ND	mg/L	0.30						10/03/06 04:09
Surr: o-Terphenyl			0.0050	79	40	140			
Sample ID: LCS-2675	Laboratory Control Sample				Run: HHP_061002B				
Total Extractable Hydrocarbons	5.06	mg/L	0.30	97	60	140			10/03/06 04:50
Surr: o-Terphenyl			0.0050	94	40	140			
Sample ID: H06090278-001BMS	Sample Matrix Spike				Run: HHP_061002B				
Total Extractable Hydrocarbons	10.4	mg/L	0.60	100	60	140			10/03/06 06:13
Surr: o-Terphenyl			0.010	93	40	140			
Sample ID: H06090278-001BMSD	Sample Matrix Spike Duplicate				Run: HHP_061002B				
Total Extractable Hydrocarbons	11.3	mg/L	0.60	108	60	140	7.9	20	10/03/06 06:54
Surr: o-Terphenyl			0.010	108	40	140			
Method: SW8015M									
Sample ID: CCV_1009GC101r-W	Continuing Calibration Verification Standard								Analytical Run: HHP_061009A
n-Nonane	0.186	mg/L	0.0050	93	75	125			10/09/06 17:06
n-Decane	0.185	mg/L	0.0050	93	75	125			
n-Dodecane	0.185	mg/L	0.0050	92	75	125			
n-Tetradecane	0.187	mg/L	0.0050	94	75	125			
n-Hexadecane	0.186	mg/L	0.0050	93	75	125			
n-Octadecane	0.186	mg/L	0.0050	93	75	125			
n-Nonadecane	0.187	mg/L	0.0050	93	75	125			
n-Eicosane	0.188	mg/L	0.0050	94	75	125			
n-Docosane	0.188	mg/L	0.0050	94	75	125			
n-Tetracosane	0.189	mg/L	0.0050	94	75	125			
n-Hexacosane	0.190	mg/L	0.0050	95	75	125			
n-Octacosane	0.190	mg/L	0.0050	95	75	125			
n-Triacontane	0.191	mg/L	0.0050	96	75	125			
n-Hexatriacontane	0.194	mg/L	0.0050	97	75	125			
Surr: o-Terphenyl			0.0050	95	75	125			

Qualifiers:

RL - Analyte reporting limit.

ND - Not detected at the reporting limit.

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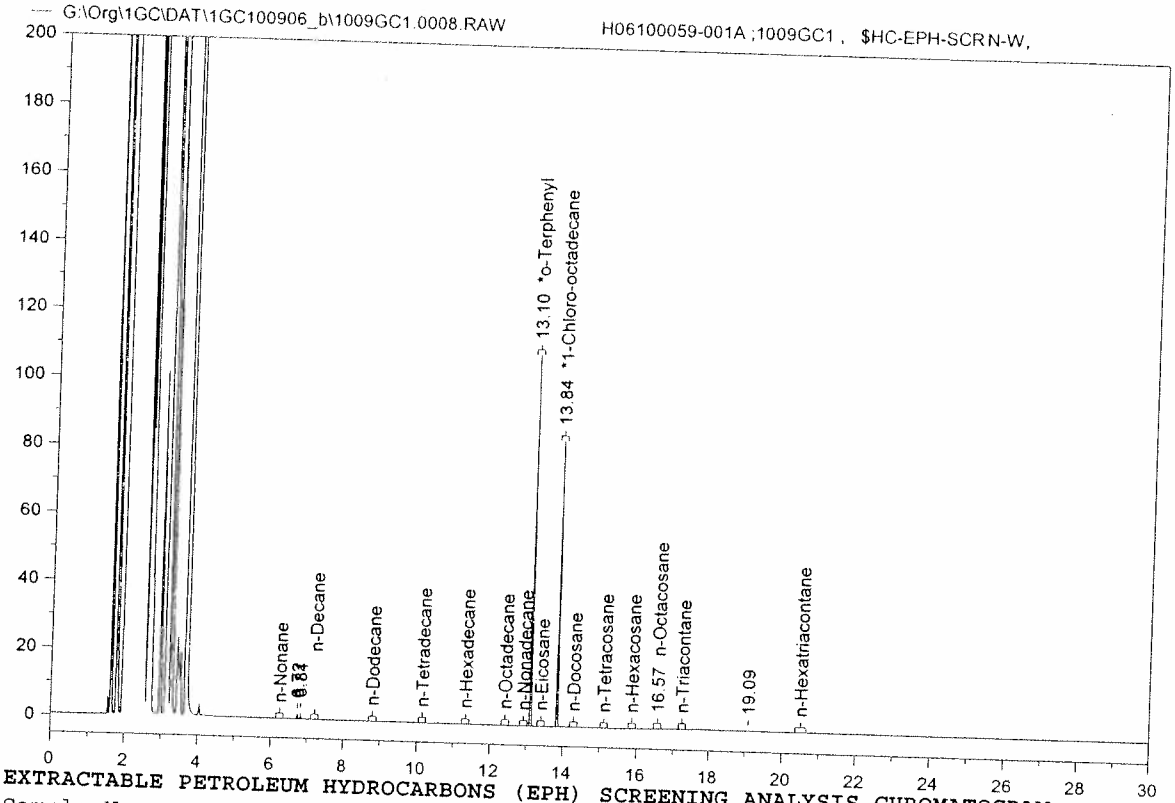
RW-1-1006



EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) SCREENING ANALYSIS CHROMATOGRAM

Sample Name: H06100059-001A ;1009GC1 , $HC-EPH-SCRN-W,
Raw File: G:\Org\1GC\DAT\1GC100906_b\1009GC1.0008.RAW
Date & Time Acquired: 10/9/2006 9:54:24 PM
Method File: G:\Org\1GC\Methods\S2000DE%.MET
Calibration File: G:\Org\1GC\Cals\A1083006DE.CAL
Sample Weight: 995.53 Dilution: 1 S.A.: 1

Mean RF for C9 to C18 Hydrocarbons: 1044.977
Mean RF for C19 to C36 Hydrocarbons: 1046.388
Mean RF for Total Extractable Hydrocarbons: 1045.682
Rt range for Diesel Range Organics: 7.11 to 17.35
Rt range for C9 to C18 Hydrocarbons: 6.14 to 12.82
Rt range for C19 to C36 Hydrocarbons: 13.05 to 20.66

SURROGATE COMPOUND	RT	ACTUAL	MEASURED	%REC	
*o-Terphenyl	13.103	.201	.134	66.82	-
*1-Chloro-octadecane	13.835	.201	.144	71.54	-

DRO Area:5323.813
TEH Area:15998.53
C9-C18 Area:8237.321
C19-C36 Area:5956.281

DRO Amount: 5.114092E-03
TEH Amount: 0.0153683
C9-C18 Amount: 7.918169E-03
C19-C36 Amount: 5.71779E-03

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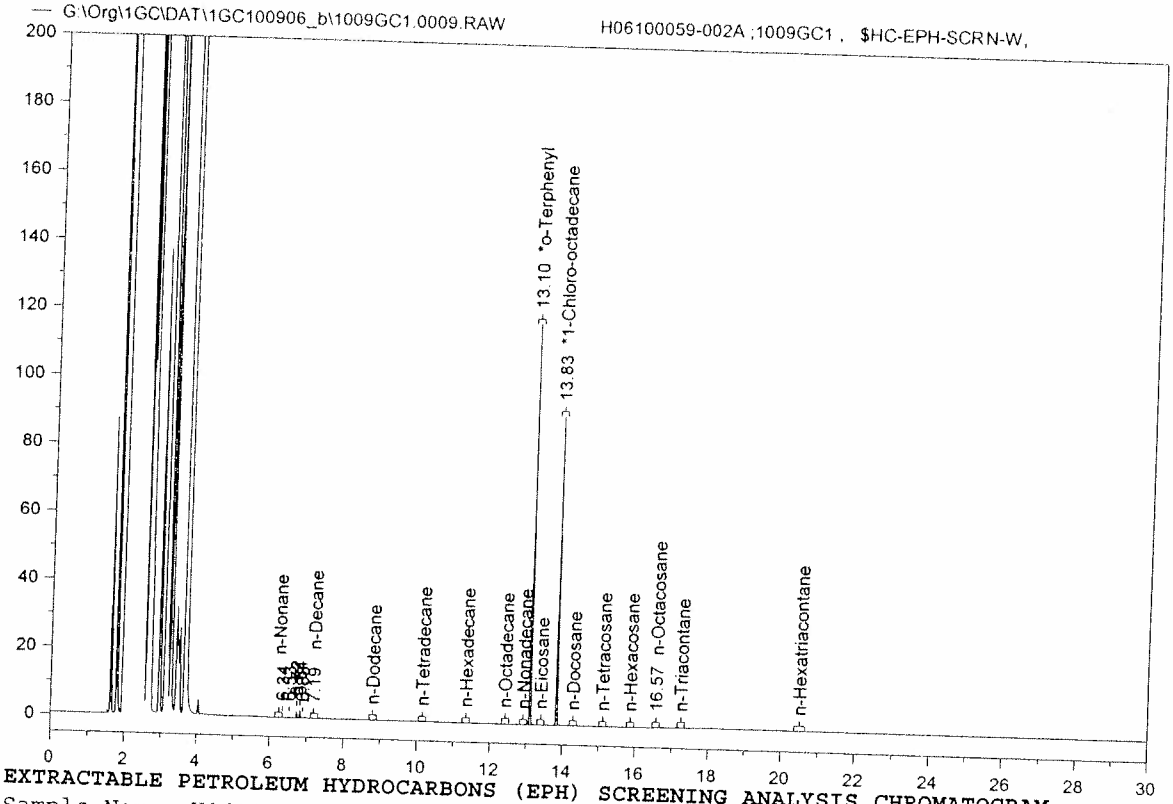
RW-7-1006



EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) SCREENING ANALYSIS CHROMATOGRAM

Sample Name: H06100059-002A ;1009GC1 , $HC-EPH-SCRN-W,
Raw File: G:\Org\1GC\DAT\1GC100906_b\1009GC1.0009.RAW
Date & Time Acquired: 10/9/2006 10:35:33 PM
Method File: G:\Org\1GC\Methods\S2000DE%.MET
Calibration File: G:\Org\1GC\Cals\A1083006DE.CAL
Sample Weight: 963.35 Dilution: 1 S.A.: 1

Mean RF for C9 to C18 Hydrocarbons: 1044.977
Mean RF for C19 to C36 Hydrocarbons: 1046.388
Mean RF for Total Extractable Hydrocarbons: 1045.682
Rt range for Diesel Range Organics: 7.11 to 17.35
Rt range for C9 to C18 Hydrocarbons: 6.14 to 12.82
Rt range for C19 to C36 Hydrocarbons: 13.05 to 20.66

SURROGATE COMPOUND	RT	ACTUAL	MEASURED	%REC	
*o-Terphenyl	13.102	.208	.151	72.54	-
*1-Chloro-octadecane	13.834	.208	.16	76.98	-

DRO Area:4934.375
TEH Area:17619.41
C9-C18 Area:10589.9
C19-C36 Area:4612.813

DRO Amount: 4.898332E-03
TEH Amount: 1.749071E-02
C9-C18 Amount: 1.051964E-02
C19-C36 Amount: 4.576033E-03

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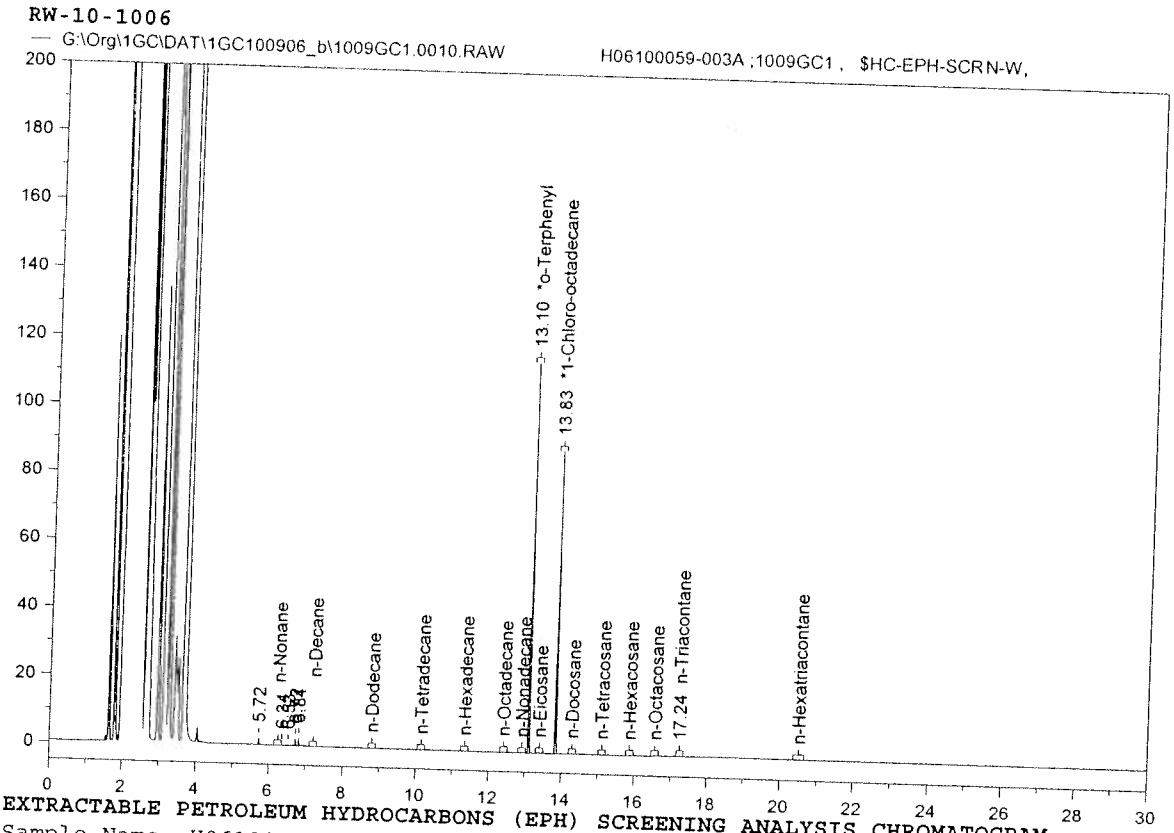

EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) SCREENING ANALYSIS CHROMATOGRAM

Sample Name: H06100059-003A ;1009GC1 , $HC-EPH-SCRN-W,
Raw File: G:\Org\1GC\DAT\1GC100906_b\1009GC1.0010.RAW
Date & Time Acquired: 10/9/2006 11:16:44 PM
Method File: G:\Org\1GC\Methods\S2000DE%.MET
Calibration File: G:\Org\1GC\Cals\A1083006DE.CAL
Sample Weight: 981.48 Dilution: 1 S.A.: 1

Mean RF for C9 to C18 Hydrocarbons: 1044.977
Mean RF for C19 to C36 Hydrocarbons: 1046.388
Mean RF for Total Extractable Hydrocarbons: 1045.682
Rt range for Diesel Range Organics: 7.11 to 17.35
Rt range for C9 to C18 Hydrocarbons: 6.14 to 12.82
Rt range for C19 to C36 Hydrocarbons: 13.05 to 20.66

SURROGATE COMPOUND	RT	ACTUAL	MEASURED	%REC	
*o-Terphenyl	13.102	.204	.144	70.61	-
*1-Chloro-octadecane	13.835	.204	.152	74.7	-

DRO Area:5271.719 DRO Amount: 5.136543E-03
TEH Area:21520.94 TEH Amount: 2.096911E-02
C9-C18 Area:10443.53 C9-C18 Amount: 0.0101826
C19-C36 Area:5278.75 C19-C36 Amount: 5.139928E-03

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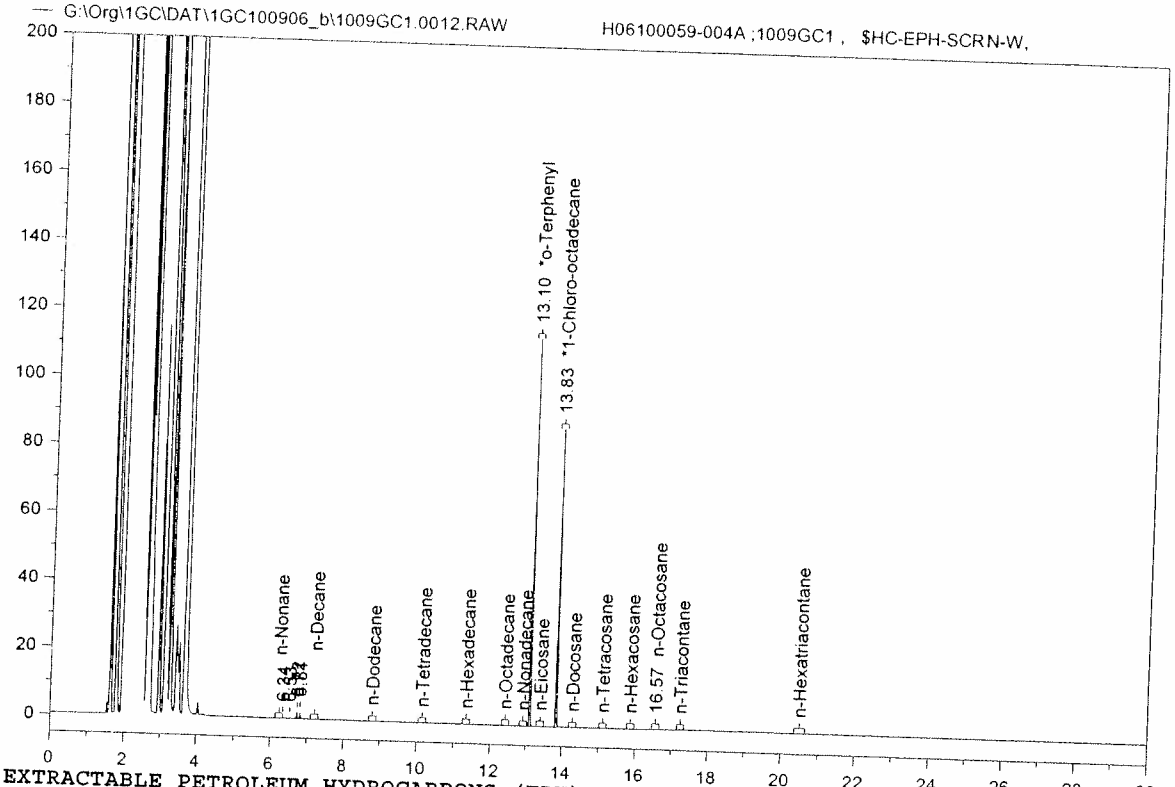
RW-12-1006



EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) SCREENING ANALYSIS CHROMATOGRAM

Sample Name: H06100059-004A ;1009GC1 , $HC-EPH-SCRN-W,
Raw File: G:\Org\1GC\DAT\1GC100906_b\1009GC1.0012.RAW
Date & Time Acquired: 10/10/2006 12:39:01 AM
Method File: G:\Org\1GC\Methods\S2000DE%.MET
Calibration File: G:\Org\1GC\Cals\A1083006DE.CAL
Sample Weight: 987.33 Dilution: 1 S.A.: 1

Mean RF for C9 to C18 Hydrocarbons: 1044.977
Mean RF for C19 to C36 Hydrocarbons: 1046.388
Mean RF for Total Extractable Hydrocarbons: 1045.682
Rt range for Diesel Range Organics: 7.11 to 17.35
Rt range for C9 to C18 Hydrocarbons: 6.14 to 12.82
Rt range for C19 to C36 Hydrocarbons: 13.05 to 20.66

SURROGATE COMPOUND	RT	ACTUAL	MEASURED	%REC	
*o-Terphenyl	13.103	.203	.143	70.68	-
*1-Chloro-octadecane	13.835	.203	.152	74.91	-

DRO Area:4472.141 DRO Amount: 4.331649E-03
TEH Area:16355.95 TEH Amount: 1.584213E-02
C9-C18 Area:8938.425 C9-C18 Amount: 8.663467E-03
C19-C36 Area:5291.328 C19-C36 Amount: 5.121648E-03

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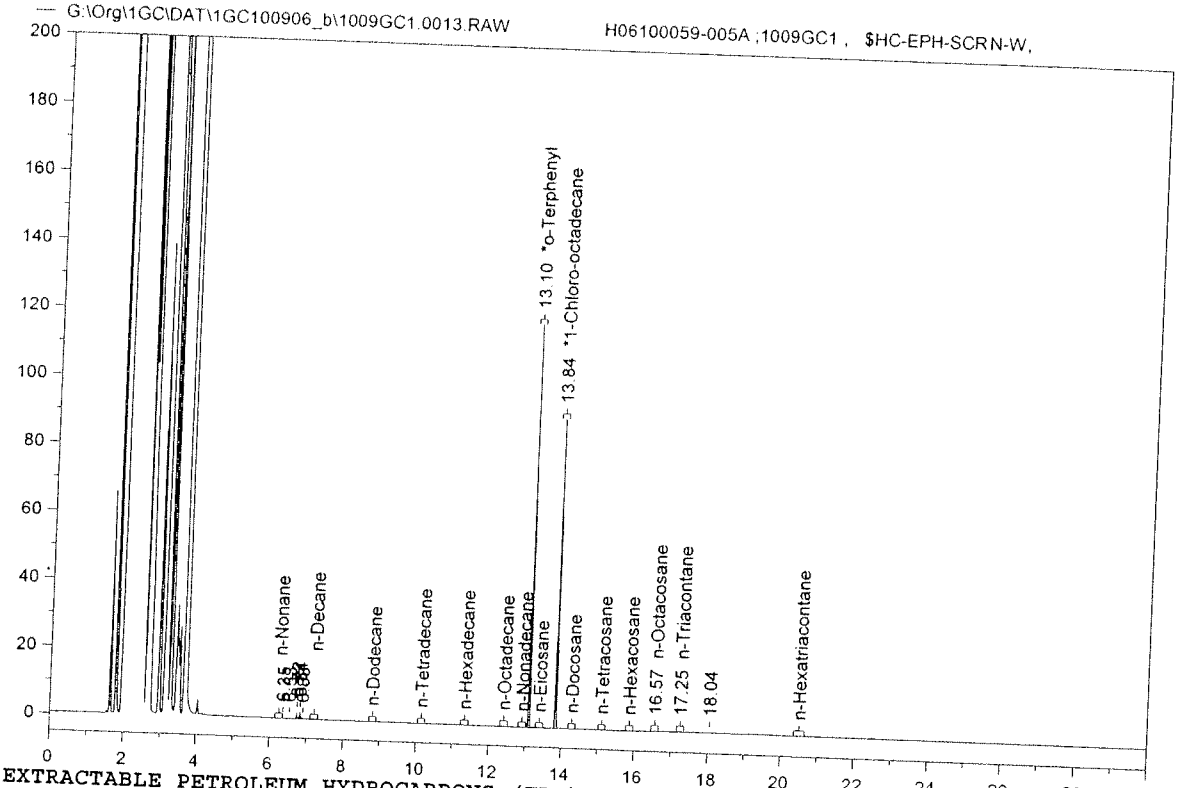
RW-13-1006



EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) SCREENING ANALYSIS CHROMATOGRAM

Sample Name: H06100059-005A ;1009GC1 , $HC-EPH-SCRN-W,
Raw File: G:\Org\1GC\DAT\1GC100906_b\1009GC1.0013.RAW
Date & Time Acquired: 10/10/2006 1:20:16 AM
Method File: G:\Org\1GC\Methods\S2000DE%.MET
Calibration File: G:\Org\1GC\Cals\A1083006DE.CAL
Sample Weight: 989.7 Dilution: 1 S.A.: 1

Mean RF for C9 to C18 Hydrocarbons: 1044.977
Mean RF for C19 to C36 Hydrocarbons: 1046.388
Mean RF for Total Extractable Hydrocarbons: 1045.682
Rt range for Diesel Range Organics: 7.11 to 17.35
Rt range for C9 to C18 Hydrocarbons: 6.14 to 12.82
Rt range for C19 to C36 Hydrocarbons: 13.05 to 20.66

SURROGATE COMPOUND	RT	ACTUAL	MEASURED	%REC	
*o-Terphenyl	13.103	.202	.149	73.56	-
*1-Chloro-octadecane	13.836	.202	.158	78.08	-

DRO Area:5802.703
TEH Area:19360.89
C9-C18 Area:9801.753
C19-C36 Area:6940.422

DRO Amount: 5.606954E-03
TEH Amount: 1.870777E-02
C9-C18 Amount: 9.477489E-03
C19-C36 Amount: 6.701772E-03

ENERGY LABORATORIES

Chain of Custody and Analytical Request Record

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

Company Name: MT DEQ

Project Name, PWS #, Permit #, Etc.: K/R/Y Residential Well Sampling

Report Mail Address: P.O. Box 200901 Helena, MT 59620

Contact Name, Phone, Fax, E-mail: Moriah Bucy 841-5050 (f) -841-5064 (p) mbucy@mt.gov

Sampler Name if other than Contact: same

Invoice Address: same as above

Invoice Contact & Phone #: same as above

Purchase Order #:

ELI Quote #:

Report Required For: POTW/WWTP ☐ DW ☐ Other _____

Special Report Formats - ELI must be notified prior to sample submittal for the following:

NELAC ☐ A2LA ☐ Level IV ☐

Other _____

EDD/EDT ☐ Format _____

ANALYSIS REQUESTED

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Shipped by: hand del

Cooler ID(s)

Receipt Temp 4.0 °C on ice

Custody Seal Y N

Intact Y N

Signature Y N

Match

Lab ID

	SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX (Number of Containers; Sample Type: A W S V B O; Air Water Soils/Solids Vegetation Bioassay Other)	*EPH Severn - MT/MA Method	Method 515.1 (PCP)	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)	Comments:	LABORATORY USE ONLY
1	RW-1-1006	10/4/06	1442	3 W	X	X			X	*If above 300 ppb please fractionate w/ PAHs.	K0610059-001
2	RW-7-1006	10/4/06	1523	3 W	X	X			X		002
3	RW-10-1006	10/4/06	1205	3 W	X	X			X		003
4	RW-12-1006	10/4/06	1345	3 W	X	X			X		004
5	RW-13-1006	10/4/06	1405	3 W	X	X			X		005
6											
7											
8											
9											
10											

Custody Record MUST be Signed

Relinquished by (print): Moriah Bucy Date/Time: 10/5/06 10:41 Signature: Moriah Bucy

Received by (print): Roxanne Weiss Date/Time: 10.5.06 10:41 Signature: [illegible]

Relinquished by (print): Date/Time: Signature:

Received by (print): Date/Time: Signature:

Sample Disposal: Return to client: _____ Lab Disposal: _____

LABORATORY USE ONLY

Sample Type: _____ # of fractions _____

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Visit our web site at *www.energylab.com* for additional information, downloadable fee schedule, forms, & links

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Energy Laboratories Inc

Sample Receipt Checklist

Client Name MT DEQ

Work Order Number H06100059

Date and Time Received: 10/5/2006 10:41:00 AM

Received by rlt

Login completed by: Roxanne L. Tubbs (Signature) 10/5/2006 10:41:00 (Date)

Reviewed by HBB (Initials) 10/9/06 (Date)

Carrier name Hand Del

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	4 °C On Ice
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	Not Applicable ☐

Adjusted? _____ Checked by _____

Contact and Corrective Action Comments: 10/10/06 M. Bucy verified PCP analysis only. RT

None

APPENDIX H

DATA QUALITY ASSESSMENT AND DATA VALIDATION REPORTS

DATA VALIDATION SUMMARY REPORT

FOR THE

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES REMEDIAL INVESTIGATION

January 2007

Prepared for:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
Remediation Division
P.O. Box 200901
Helena, Montana 59620

Contract Number 402014
Contract Task Order Number 37

Prepared by:

TETRA TECH EM INC.
Power Block Building, Suite 612
7 West 6th Avenue
Helena, Montana 59601
(406) 442-5588

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Appendix

A KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES REMEDIAL INVESTIGATION GROUNDWATER ANALYTICAL DATABASE—APRIL THROUGH JULY 2006

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ACRONYMS AND ABBREVIATIONS

µg/L	Microgram per liter
ASA	American Society of Agronomy
APHA	American Public Health Association
AWWA	American Water Works Association
CCB	Continuing calibration blank
CDD	Chlorinated dibenzo-p-dioxin
CDF	Chlorinated dibenzofurans
CECRA	Comprehensive Environmental Cleanup and Responsibility Act
CVAA	Cold vapor atomic absorption
Dioxins	Dibenzo-p-dioxins
DQO	Data quality objective
DVSR	Data validation summary report
EDD	Electronic data deliverable
EMPC	Estimated maximum possible concentration
Energy	Energy Laboratories, Inc.
EPA	U.S. Environmental Protection Agency
EPH	Extractable petroleum hydrocarbons
FS	Feasibility study
Furans	Dibenzofurans
GC	Gas chromatography
GC/MS	Gas chromatography/mass spectrometer
HRGC	High-resolution gas chromatography
HRMS	High-resolution mass spectrometry
ICB	Initial calibration blank
ICP	Inductively coupled plasma
ICP/MS	Inductively coupled plasma/mass spectrometer
KPT	Kalispell Pole and Timber
LCS	Laboratory control sample
LCSD	Laboratory control sample duplicate
LRRL	Laboratory-required reporting limit
MADEP	Massachusetts Department of Environmental Protection
MD	Matrix duplicate
MDL	Method detection limit

ACRONYMS AND ABBREVIATIONS (Continued)

MS	Matrix spike
MSD	Matrix spike duplicate
NIOSH	National Institute of Occupational Health and Safety
Pace	Pace Analytical Services, Inc.
PAH	Polynuclear aromatic hydrocarbons
PARCCS	Precision, accuracy, representativeness, completeness, comparability, and sensitivity
PCB	Polychlorinated biphenyl
PCP	Pentachlorophenol
QA	Quality assurance
QC	Quality control
Reliance	Reliance Refinery Company
RI	Remedial investigation
RPD	Relative percent difference
RRV	Required reporting value
SAP	Sampling and analysis plan
SDG	Sample delivery group
SIM	Selective ion monitoring
SM	Standard Methods
SPLP	Synthetic precipitation leaching procedure
SQL	Sample quantitation limit
SSSA	Soil Science Society of American
SVOC	Semivolatile organic compound
TCDF	Tetrachlorodibenzofuran
TCLP	Toxicity characteristic leaching procedure
Tetra Tech	Tetra Tech EM Inc.
TOC	Total organic carbon
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbons
WEF	Water Environmental Federation
Yale Oil	Yale Oil Corporation

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech), prepared this data validation summary report (DVSR) to assess the validity (based on data validation) and usability (based on project objectives) of water, soil, and sediment analytical data collected for the Comprehensive Environmental Cleanup and Responsibility Act (CECRA) Remedial Investigation (RI), risk assessment, and feasibility study (FS) at the Kalispell Pole and Timber (KPT) Facility, Reliance Refinery Company (Reliance) Facility, and the Yale Oil Corporation (Yale Oil) Facility. The three facilities are herein referred to as the KRY site. Table 1 lists all samples collected in from April through July 2006, based on the Final Sampling and Analysis Plan (SAP) prepared and approved for this investigation (Tetra Tech 2006).

1.1 PURPOSE AND OBJECTIVES

The purpose of this DVSR is to summarize the validation and usability of chemical data collected during this CECRA RI and FS. The purpose of this investigation is to:

- Investigate the nature and extent of suspected sources of contamination
- Investigate the nature, extent, and migration of contamination
- Characterize the risks at the site
- Gather data needed to evaluate likely remedial alternatives

Two analytical service companies conducted chemical analysis of samples during the investigation. Dioxin and furan analyses were conducted by Pace Analytical Services, Inc. (Pace) in Minneapolis, Minnesota. All other analyses were conducted by Energy Laboratories, Inc. (Energy) in Helena, Montana. All data were delivered as hardcopy data packages and accompanied by electronic data deliverables (EDD). Most hardcopy data deliverables were summary data packages including sample results and quality control (QC) sample summary tables. One full data package (including sample results, QC summaries, and all associated sample receipt, preparation, and analytical raw data) was submitted from Pace and Energy. EDDs received from both laboratories (same format requirements) were loaded into a Microsoft Access® database and used for reporting. Both laboratories reported sample results in the EDD (with applicable laboratory qualifiers), as well as associated field and laboratory QC sample results.

A total of 124 water, 282 soil, and 5 sediment samples were collected during this RI and FS (Table 1). Chlorinated dibenzo-p-dioxins (dioxins) and chlorinated dibenzofurans (furans) were analyzed by high-resolution gas chromatography/high-resolution mass spectrometry (HRGC/HRMS) according to U.S. Environmental Protection Agency (EPA) Method 8290 (EPA 1996) by Pace. The following types of analyses were conducted on samples analyzed by Energy:

- Volatile organic compounds (VOC) by gas chromatography/mass spectrometry (GC/MS) by EPA Method 8260B and revisions (EPA 1996)
- Toxicity characteristic leaching procedure (TCLP) VOCs by EPA Methods 1311 and 8260B and synthetic precipitation leaching procedure (SPLP) VOCs by EPA Methods 1312 and 8260B (EPA 1996)
- Semivolatile organic compounds (SVOC) by GC/MS by EPA Method 8270C and revisions (EPA 1996) including polynuclear aromatic hydrocarbons (PAH) by selected ion monitoring (SIM) GC/MS using the same method
- TCLP SVOCs by EPA Methods 1311 and 8270C, and SPLP SVOCs by EPA Methods 1312 and 8270C (EPA 1996)
- Volatile petroleum hydrocarbons (VPH) by gas chromatography (GC) by Massachusetts Department of Environmental Protection (MADEP)
- Extractable petroleum hydrocarbons (EPH) by GC by MADEP and EPH screen by GC by modified EPA Method 8015 and revisions (EPA 1996)
- Pentachlorophenol (PCP) by GC by EPA Method 8151A and revisions (EPA 1996)
- Polychlorinated biphenyls (PCB) by GC by EPA Method 8082 and revisions (EPA 1996)
- Total metals by inductively coupled plasma (ICP) by EPA Methods 200.7 and 6010B, ICP/MS by EPA Methods 200.8 and 6020, and cold vapor atomic absorption (CVAA) for mercury by EPA Methods 245.1 and 7471A (EPA 1983 and 1996)
- TCLP metals by EPA Methods 1311, 200.7, 200.8, and 245.1 and SPLP metals by EPA Methods 1312, 200.7, 200.8, and 245.1 (EPA 1983 and 1996)
- Inorganic and physical chemistry analytes including bromate by ion chromatography (EPA Method 300.1) (EPA 1983), chlorine by titration [Standard Method (SM) 4500-Cl-B] (APHA/AWWA/WEF 2005), formaldehyde by visible absorption spectrometry [modified National Institute of Occupational Health and Safety (NIOSH) Method 3500] (NIOSH 2004), total organic carbon (TOC) by spectrophotometry (ASA/SSSA 1982) Method 29-3, pH by electrometry by EPA Method 9045C (EPA 1996), and SPLP pH by EPA Methods 1312 and 9045C (EPA 1996)

A discussion of the impact of changes in reference methods and analytical techniques are discussed in Section 2.2.5.

Positive (detected) laboratory results were reported as the concentration along with applicable laboratory data qualifiers. Non-detect results were reported to the sample quantitation limit with the "U" qualifier to signify that the chemical was undetected. The SQL is defined as the method detection limit (MDL) adjusted to reflect sample-specific actions, such as dilution or use of smaller aliquot sizes, and takes into account sample characteristics, sample preparation, and analytical adjustments. It represents the sample-specific detection limit and all non-detected results are reported to this level. By definition, the MDL is the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The laboratory was also provided with laboratory-required reporting limits (LRRL) as defined and specified in the SAP (Tetra Tech 2006). For this project, results of laboratory analyses were reported as estimated values (J) if concentrations were less than laboratory-required reporting limits (LRRL) but greater than SQLs. LRRLs and SQLs are discussed further in Section 2.2.6.

1.2 VALIDATION PROCESS

Two types of validations were conducted on the analytical data collected during this investigation: (1) cursory validation, and (2) full validation. Table 1 indicates the level of data validation conducted on results from each sampling location. Table 2 lists the review items associated with each of the two levels of validation. A description of each review item, including instances when results did not meet acceptance criteria, is provided in Section 2.0

Chemistry sample results were validated in accordance with the following EPA guidance documents: "U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 1999), "U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review" (EPA 2004), and "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" (EPA 2005).

Based on data validation, data qualifiers were placed in the electronic database to signify whether the data were acceptable, acceptable with qualification, or rejected. Table 3 provides the definitions for the data validation qualifiers. Validation qualifiers and definitions are based on those used by EPA in the current validation guidelines (EPA 1999, 2004, and 2005). The validated results are contained in the Kalispell database and provided in electronic format as Appendix A to this document.

Laboratories were also required to submit a detailed case narrative with every data package listing any QC criteria that were not met or any other issue that might affect data quality (for example initial or continuing calibration problems). In addition to the criteria listed above, each laboratory case narrative

was thoroughly reviewed. Results were qualified for any issues that affected data quality listed in the laboratory case narrative.

1.3 REPORT ORGANIZATION

After this introductory section, Section 2.0 summarizes data validation and usability for sample data collected during this investigation. Section 3.0 provides general conclusions about the usability of the data sets. The conclusions regarding data usability will be used to prepare data quality objectives (DQO) for future environmental investigations undertaken at KRY. The references and tables follow the conclusions and recommendations at the end of this document.

Table 1 provides a summary of all sampling locations from which sample data were obtained for this reporting period. Table 1 also includes relevant information about the sampling dates, matrices, analytical suite, and level of validation.

2.0 DATA VALIDATION SUMMARY

This section describes the data validation findings and usability with regard to the project-specific objectives. Section 2.1 summarizes the data validation findings, and Section 2.2 summarizes the evaluation of the following quality indicator parameters: precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS).

2.1 DATA VALIDATION FINDINGS

This section summarizes all items of the validation process and discusses the findings their effects on data quality.

2.1.1 Holding Times

Holding time refers to the period of time between sample collection and the preparation and/or analysis of the sample. Sample results were reviewed for compliance with the method-prescribed preparation and analysis holding times. Holding times for aqueous and solid matrices are based on those listed in documents, "Test Methods for Evaluating Solid Waste" (EPA 1996), "Method for Chemical Analysis of Water and Waste" (EPA 1983), "Method for the Determination of Extractable Petroleum Hydrocarbons (EPH)" and "Method for the Determination of Volatile Petroleum Hydrocarbons (VPH)" (MADEP 2004), "Methods of Soil Analysis. Part 2. Chemical and Microbiological Properties" (ASA/SSSA 1982),

"NIOSH Manual of Analytical Methods" (NIOSH 2004), and "Standard Methods for the Examination of Water and Wastewater" (SM 2005). Table 4 presents the holding time criteria that were used to validate the data.

Holding times were exceeded for dioxin and furan analysis in one groundwater sample, PCP analysis in five soil samples, and VPH analysis in three groundwater samples. EPA guidance for validation allows professional judgment to be used in evaluating qualification due to holding time exceedances. Sample results that were generated after the required holding time but less than two times the holding time were qualified as estimated (J or UJ). If the samples were prepared after two times the holding time was exceeded, results were qualified as rejected (R). Samples extracted or analyzed beyond the holding time may yield estimated results. Because all holding time exceedances were less than two times the holding time, these dioxin and furan, PCP, and VPH results were qualified as estimated (J or UJ).

2.1.2 Calibration

Instrument calibration data are generally not provided in data summary packages or EDDs. For this project, initial calibration data were not provided (hardcopy or electronic) in data summary packages or EDDs from Energy. Initial calibration data for metals analysis were received in November 2006 and reviewed by Tetra Tech. No additional qualifications were required as a result of the review. All calibration data was included in the Pace hardcopy data packages, but not the EDD. As such, only initial calibration data were evaluated for dioxin and furan data and full data package H06070135 from Energy.

No VPH, EPH, PCP, or general chemistry data were qualified based on calibration issues. However, for metals analysis by EPA Method 200.7 a low-concentration standard for zinc was biased low and outside QC limits. Because the recovery was less than 30 percent, the following nondetected results were qualified as rejected (R) because of the possibility of false negatives:

- Zinc in samples KRY204SW001, KRY203SW001, KRY201SW001, and KRY200SW001

For VOC, SVOC, and dioxin and furan analyses, percent differences in the continuing calibrations were occasionally greater than the required limit. Therefore, associated sample results were qualified as estimated (J or UJ).

2.1.3 Blank Samples

Field and laboratory blanks consisting of contaminant-free water were prepared and analyzed as part of standard quality assurance (QA)/QC procedures to monitor for potential contamination of field equipment, laboratory process reagents, and sample containers. For this investigation, two groups of blanks were prepared and analyzed: (1) laboratory blanks (calibration and method blanks), and (2) field QC blanks (including trip, source water, and equipment rinsate blanks). Each blank type is discussed in the following sections (Sections 2.1.3.1 and 2.1.3.2). The assignment of validation qualifiers associated with blank contamination is discussed in Section 2.1.3.3.

2.1.3.1 Laboratory Blanks

Two types of laboratory blanks were prepared and analyzed; calibration blanks and method blanks. Both types were prepared in the laboratory using high-grade contaminant-free water.

Calibration Blanks – Calibration blanks are comprised of acidified high-grade contaminant-free water analyzed at the beginning (initial calibration blank [ICB]), end (continuing calibration blank [CCB]), and every 10 runs during analysis of metals by ICP and ICP/MS. Their primary function is to initially set the calibration curve (along with calibration standards) and continually monitor the background for possible variations in instrument electronic signal or cross-contamination. ICB and CCB data were not provided in data packages or EDDs. As such, ICB and CCB data were not evaluated

Method Blanks – Method blanks are laboratory QC samples that are prepared and analyzed with each batch of environmental samples. Method blanks are comprised of high-grade contaminant-free water that is carried though all preparation procedures in batches with field samples (including the addition of all reagents and QC monitoring compounds). Method blanks monitor potential contaminants in laboratory processes, reagents, and containers, and were analyzed for each analytical method used on field samples. Method blanks are discussed further in Section 2.1.3.3.

2.1.3.2 Field QC Blanks

Three types of field QC blanks were collected and analyzed with field samples; trip blanks, source water blanks, and equipment rinsate blanks. Each one monitors the potential impact of field and transportation conditions on the collection and integrity of field samples as discussed in the following paragraphs.

Trip Blanks – Trip blanks are a type of field blank prepared at the laboratory by filling a 40-milliliter vial

vial with high-grade contaminant-free water and sealing it with a Teflon-lined lid. Trip blanks are shipped to the field sampling location accompanying sample containers in the shipping cooler. When samples for VOCs and VPH are collected and shipped back to the laboratory for analysis, a trip blank is transported within the shipping container back to the laboratory for analysis of VOCs and TPH. Trip blanks monitor for potential contamination of sample containers during shipment to the field, as well as monitor for potential contamination of VOC samples during collection and transportation back to the laboratory. A total of 41 trip blank samples were prepared by the laboratory and shipped to the field in coolers with unused sample containers; these samples were shipped back to the laboratory in coolers along with samples to be analyzed for VOCs and VPH. Trip blanks are discussed further in Section 2.1.3.3.

Source Water Blanks – In order to identify any contamination in the water used for decontamination, three source water blanks were collected during this sampling event. Source water blanks were prepared from laboratory-grade water from Energy Laboratories, the Evergreen public water supply, and Culligan deionized water, poured into field sampling containers, and shipped to the laboratory for analysis. Source water blanks were analyzed for all parameters. Source water blank results were submitted in hardcopy and EDD formats and are available in the database. Source water blanks are discussed further in Section 2.1.3.3.

Equipment Rinsate Blanks – In order to identify any affect of carry-over from sampling equipment on sample collection, 22 equipment rinsate blanks were collected during this sampling event. The equipment rinsate blanks were prepared by pouring high-grade contaminant-free water over or through the decontaminated sampling equipment into a sample container and sent to the laboratory for analysis. The equipment rinsate blanks were shipped to the laboratory for analysis for VOCs, SVOCs, pentachlorophenol, VPH, EPH, and metals. Equipment rinsate blank results were submitted in hardcopy and EDD formats and are available in the database.

2.1.3.3 Qualifications Due to Blank Contamination

The previous subsections describe the types of blanks that were collected and analyzed with field samples. This section discusses the procedure for evaluating blank results and applying qualifiers on field data.

Note that not every compound detected in laboratory or field QC blanks resulted in qualification of data. If the criteria discussed below were not met for a given result, then no qualification was required.

All laboratory and field QC blank contamination was generally evaluated as discussed in this paragraph. Sample results that were less than 5 times the associated blank value (10 times for common laboratory contaminants, such as acetone, methylene chloride, and ketones) were qualified as undetected (U). Sample results that were greater than 5 (or 10) times the blank value were not qualified. Qualifiers based on laboratory blanks were assigned first, and then evaluation of field blanks was conducted. If a qualifier was already assigned to a result based on laboratory blank contamination, no further qualification was assigned for field blank contamination. No data were rejected and the qualified data are fully usable and meet project objectives based on this criterion.

2.1.4 Spike Samples

Spiked samples are environmental matrices spiked with a subset of target compounds at known concentrations. These QC samples were analyzed with project samples to measure laboratory accuracy and potential interference from the matrix. Two types of spike samples were analyzed with the project samples to monitor for potential interferences during analysis:

- Matrix spike (MS) and matrix spike duplicate (MSD) samples; these samples consist of aliquots of environmental samples spiked with a subset of target compounds. MS/MSD samples monitor potential interference from the site-specific sample matrix and its effect on target compounds.
- Blank spike samples, also known as laboratory control samples (LCS); these samples are an aliquot of reagent soil or water spiked with a subset of target compounds. The LCS monitors laboratory accuracy without the bias of a sample matrix. In some cases, the LCS was analyzed in duplicate (LCSD).

At least one MS/MSD sample and one LCS were prepared and analyzed with each batch of environmental samples except for formaldehyde and TOC analyses, which require only LCSs. Note that for some SDGs, the laboratory conducted MS and MSD analyses on samples that were not specific to the KRY site. In those cases, evaluation of the MS and MSD is not conducted because the reviewer has no way to confirm that the matrix chosen is representative of samples from the KRY site.

MS/MSD recoveries and relative percent differences (RPD) for VOC, SVOC, EPH, PCP and metals analyses and LCS recoveries for VOC, SVOC, and metals analyses outside QC limits were generally qualified as estimated (J or UJ). However, qualifications were not applied if MS/MSD or LCS recoveries were biased high and associated sample results were not detected. When the MS/MSD or LCS/LCSD recoveries were extremely low (less than 20 percent for organic analyses and 30 percent for inorganic analyses), associated nondetect results are qualified as rejected (R), because large biases or false negatives

are a possibility. The results listed in Table 5 were qualified as rejected based on very low MS/MSD or LCS/LCSD recoveries and are considered unusable for meeting project objectives.

Although tetraethyllead LCS and MS/MSD recoveries were less than 10 percent in several data packages, nondetected results were not rejected because the laboratory case narratives indicated that the spiking solution had degraded in storage. Instead, tetraethyllead results for these samples were qualified as estimated (UJ).

2.1.5 Surrogate Spikes

Surrogate spikes were prepared by adding compounds similar to target compounds of interest to sample aliquots and associated QC samples for organic analyses only. Surrogate spike recoveries monitor the efficiency of contaminant extraction from the sample medium into the instrument measuring system and measure possible interferences from the sample matrix that may affect the data quality of target compound results.

Surrogate spikes were added to each of the samples submitted for organic analysis to monitor potential interferences from the matrix. Surrogates were added to the sample aliquot during preparation of the sample for analysis, and surrogate recoveries were compared with QC acceptance limits. Surrogate recoveries outside of the acceptable limits indicate interference from the sample matrix for the detection of target compounds. No data were rejected based on this criterion. However, surrogate recoveries were outside QC limits in the VOC, SVOC, VPH, EPH, and PCP analyses. When surrogate recoveries were outside QC limits, associated sample data were qualified as estimated (J or UJ). Sample results were not qualified when only one SVOC surrogate from each fraction was outside QC limits. In addition, qualifications were not applied if surrogate recoveries were biased high and associated sample results were not detected.

2.1.6 Internal Standards

Internal standards were prepared for certain dioxin and furan, VOC, and SVOC analyses by adding compounds similar to target compounds of interest to sample aliquots. Internal standards are used in the quantitation of target compounds in the sample or sample extract. Internal standard responses and retention times were not reported in the QC summary reports provided by Energy. Only the full data package (SDG H06070135) received from Energy and all data packages received from Pace contained the

internal standard results. As such, only this data were evaluated for internal standard responses and retention times.

The evaluation of internal standards involved comparing the instrument response and retention time from the target compounds in the sample with the response and retention time of specific internal standards added to the sample extract prior to analysis. No data were rejected based on this criterion. However, internal standards were outside QC limits in the dioxin and furan analyses. Sample results quantitated against these internal standards were qualified as estimated (J or UJ).

2.1.7 Duplicate Samples

Duplicate samples involved the preparation and analysis of an additional aliquot of a field sample. Results from duplicate sample analysis measure laboratory precision as well as homogeneity of contaminants in the field matrix. For this investigation, three types of duplicate analyses were conducted: (1) MSDs for organic analyses and total metals, (2) matrix duplicates (MD) for inorganic analyses, and (3) field duplicates for both types of analyses. MSDs and MDs measure laboratory precision and sample homogeneity, while field duplicates are used to evaluate field sampling technique precision, laboratory precision, and homogeneity of the sample matrix.

At least one duplicate analysis (MSD or MD) was performed with each batch of environmental samples processed in the laboratory with one exception. MD analyses were not performed for formaldehyde analyses. No qualifications were applied because of this data gap. The laboratory calculated the (RPD) between the two detected values for MSD and MD analyses. RPD values within the acceptable limits indicate both laboratory precision and minimal matrix heterogeneity of compounds detected in the samples. Detected results associated with elevated RPD values were qualified as estimated (J) to indicate the variability in detected concentrations or poor laboratory precision. Estimated analytical results are quantitatively unreliable, but are qualitatively acceptable and meet project objectives. Nondetects are not affected by duplicate precision.

Eight aqueous field duplicate pairs were collected as follows.

SDG Number	Sample ID	Field Duplicate Sample ID
1034582	KRYKPT15GW001	KRYKPT15GW701
H06060263	KRYKPT16GW001	KRYKPT16GW701
H06060332	KRYKPT20GW001	KRYKPT20GW701
H06060128	KRY102GW001	KRY102AGW701
H06060219	KRY121AGW001	KRY121AGW701
1035349	KRY202SW001	KRY202SW701
H06060332	KRYRW11GW001	KRYRW11GW701
H06060349	KRYSW9GW001	KRYSW9GW701

This collection frequency (6.4 percent of the total water samples collected) meets the collection frequency of 5 (one per 20 samples) percent needed to meet project objectives. According to EPA guidance, there are no specific criteria for evaluating field duplicates (EPA 1999 and 2004). Generally, field duplicate precision was less than 25 percent RPD for water samples for results that exceeded five times the reporting limit. Field duplicate precision was not assessed when results were less than five times the reporting limit. No data were qualified based on field duplicate precision.

Although field duplicate soil samples are sometimes collected as soil samples from adjacent locations, such soil duplicate samples were not collected as specified in the SAP (Tetra Tech 2006) for this project for two reasons. First, since adjacent soil samples incorporate some spatial variability, these samples cannot be used directly to assess sampling precision. Second, it is not practical to set QC limits for the RPDs of such samples, which precludes the use of these samples for QC purposes.

2.1.8 Other Qualifications

Each of the paragraphs in this section addresses the following qualification scenarios that are not already addressed in the larger review sections:

- Positive results above the SQL, but less than the LRRLs were qualified as estimated (J)
- In the dioxin and furan analysis, positive 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) were not confirmed on a second column and were qualified as estimated (J)
- Results for dioxins and furans with ion abundance ratios outside the method-specified limits were qualified as nondetected (U).

Quantitation less than the LRRLs for stable chemistries – Both laboratories evaluated the SQL and LRRL for each sample result. In cases where sample results were greater than the SQL, but less than the LRRL, the laboratory qualified results as estimated. Specifically, results with this scenario were qualified by the laboratory as "J". Qualitatively, the results are acceptable; however, these results were considered estimated, because as the value approaches the SQL, the accuracy of the measurement is less certain. In these cases, bias cannot be determined.

Positive 2,3,7,8-TCDF that were not confirmed – Positive 2,3,7,8-TCDF results were not confirmed on a second column as required by the method. During data validation, positive results for 2,3,7,8-TCDF that were not confirmed on a second column were qualified as estimated (J).

Dioxin and furan results with irregular ion abundance ratios – Pace identified results with ion abundance ratios outside control limits by the flag "I" for interference or "E" when the interference from polychlorinated diphenylethers was identified and calculated the estimated maximum possible concentration (EMPC). During data validation, results for dioxins and furans with ion abundance ratios outside method-specified control limits were qualified as nondetect (U).

2.1.9 Summary of Groundwater Data Quality

As summarized above, groundwater data were qualified as estimated because of irregularities in the continuing calibration, laboratory duplicate, MS/MSD and LCS, surrogate, and internal standard results. Sample results were also qualified as estimated because some positive results were above the SQL, but less than the LRRLs. Positive 2,3,7,8-TCDF that were not confirmed on a second column were also qualified as estimated. Estimated analytical results are quantitatively unreliable, but are qualitatively acceptable and meet project objectives. Groundwater data were qualified as nondetected because of laboratory and field QC blank contamination. Results for dioxins and furans with ion abundance ratios outside the method-specified limits were also qualified as nondetected. All data except rejected results are usable to meet project objectives with the qualifications discussed in the sections above.

Based on the review summarized above, 186 sample results were rejected. Undetected sample data collected during this investigation were rejected due to poor MS/MSD and LCS recoveries (less than 20 percent) for benzoic acid and tetraethyllead and poor MS/MSD recoveries (less than 30 percent) for antimony and tin, because large biases or false negatives are a possibility. Benzoic acid, antimony, and tin typically respond poorly during analysis. In addition, undetected sample data for zinc were rejected

due to poor recovery (less than 30 percent) in the low-concentration calibration verification standard. All rejected data are unusable and considered incomplete and do not meet project objectives.

2.2 EVALUATION OF PARCCS PARAMETERS

Overall data quality was acceptable based on the critical indicator parameters, except for data specifically rejected and qualified as such (R). PARCCS parameters were reviewed for laboratory analytical results obtained during this sampling event, and the sections below discuss the results of the evaluation for each indicated parameter.

2.2.1 Precision

Precision is the measure of the variability associated with an entire sampling and analysis process. It is the comparison among independent measurements as the result of repeated application of the same process under similar conditions. It is determined by analyzing field duplicate pairs, MSD pairs, and MD pairs. Precision is expressed as the RPD of a pair of values (or results).

Field duplicate pairs were collected, analyzed, and evaluated for each analysis performed on every sample matrix. Frequencies of field duplicate pairs submitted to the laboratory for analysis were shown to be 6.4 percent for the water data collected during this reporting period; meeting the requirement of 5 percent (1 per 20 field samples). Field duplicate precision for aqueous samples was acceptable. No data were qualified because of field duplicate precision.

The frequency criterion for MSD or MD pairs is 5 percent of the samples (per matrix) or one per each analytical batch of 20 or less per matrix. MSD or MD samples were collected, analyzed, and evaluated for each analysis performed on every sample matrix and met the frequency of 5 percent except for formaldehyde analysis. No data were qualified because of this irregularity. The frequencies in which MSDs or MDs were prepared and analyzed by the laboratory met the frequency requirement as stated above. Data were qualified as estimated based on MSD or MD precision, but no data were rejected due to poor duplicate precision.

2.2.2 Accuracy

Accuracy is the degree to which a measurement agrees with its true value and is expressed as percent recovery. Accuracy is assessed by comparing calibration verification, MS, LCS, surrogate, and internal standard recoveries with associated QC limits. Calibration verification, MS, LCS, surrogate, and internal

standard recoveries were evaluated for compliance with acceptance criteria for each applicable analytical methodology.

The calibration verifications were analyzed at the proper concentration and frequency. The frequency criterion for MSs and LCSs is 5 percent of the samples per matrix or one per each analytical batch of 20 samples or less per matrix. MSs and LCSs were collected, analyzed, and evaluated for each analysis performed at the proper frequency. The criterion for MS and LCS accuracy is based on recommended QC limits provided in EPA validation guidelines and on laboratory historical QC limits for those analytes not presented in validation guidelines. Sample data collected during this investigation were rejected due to (1) poor MS/MSD and LCS recoveries for benzoic acid and tetraethyllead; (2) poor MS/MSD recoveries for antimony and tin; and (3) poor low-concentration calibration verification recovery for zinc. Data were also qualified as estimated based on MS/MSD, LCS, surrogate, and internal standard accuracy.

2.2.3 Representativeness

Representativeness is a qualitative parameter and is defined by the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or a process or environmental condition. Sample results were evaluated for representativeness by examining items related to sample collection, including chain-of-custody documentation, sample labeling, collection dates, and condition of the samples upon receipt at the laboratory. Laboratory procedures also were examined, including anomalies reported by the laboratory, either upon receipt of the samples at the laboratory or during analytical processes, adherence to recommended holding times of samples prior to analysis, calibration of laboratory instruments, adherence to analytical methods, and completeness of data package documentation. All issues were minor and satisfactorily rectified during data review.

Representativeness is also evaluated by reviewing blanks (laboratory method blanks and field blanks). Laboratory and field QC blanks contained detectable amounts of SVOCs, metals, and dioxins and furans. Generally, concentrations detected in the blanks were considerably less than reported results for the field samples; therefore, these concentrations did not affect overall data quality. Sample results were generally qualified as undetected (U) based on evaluation guidelines discussed in Section 2.1.1.3.

2.2.4 Completeness

Completeness is defined as the percentage of measurements judged to be valid. The validity of sample results is determined through the data validation process. All rejected sample results are considered to be incomplete and unusable. Data that are qualified as undetected (U), undetected at estimated reporting limits (UJ), and estimated (J) are considered to be valid and usable. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set.

For data collected during this sampling event, the total number of field sample results is 56,447. Of the total field sample results, 186 results were rejected so the number of valid field sample results is 56,261. The percent complete (valid and not rejected) is 99.7 percent. The total number of residential well sample results is 1,330 and 10 results were rejected, resulting in a completeness of 99.2 percent. The total number of residential soil results is 935 and no results were rejected, resulting in a completeness of 100 percent. The total number of surface water sample results is 872 and 4 results were rejected, resulting in a completeness of 99.5 percent. The total number of sediment sample results is 855 and no results were rejected, resulting in a completeness of 100 percent. Incomplete results are the rejected analytical results specified in Table 5. The completeness is slightly lower than the completeness goal of 100 percent for all residential well and surface water samples, but residential soil and sediment samples meet the goal of 100 percent and all other sample types meet the goal of 90 percent. The slightly lower completeness for residential well and surface water samples was a result of rejected results for benzoic acid in 10 residential well samples and zinc in 4 surface water samples. All other residential well and surface water sample results are considered fully usable to meet project objectives.

2.2.5 Comparability

Comparability of the data is a qualitative parameter that expresses the confidence with which one data set may be compared with another. Comparability of the data is achieved by using standard methods for sampling and analysis, reporting data in standard units, normalizing results to standard conditions, and using standardized reporting formats and data validation procedures. Formaldehyde analysis was analyzed by Standard Method 4500-Cl-B using visible absorption spectrometry. The SAP (Tetra Tech 2006) specified formaldehyde analysis by EPA Method 8315 using high performance liquid chromatography (HPLC). The visible absorption spectrometry method has an increased potential for false positives because oxidizable organic material may give a positive interference. However, formaldehyde was undetected in all samples, so data quality was unaffected.

2.2.6 Sensitivity

Sensitivity is the measure of the signal from an instrument that represents an actual deflection or response above instrument noise. Analytical sensitivity is measured by the MDL, the minimum concentration of an analyte that can be reliably distinguished from background noise for a specific analytical method. The SQL is defined as the MDL adjusted to reflect sample-specific actions, such as dilution or use of smaller aliquot sizes, and takes into account sample characteristics, sample preparation, and analytical adjustments. It represents the sample-specific detection limit and all non-detected results are reported to this level. For this project, results of laboratory analyses will be reported as estimated values if concentrations are less than LRRLs but greater than SQLs.

Most LRRLs specified in Appendix D of the SAP were met by Pace and Energy in order to meet approved applicable screening levels. However, the aqueous reporting limit of 3 micrograms per liter (µg/L) for arsenic was slightly above the LRRL of 1 µg/L and the pentachlorophenol reporting limit of 0.1 µg/L was slightly above the DEQ-7 required reporting value (RRV) of 0.05 µg/L. Although Energy could have met the lower RRV by utilizing "clean room" techniques, these procedures would have likely resulted in significantly more data qualifications. In light of this, DEQ approved the pentachlorophenol RRV of 0.05 µg/L.

Scenarios involving dilutions, high moisture content, and matrix interference affect the LRRL by raising it according to the dilution factor or percent moisture content. Dilutions were required for numerous SVOC analyses because of high concentrations. Whenever the concentration exceeded the linear range of the instrumentation, dilutions were analyzed. All dilutions were reported.

3.0 CONCLUSIONS AND RECOMMENDATIONS

This section summarizes the conclusions and recommendations regarding usability of the data for the project objectives. For residential soil and sediment samples, 100 percent of the data are valid and acceptable for their intended use. For residential well and surface water samples, 99.2 and 99.5 percent, respectively, of the data are valid and acceptable for their intended use. Based on the evaluation of all sample data, 99.7 percent of the data obtained during this reporting period are valid (that is, not rejected) and acceptable for their intended use.

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TABLES

TABLE 1
SUMMARY OF SAMPLE ANALYSIS
DATA VALIDATION SUMMARY REPORT
KRY REMEDIAL INVESTIGATION

SAMPLE ID	SDG ID	Date Sampled	Matrix	QC ID	Validation	VOC	SVOC	PCP	VPH	EPH	TPH	D/F	Metals	Br	Cl	Form	pH	TOC	TCLP VOC	TCLP SVOC	TCLP Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY100AGW001	1034012	6/15/2006	Water		Cursory							X													
KRY100AGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X		X												
KRY100ASB001	H06050232	5/19/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY100ASS001	H06050232	5/19/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY101AGW001	1034012	6/14/2006	Water		Cursory							X													
KRY101AGW001	H06060173	6/14/2006	Water		Cursory	X	X	X	X		X		X	X	X	X									
KRY101BGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X				X	X									
KRY102AGW001	H06060128	6/13/2006	Water		Cursory	X	X	X	X		X														
KRY102AGW701	H06060128	6/13/2006	Water	FD	Cursory	X	X	X	X		X														
KRY102BGW001	H06060128	6/13/2006	Water		Cursory	X	X	X	X		X														
KRY103AGW001	1034012	6/15/2006	Water		Cursory							X													
KRY103AGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X		X												
KRY103ASB001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY103ASB002	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X														
KRY103ASB003	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY103ASS001	1032962	5/22/2006	Soil		Cursory							X													
KRY103ASS001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY103ASS002	1032962	5/22/2006	Soil		Cursory							X													
KRY103ASS002	H06050262	5/22/2006	Soil		Cursory			X																	
KRY103ASS003	1032962	5/22/2006	Soil		Cursory							X													
KRY103ASS003	H06050262	5/22/2006	Soil		Cursory			X																	
KRY103BGW001	1034012	6/15/2006	Water		Cursory							X													
KRY103BGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X		X												
KRY104AGW001	H06060145	6/14/2006	Water		Cursory	X	X	X	X		X														
KRY105AGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X														
KRY105ASB001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X		X		X												
KRY105ASB002	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY105ASS001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X														
KRY105ASS002	1032962	5/22/2006	Soil		Cursory							X													
KRY106AGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X														
KRY106BGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X														
KRY107AGW001	1034012	6/16/2006	Water		Cursory							X													
KRY107AGW001	H06060173	6/16/2006	Water		Cursory	X	X	X	X		X		X												
KRY107BGW001	1034012	6/16/2006	Water		Cursory							X													
KRY107BGW001	H06060173	6/16/2006	Water		Cursory	X	X	X	X		X		X												
KRY108AGW001	H06060263	6/22/2006	Water		Cursory	X	X	X	X		X														
KRY108ASS001	H06050232	5/19/2006	Soil		Cursory	X	X	X	X	X	X														
KRY109AGW001	H06060173	6/16/2006	Water		Cursory	X	X	X	X		X														
KRY110AGW001	H06060173	6/15/2006	Water		Cursory	X	X	X	X		X														
KRY110BGW001	H06060173	6/16/2006	Water		Cursory	X	X	X	X		X														
KRY111AGW001	1034012	6/16/2006	Water		Cursory							X													
KRY111AGW001	H06060173	6/16/2006	Water		Cursory	X	X	X	X	X	X		X												
KRY111AQE001	1034012	6/16/2006	Water	ER	Cursory							X													
KRY111AQE001	H06060173	6/16/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY111ASB001	H06050049	5/2/2006	Soil		Cursory	X	X	X	X		X														
KRY111ASS001	1031716	5/2/2006	Soil		Cursory							X													
KRY111ASS001	H06050049	5/2/2006	Soil		Cursory	X	X	X	X	X	X														

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SUMMARY OF SAMPLE ANALYSIS
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SAMPLE ID	SDG ID	Date Sampled	Matrix	QC ID	Validation	VOC	SVOC	PCP	VPH	EPH	TPH	D/F	Metals	Br	Cl	Form	pH	TOC	TCLP VOC	TCLP SVOC	TCLP Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY111ASS002	1031716	5/2/2006	Soil		Cursory							X													
KRY111ASS002	H06050049	5/2/2006	Soil		Cursory			X																	
KRY111ASS003	1031716	5/2/2006	Soil		Cursory							X													
KRY111ASS003	H06050049	5/2/2006	Soil		Cursory			X																	
KRY111BGW001	1034012	6/16/2006	Water		Cursory							X													
KRY111BGW001	H06060173	6/16/2006	Water		Cursory	X	X	X	X		X		X												
KRY112AGW001	H06060145	6/14/2006	Water		Cursory	X	X	X	X		X														
KRY112ASS001	H06050049	5/3/2006	Soil		Cursory	X	X	X	X	X	X														
KRY112BGW001	H06060145	6/14/2006	Water		Cursory	X	X	X	X		X														
KRY113AGW001	H06060247	6/22/2006	Water		Cursory	X	X	X	X		X														
KRY113ASB002	H06050262	5/23/2006	Soil		Cursory	X	X	X	X		X														
KRY113ASS001	H06050262	5/23/2006	Soil		Cursory	X	X	X	X	X	X														
KRY113BGW001	H06060247	6/22/2006	Water		Cursory	X	X	X	X		X														
KRY114AGW001	1035023	6/29/2006	Water		Cursory							X													
KRY114AGW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X	X	X		X	X	X	X									
KRY114BGW001	1035023	7/5/2006	Water		Cursory							X													
KRY114BGW001	H06070055	7/5/2006	Water		Cursory	X	X	X	X		X		X	X	X	X									
KRY114BSB001	H06040167	4/18/2006	Soil		Cursory	X	X	X	X	X	X														
KRY114BSS001	H06040167	4/18/2006	Soil		Cursory	X	X	X	X		X														
KRY115AGW001	H06060128	6/13/2006	Water		Cursory	X	X	X	X		X														
KRY115BGW001	H06060128	6/13/2006	Water		Cursory	X	X	X	X		X														
KRY115BSS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY116AGW001	H06060145	6/14/2006	Water		Cursory	X	X	X	X		X														
KRY116ASB001	H06050070	5/5/2006	Soil		Cursory	X	X	X	X		X														
KRY116ASS001	H06050070	5/5/2006	Soil		Cursory	X	X	X	X		X														
KRY116BGW001	H06060173	6/14/2006	Water		Cursory	X	X	X	X		X														
KRY118AGW001	1035023	7/5/2006	Water		Cursory							X													
KRY118AGW001	H06070055	7/5/2006	Water		Cursory	X	X	X	X		X		X												
KRY118ASS001	H06060029	6/1/2006	Soil		Cursory	X	X	X	X		X		X												
KRY118BGW001	1035023	7/5/2006	Water		Cursory							X													
KRY118BGW001	H06070055	7/5/2006	Water		Cursory	X	X	X	X		X		X												
KRY121AGW001	1034368	6/20/2006	Water		Cursory							X													
KRY121AGW001	H06060219	6/20/2006	Water		Cursory	X	X	X	X	X	X		X												
KRY121AGW701	H06060219	6/20/2006	Water	FD	Cursory	X	X	X	X	X	X		X												
KRY121BGW001	1034582	6/28/2006	Water		Cursory							X													
KRY121BGW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X		X		X												
KRY121BQE001	H06060349	6/28/2006	Water		Cursory	X	X	X	X		X														
KRY121CSB001	H06040170	4/20/2006	Soil		Cursory													X							
KRY121CSB002	H06040170	4/20/2006	Soil		Cursory	X	X	X	X	X	X							X							
KRY121CSS001	H06040170	4/20/2006	Soil		Cursory	X	X	X	X		X														
KRY122AGW001	H06060298	6/26/2006	Water		Cursory	X	X	X	X		X														
KRY122AQE001	H06060298	6/26/2006	Water	ER	Cursory	X	X	X	X		X														
KRY122BGW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X		X														
KRY123AGW001	1034368	6/21/2006	Water		Cursory							X													
KRY123AGW001	H06060219	6/21/2006	Water		Cursory	X	X	X	X		X		X												
KRY123ASB001	H06040170	4/21/2006	Soil		Cursory	X	X	X	X		X		X												
KRY123ASB002	H06040202	4/21/2006	Soil		Cursory	X	X	X	X		X		X												

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KRY123ASS001	H06040170	4/21/2006	Soil		Cursory	X	X	X	X	X	X														
KRY125AGW001	H06060298	6/26/2006	Water		Cursory	X	X	X	X		X														
KRY125AQE001	H06060298	6/26/2006	Water	ER	Cursory	X	X	X	X		X														
KRY125BGW001	H06060298	6/26/2006	Water		Cursory	X	X	X	X		X														
KRY126AGW001	1034368	6/21/2006	Water		Cursory							X													
KRY126AGW001	H06060219	6/21/2006	Water		Cursory	X	X	X	X		X		X												
KRY126ASB001	H06050307	5/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY126ASB002	H06050307	5/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY126ASS001	H06050307	5/25/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY127AGW001	1034368	6/21/2006	Water		Cursory							X													
KRY127AGW001	H06060219	6/21/2006	Water		Cursory	X	X	X	X		X		X												
KRY127ASB001	1033170	5/31/2006	Soil		Cursory							X													
KRY127ASB001	H06060029	5/31/2006	Soil		Cursory	X	X	X	X		X		X												
KRY127ASB002	1033170	5/31/2006	Soil		Cursory							X													
KRY127ASB002	H06060029	5/31/2006	Soil		Cursory	X	X	X	X		X		X												
KRY127ASS001	H06060029	5/31/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY128AGW001	H06060332	6/27/2006	Water		Cursory	X	X	X	X		X														
KRY128BGW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X		X														
KRY129AGW001	1034582	6/27/2006	Water		Cursory							X													
KRY129AGW001	H06060332	6/27/2006	Water		Cursory	X	X	X	X		X		X												
KRY129ASB001	H06050307	5/24/2006	Soil		Cursory	X	X	X	X		X														
KRY129BGW001	1034368	6/21/2006	Water		Cursory							X													
KRY129BGW001	H06060247	6/21/2006	Water		Cursory	X	X	X	X		X		X												
KRY130AGW001	H06060219	6/20/2006	Water		Cursory	X	X	X	X		X														
KRY130BGW001	H06060263	6/22/2006	Water		Cursory	X	X	X	X		X														
KRY130QE001	1031716	4/27/2006	Water	ER	Cursory							X													
KRY130QE001	H06040234	4/27/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY134ASS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY136SB001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X		X												
KRY136SB002	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY136SB003	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY137ASB001	H06040225	4/25/2006	Soil		Cursory								X				X					X	X	X	
KRY139AGW001	H06060298	6/27/2006	Water		Cursory	X	X	X	X	X	X														
KRY139ASB001	H06050307	5/24/2006	Soil		Cursory	X	X	X	X		X														
KRY139BGW001	H06060298	6/27/2006	Water		Cursory	X	X	X	X		X														
KRY200QE001	H06070142	7/14/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY200SE001	H06070135	7/13/2006	Sediment		Full	X	X	X	X	X	X		X												
KRY200SW001	H06070135	7/13/2006	Water		Full	X	X	X	X		X		X												
KRY201SE001	H06070135	7/13/2006	Sediment		Full	X	X	X	X		X		X												
KRY201SW001	H06070135	7/13/2006	Water		Full	X	X	X	X		X		X												
KRY202SE001	H06070135	7/13/2006	Sediment		Full	X	X	X	X	X	X		X												
KRY202SW001	H06070135	7/13/2006	Water		Full	X	X	X	X		X		X												
KRY203SE001	H06070135	7/13/2006	Sediment		Full	X	X	X	X		X		X												
KRY203SW001	H06070135	7/13/2006	Water		Full	X	X	X	X		X		X												
KRY204SE001	H06070135	7/13/2006	Sediment		Full	X	X	X	X		X		X												
KRY204SW001	H06070135	7/13/2006	Water		Full	X	X	X	X		X		X												
KRY402SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X														

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KRY403QE001	1031364	4/26/2006	Water	ER	Cursory							X													
KRY403QE001	H06040225	4/26/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY403SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X														
KRY409SS001	1031219	4/24/2006	Soil		Cursory							X													
KRY409SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X														
KRY409SS002	1031219	4/24/2006	Soil		Cursory							X													
KRY409SS002	H06040202	4/24/2006	Soil		Cursory			X																	
KRY409SS003	1031219	4/24/2006	Soil		Cursory							X													
KRY409SS003	H06040202	4/24/2006	Soil		Cursory			X																	
KRY410QE001	1031219	4/24/2006	Water	ER	Cursory							X													
KRY410QE001	H06040202	4/24/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY410SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY411SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY412SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY414SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY415SS001	1031172	4/24/2006	Soil		Cursory							X													
KRY415SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X														
KRY415SS002	1031172	4/24/2006	Soil		Cursory							X													
KRY415SS002	H06040202	4/24/2006	Soil		Cursory			X																	
KRY415SS003	1031172	4/24/2006	Soil		Cursory							X													
KRY415SS003	H06040202	4/24/2006	Soil		Cursory			X					X						X	X	X				
KRY420SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY422SS001	1031219	4/24/2006	Soil		Cursory							X													
KRY422SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X						X	X	X				
KRY423SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X														
KRY424SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X														
KRY425SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X														
KRY426SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X														
KRY427SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X														
KRY428SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X														
KRY429SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY429SS002	1032190	5/11/2006	Soil		Cursory							X													
KRY429SS002	H06050161	5/11/2006	Soil		Cursory			X																	
KRY429SS003	1032190	5/11/2006	Soil		Cursory							X													
KRY429SS003	H06050161	5/11/2006	Soil		Cursory			X																	
KRY430QE001	1032190	5/11/2006	Water	ER	Cursory							X													
KRY430SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY430SS002	1032190	5/11/2006	Soil		Cursory							X													
KRY430SS002	H06050161	5/11/2006	Soil		Cursory			X																	
KRY430SS003	1032190	5/11/2006	Soil		Cursory							X													
KRY430SS003	H06050161	5/11/2006	Soil		Cursory			X																	
KRY432SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY433SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY436SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY437SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY438SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY439SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X		X												

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KRY440QE001	1031716	5/3/2006	Water	ER	Cursory							X													
KRY440QE001	H06050049	5/3/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY440SS001	1031716	5/3/2006	Soil		Cursory							X													
KRY440SS001	H06050049	5/3/2006	Soil		Cursory	X	X	X	X	X	X														
KRY440SS002	1031716	5/3/2006	Soil		Cursory							X													
KRY440SS002	H06050049	5/3/2006	Soil		Cursory			X																	
KRY442SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY443SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X		X														
KRY444SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY445SS001	H06050049	5/1/2006	Soil		Cursory	X	X	X	X		X		X												
KRY447SS001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X														
KRY451SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY452SS001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X		X														
KRY453SS001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X														
KRY454SS001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY455SS001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X														
KRY456SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY457SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY459SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY460SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY462SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X														
KRY463SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY464SS001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY465SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY466SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY471SS001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X														
KRY475QE001	H06050229	5/17/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY475SS001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X														
KRY477SS001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X														
KRY482SS001	1032190	5/10/2006	Soil		Cursory							X													
KRY482SS002	1032190	5/10/2006	Soil		Cursory							X													
KRY482SS002	H06050161	5/10/2006	Soil		Cursory			X																	
KRY482SS003	1032190	5/10/2006	Soil		Cursory							X													
KRY482SS003	H06050161	5/10/2006	Soil		Cursory			X																	
KRY483SS001	1033170	5/31/2006	Soil		Cursory							X													
KRY483SS001	H06060029	5/31/2006	Soil		Cursory	X	X	X	X		X														
KRY483SS002	1033170	5/31/2006	Soil		Cursory							X													
KRY483SS002	H06060029	5/31/2006	Soil		Cursory			X																	
KRY483SS003	1033170	5/31/2006	Soil		Cursory							X													
KRY483SS003	H06060029	5/31/2006	Soil		Cursory			X																	
KRY484SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY486SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY493SS001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X														
KRY499SS001	1032962	5/22/2006	Soil		Cursory							X													
KRY499SS001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X														
KRY501SS001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY502SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														

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KRY504SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														
KRY505SS001	1032459	5/16/2006	Soil		Cursory							X													
KRY505SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														
KRY507QE001	H06050205	5/15/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY514SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY515SS001	H06060029	5/31/2006	Soil		Cursory	X	X	X	X		X														
KRY549SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY550SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY551SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY552SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY553SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY554SS001	1032459	5/18/2006	Soil		Cursory							X													
KRY555SS001	1032459	5/16/2006	Soil		Cursory							X													
KRY556SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY557SS001	1032190	5/11/2006	Soil		Cursory							X													
KRY558QE001	1033170	5/31/2006	Water	ER	Cursory							X													
KRY558QE001	H06060029	5/31/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY558SS001	1033170	5/31/2006	Soil		Cursory							X													
KRY559SS001	1033170	6/2/2006	Soil		Cursory							X													
KRY560BKDSS001	H06070142	7/14/2006	Soil		Cursory	X	X	X	X		X		X												
KRY561BKDSS001	H06070142	7/14/2006	Soil		Cursory	X	X	X	X		X		X												
KRY562BKDSS001	H06070142	7/14/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY601SB001	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X														
KRY601SB002	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X														
KRY601SB003	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X														
KRY601SS001	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X														
KRY603SB001	1031364	4/26/2006	Soil		Cursory							X													
KRY603SB001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X		X												
KRY603SB002	1031364	4/26/2006	Soil		Cursory							X													
KRY603SB002	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X		X												
KRY603SB003	1031364	4/26/2006	Soil		Cursory							X													
KRY603SB003	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY603SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY604SB001	H06060029	6/2/2006	Soil		Cursory	X	X	X	X		X														
KRY605SB001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY605SS001	1031364	4/26/2006	Soil		Cursory							X													
KRY605SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY605SS002	1031364	4/26/2006	Soil		Cursory							X													
KRY605SS002	H06040225	4/26/2006	Soil		Cursory			X																	
KRY605SS003	1031364	4/26/2006	Soil		Cursory							X													
KRY605SS003	H06040225	4/26/2006	Soil		Cursory			X																	
KRY606SB001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY606SB003	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X		X												
KRY606SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X		X		X												
KRY607SB001	H06040170	4/21/2006	Soil		Cursory	X	X	X	X		X		X												
KRY607SB002	H06040170	4/21/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY607SS001	1031172	4/21/2006	Soil		Cursory							X													

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SAMPLE ID	SDG ID	Date Sampled	Matrix	QC ID	Validation	VOC	SVOC	PCP	VPH	EPH	TPH	D/F	Metals	Br	Cl	Form	pH	TOC	TCLP VOC	TCLP SVOC	TCLP Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY607SS001	H06040170	4/21/2006	Soil		Cursory	X	X	X	X	X	X														
KRY607SS002	1031172	4/21/2006	Soil		Cursory							X													
KRY607SS002	H06040170	4/21/2006	Soil		Cursory			X																	
KRY607SS003	1031172	4/21/2006	Soil		Cursory							X													
KRY607SS003	H06040170	4/21/2006	Soil		Cursory			X																	
KRY608QE001	H06050307	5/25/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY608SB001	H06050307	5/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY608SB002	H06050307	5/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY608SB003	H06050307	5/25/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY608SS001	H06050307	5/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY609SB001	H06050307	5/24/2006	Soil		Cursory	X	X	X	X		X		X												
KRY609SB002	H06050307	5/24/2006	Soil		Cursory	X	X	X	X		X		X												
KRY609SB003	H06050307	5/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY609SS001	H06050307	5/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY610SB001	1031219	4/24/2006	Soil		Cursory							X													
KRY610SB001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY610SB002	1031219	4/24/2006	Soil		Cursory							X													
KRY610SB002	H06040202	4/24/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY612QE001	1031172	4/21/2006	Water	ER	Cursory							X													
KRY612QE001	H06040170	4/21/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY612SB001	1031172	4/21/2006	Soil		Cursory							X													
KRY612SB001	H06040170	4/21/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY612SB002	1031172	4/21/2006	Soil		Cursory							X													
KRY612SB002	H06040170	4/21/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY616SB001	H06040167	4/19/2006	Soil		Cursory	X	X	X	X		X		X												
KRY616SB002	H06040167	4/19/2006	Soil		Cursory	X	X	X	X		X		X												
KRY616SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X		X												
KRY617SB001	H06040167	4/19/2006	Soil		Cursory	X	X	X	X		X		X												
KRY617SS001	H06040202	4/24/2006	Soil		Cursory	X	X	X	X		X														
KRY618SB001	H06040225	4/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY618SB002	H06040225	4/25/2006	Soil		Cursory	X	X	X	X		X		X												
KRY618SS001	H06040225	4/25/2006	Soil		Cursory	X	X	X	X	X	X														
KRY623SB002	H06050161	5/11/2006	Soil		Cursory	X	X	X	X		X		X												
KRY628SB001	1032459	5/12/2006	Soil		Cursory							X													
KRY628SB003	1032459	5/12/2006	Soil		Cursory							X													
KRY628SB004	1032459	5/12/2006	Soil		Cursory							X													
KRY628SS001	1032459	5/12/2006	Soil		Cursory							X													
KRY628SS002	1032459	5/12/2006	Soil		Cursory							X													
KRY628SS003	1032459	5/12/2006	Soil		Cursory							X													
KRY631SS001	H06050161	5/10/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY632SB001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X														
KRY632SS001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY633SB001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY633SB002	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY633SB003	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY633SS001	H06050229	5/17/2006	Soil		Cursory	X	X	X	X	X	X														
KRY634SB001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X		X												

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KRY634SB002	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY634SB003	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY634SS001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY635SB001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY635SB002	H06050109	5/8/2006	Soil		Cursory	X	X	X	X		X		X												
KRY635SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY636QE001	1032190	5/9/2006	Water	ER	Cursory							X													
KRY636QE001	H06050109	5/9/2006	Water	ER	Cursory	X	X	X	X	X	X		X												
KRY636SB001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY636SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY637SB001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY637SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY638SB001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY638SB002	H06050109	5/8/2006	Soil		Cursory	X	X	X	X		X		X												
KRY638SB003	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY638SS001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY639SB001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X		X														
KRY639SS001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X	X	X														
KRY640SB001	H06050109	5/8/2006	Soil		Cursory	X	X	X	X		X														
KRY640SS001	H06040225	4/26/2006	Soil		Cursory	X	X	X	X	X	X														
KRY651SB001	H06050229	5/18/2006	Soil		Cursory	X	X	X	X	X	X														
KRY653SS001	H06050109	5/9/2006	Soil		Cursory	X	X	X	X	X	X														
KRY656SB001	1032459	5/15/2006	Soil		Cursory							X													
KRY656SB002	1032459	5/15/2006	Soil		Cursory							X													
KRY656SB003	1032459	5/15/2006	Soil		Cursory							X													
KRY657SB001	H06050205	5/15/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY657SB002	H06050205	5/15/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY657SB003	H06050205	5/15/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY657SS001	H06050205	5/15/2006	Soil		Cursory	X	X	X	X	X	X														
KRY657SS002	H06050205	5/15/2006	Soil		Cursory								X									X	X	X	X
KRY658SB001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X		X		X												
KRY658SB002	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY658SB003	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY658SB004	H06050205	5/16/2006	Soil		Cursory								X									X	X	X	X
KRY658SS001	1032459	5/16/2006	Soil		Cursory							X													
KRY658SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														
KRY659SB001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY659SB002	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY659SB003	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY659SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														
KRY660QE001	H06050262	5/23/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY660SB001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X		X		X												
KRY660SB002	H06050262	5/22/2006	Soil		Cursory	X	X	X	X		X		X												
KRY660SB003	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY660SS001	H06050262	5/22/2006	Soil		Cursory	X	X	X	X	X	X														
KRY662QE001	H06050205	5/16/2006	Water	ER	Cursory	X	X	X	X		X		X												
KRY662SB001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												

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KRY662SB002	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY662SB003	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY662SS001	1032459	5/16/2006	Soil		Cursory							X													
KRY662SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														
KRY663SB001	H06050205	5/17/2006	Soil		Cursory	X	X	X	X		X		X												
KRY663SB002	H06050205	5/17/2006	Soil		Cursory	X	X	X	X		X		X												
KRY663SB003	H06050205	5/17/2006	Soil		Cursory	X	X	X	X	X			X												
KRY663SS001	H06050205	5/17/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY664SB001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X		X		X												
KRY664SB002	H06050205	5/16/2006	Soil		Cursory	X	X	X	X		X		X												
KRY664SB003	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY664SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY665SB001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X		X		X												
KRY665SB002	H06050205	5/16/2006	Soil		Cursory	X	X	X	X		X		X												
KRY665SB003	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY665SS001	H06050205	5/16/2006	Soil		Cursory	X	X	X	X	X	X														
KRY666SB001	1031364	4/27/2006	Soil		Cursory							X													
KRY666SB001	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X		X												
KRY666SB002	1031364	4/27/2006	Soil		Cursory							X													
KRY666SB002	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X		X												
KRY666SB003	H06040225	4/27/2006	Soil		Cursory	X	X	X	X		X		X												
KRY666SS001	H06040225	4/27/2006	Soil		Cursory	X	X	X	X	X	X		X												
KRY667SB001	H06060029	6/1/2006	Soil		Cursory	X	X	X	X		X														
KRY667SB002	H06060029	6/1/2006	Soil		Cursory	X	X	X	X	X	X														
KRY669SB001	H06060029	6/1/2006	Soil		Cursory								X				X					X	X	X	X
KRY670SB001	H06060029	6/1/2006	Soil		Cursory	X	X	X	X		X		X												
KRY670SB002	H06060029	6/1/2006	Soil		Cursory	X	X	X	X		X		X												
KRY672SB001	H06060064	6/2/2006	Soil		Cursory	X	X	X	X		X														
KRY672SB002	H06060064	6/2/2006	Soil		Cursory	X	X	X	X		X														
KRY672SB003	H06060064	6/2/2006	Soil		Cursory	X	X	X	X	X	X														
KRY900QS001	H06040167	4/19/2006	Water	SW	Full	X	X	X	X		X	X	X	X	X	X									
KRY901QS001	H06040202	4/24/2006	Water	SW	Cursory	X	X	X	X		X	X	X	X	X	X									
KRY902QS001	H06050109	5/9/2006	Water	SW	Cursory	X	X	X	X	X	X	X	X												
KRYCLCW1GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X														
KRYGW14GW701	1035023	7/6/2006	Water		Cursory							X													
KRYGW1GW001	H06060263	6/22/2006	Water		Cursory	X	X	X	X		X														
KRYGW5GW001	H06060298	6/27/2006	Water		Cursory	X	X	X	X		X														
KRYGWRM1GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWRM2GW002	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWRR1GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWRR2GW001	1035023	7/5/2006	Water		Cursory							X													
KRYGWRR2GW001	H06070055	7/5/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYGWRR3GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWRR4GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X		X														
KRYGWRR4QE001	H06060349	6/29/2006	Water	ER	Cursory	X	X	X	X		X														
KRYGWRR5GW001	1035023	7/5/2006	Water		Cursory							X													
KRYGWRR5GW001	H06070055	7/5/2006	Water		Cursory	X	X	X	X		X		X												

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KRYGWRR6GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWRR7GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYGWRR8GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X		X														
KRYGWRR9GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYGWY10GW001	1035023	7/6/2006	Water		Cursory							X													
KRYGWY10GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X		X		X												
KRYGWY10QE001	1035023	7/7/2006	Water	ER	Cursory							X													
KRYGWY12GW001	H06070055	7/7/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWY13GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X														
KRYGWY14GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X		X		X												
KRYGWY3GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X		X														
KRYGWY4GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYIW1GW001	H06060247	6/21/2006	Water		Cursory	X	X	X	X	X	X														
KRYIW2GW001	H06060247	6/21/2006	Water		Cursory	X	X	X	X		X														
KRYIW4GW001	H06060247	6/22/2006	Water		Cursory	X	X	X	X		X														
KRYIW5GW001	H06060247	6/21/2006	Water		Cursory	X	X	X	X		X														
KRYIW6GW001	H06060247	6/21/2006	Water		Cursory	X	X	X	X		X														
KRYIW7GW001	H06060247	6/22/2006	Water		Cursory	X	X	X	X		X														
KRYIW8GW001	H06060247	6/22/2006	Water		Cursory	X	X	X	X		X														
KRYKPT10GW001	H06060298	6/27/2006	Water		Cursory	X	X	X	X		X														
KRYKPT11GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYKPT12GW001	H06060298	6/23/2006	Water		Cursory	X	X	X	X		X														
KRYKPT13GW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYKPT14GW001	H06060298	6/27/2006	Water		Cursory	X	X	X	X		X														
KRYKPT15GW001	1034582	6/28/2006	Water		Cursory							X													
KRYKPT15GW001	H06060298	6/28/2006	Water		Cursory	X	X	X	X		X		X												
KRYKPT15GW701	1034582	6/28/2006	Water	FD	Cursory							X													
KRYKPT16GW001	H06060263	6/23/2006	Water		Cursory	X	X	X	X		X														
KRYKPT16GW701	H06060263	6/23/2006	Water	FD	Cursory	X	X	X	X		X														
KRYKPT17GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X	X	X														
KRYKPT18GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X	X	X														
KRYKPT19GW001	H06060332	6/27/2006	Water		Cursory	X	X	X	X	X	X														
KRYKPT1GW001	1034582	6/22/2006	Water		Cursory							X													
KRYKPT1GW001	H06060263	6/22/2006	Water		Cursory	X	X	X	X		X		X												
KRYKPT20GW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X	X	X														
KRYKPT20GW701	H06060332	6/28/2006	Water	FD	Cursory	X	X	X	X	X	X														
KRYKPT21GW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X	X	X														
KRYKPT22GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYKPT2GW001	1035023	6/28/2006	Water		Cursory							X													
KRYKPT2GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYKPT3GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYKPT3GW002	1036399	8/3/2006	Water		Cursory							X													
KRYKPT4GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X	X	X														
KRYKPT5GW001	H06060263	6/23/2006	Water		Cursory	X	X	X	X		X														
KRYKPT6GW001	H06060298	6/23/2006	Water		Cursory	X	X	X	X		X														
KRYKPT7GW001	H06060263	6/23/2006	Water		Cursory	X	X	X	X		X		X		X	X									
KRYKPT8GW001	H06060263	6/23/2006	Water		Cursory	X	X	X	X		X		X		X	X									

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KRY REMEDIAL INVESTIGATION

SAMPLE ID	SDG ID	Date Sampled	Matrix	QC ID	Validation	VOC	SVOC	PCP	VPH	EPH	TPH	D/F	Metals	Br	Cl	Form	pH	TOC	TCLP VOC	TCLP SVOC	TCLP Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRYKPT9GW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYNTLMW4GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X		X														
KRYNTLMW4QE001	H06060349	6/29/2006	Water	ER	Cursory	X	X	X	X		X														
KRYPW1GW001	1035023	7/7/2006	Water		Cursory							X													
KRYPW1GW001	H06070055	7/7/2006	Water		Cursory	X	X	X	X	X	X		X												
KRYPW3GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X		X														
KRYPWS1GW001	H06060332	6/27/2006	Water		Cursory	X	X	X	X		X														
KRYPWS2GW001	H06060332	6/27/2006	Water		Cursory	X	X	X	X		X														
KRYRW10GW001	H06070055	7/6/2006	Water		Cursory	X	X	X	X		X														
KRYRW11GW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYRW11GW701	H06060332	6/28/2006	Water	FD	Cursory	X	X	X	X		X														
KRYRW12GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYRW13GW001	H06070055	7/7/2006	Water		Cursory	X	X	X	X		X														
KRYRW1GW001	H06060349	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYRW6GW 001	H06060349	6/29/2006	Water		Cursory	X	X	X	X		X														
KRYRW8GW001	H06060332	6/28/2006	Water		Cursory	X	X	X	X		X														
KRYRW9AGW001	H06060298	6/27/2006	Water		Cursory	X	X	X	X		X														
KRYRW9GW001	H06060298	6/23/2006	Water		Cursory	X	X	X	X		X														
KRYSW9GW001	H06060349	6/29/2006	Water		Cursory	X	X	X	X		X														
KRYSW9GW701	H06060349	6/29/2006	Water	FD	Cursory	X	X	X	X		X														

Notes:

Br = Bromide
Cl = Chloride
D/F = Dioxins and furans
EPH = Extractable petroleum hydrocarbons
ER = Equipment rinsate
FD = Field duplicate
Form = Formaldehyde
PCP = Pentachlorophenol
QC = Quality control
SPLP = Synthetic precipitation leaching procedure
SVOC = Semivolatile organic compound
SW = Source water
TCLP = Toxicity characteristic leaching procedure
TOC = Total organic carbon
TPH = Total petroleum hydrocarbon
VOC = Volatile organic compound
VPH = Volatile petroleum hydrocarbon

TABLE 2
DATA VALIDATION CRITERIA
DATA VALIDATION SUMMARY REPORT
KRY REMEDIAL INVESTIGATION

Analytical Parameter Group	Cursory Data Validation Criteria	Full Data Validation Criteria
Organic Analyses	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Surrogate recovery Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Internal standard performance Field duplicate sample analysis Compound identification Detection limits Compound quantitation Sample results verification Other laboratory QC specified by the method Overall assessment of data for an SDG
Analytical Parameter Group	**Cursory Data Validation Criteria**	**Full Data Validation Criteria**
Inorganic and Physical Analyses	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample or blank spike Field duplicate sample analysis Other laboratory QC specified by the method Overall assessment of data for an SDG	Method compliance Holding times Calibration Blanks Matrix spike and matrix spike duplicate recovery Laboratory control sample Field duplicate sample analysis Other laboratory QC specified by the method Detection limits Analyte identification Analyte quantitation Sample results verification Overall assessment of data for an SDG

Notes:

SDG Sample Delivery Group
QC Quality Control

TABLE 3
DATA VALIDATION QUALIFIERS
DATA VALIDATION SUMMARY REPORT
KRY REMEDIAL INVESTIGATION

Validation Qualifier	Definition
U	The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ	The analyte was analyzed for, but was not detected. The reported sample quantitation limit is approximate and may be inaccurate or imprecise.
J	The result is an estimated quantity. The associated numerical value is an approximate concentration of the analyte in the sample.
R	The sample result is rejected and unusable due to serious deficiencies in meeting quality control criteria. The analyte may or may not be present in the sample.

TABLE 4
HOLDING TIME CRITERIA
DATA VALIDATION SUMMARY REPORT
KRY REMEDIAL INVESTIGATION

Parameter	Aqueous Matrix	Soil/Sediment Matrix
Volatile organic compounds	14 days	14 days
Semivolatile organic compounds	7 days/40 days	14 days/40 days
Pentachlorophenol	7 days/40 days	14 days/40 days
Volatile petroleum hydrocarbons	14 days	28 days
Extractable petroleum hydrocarbons	14 days/40 days	14 days/40 days
Polychlorinated biphenyls	Not applicable	14 days/40 days
Dioxins and furans	30 days/45 days	30 days/45 days
Total metals (except mercury)	180 days	180 days
Total mercury	28 days	28 days
Bromate	28 days	28 days
Chlorine	28 days	28 days
Formaldehyde	Not specified	Not specified
pH	As soon as possible	As soon as possible
Total organic carbon	28 days	28 days
Toxicity leaching procedure	Not applicable	14 days
Synthetic precipitation leaching procedure	Not applicable	14 days

TABLE 5
REJECTED RESULTS
DATA VALIDATION SUMMARY REPORT
KRY REMEDIAL INVESTIGATION

SDG Number	Analyte	Associated Samples
H06040202	Antimony	KRY123ASB002, KRY422SS001, KRY420SS001 KRY616SS001, KRY412SS001, KRY411SS001 KRY136SB001, KRY136SB002, KRY136SB003 KRY610SB001, KRY610SB002, KRY410SS001
H06050109	Benzoic acid	KRY636QE001
	Tin	KRY638SB001, KRY638SB002, KRY638SB003 KRY635SB001, KRY635SB002
H06050161	Benzoic acid	KRY403QE001
	Antimony	KRY631SS001, KRY623SB001, KRY623SB002
H06050176	Antimony	KRY628SB001, KRY628SB002, KRY628SB003 KRY656SS001, KTY656SB001, KTY656SB002 KTY656SB003
H06050205	Benzoic acid	KRY507QE001, KRY662QE001
H06050229	Benzoic acid	KRY475SS001, KRY475QE001
H06050262	Tetraethyllead	KRY501ASS001
H06050307	Tetraethyllead	KRY139ASB001, KRY129ASB001, KRY609SS001 KRY609SB001, KRY609SB002, KRY609SB003 KRY608SS001, KRY608SB001, KRY608SB002 KRY608SB003, KRY126ASS001, KRY126ASB001 KRY126ASB002
H06050307	Antimony	KRY609SS001, KRY609SB001, KRY609SB002 KRY609SB003, KRY608SS001, KRY608SB002 KRY608SB003, KRY126ASS001, KRY126ASB001 KRY126ASB002
H06060128	Benzoic acid	KRY102AGW001, KRY102AGW701, KRY102BGW001 KRY115AGW001, KRY115BGW001
H06060145	Benzoic acid	KRY104AGW001, KRY112AGW001, KRY112BGW001 KRY116AGW001
H06060173	Benzoic acid	KRY116BGW001, KRY101AGW001, KRY101BGW001 KRY103BGW001, KRY100AGW001, KRY110AGW001 KRY103AGW001, KRY106BGW001, KRY106AGW001 KRY105AGW001, KRY110BGW001, KRY107BGW001 KRY107AGW001, KRY111BGW001, KRY111AGW001 KRY111AQE001, KRY109AGW001
H06060219	Benzoic acid	KRY121AGW001, KRY121AGW701, KRY130AGW001 KRY123AGW001, KRY127AGW001, KRY126AGW001
H06060247	Benzoic acid	KRYIW5GW001, KRYIW6GW001, KRYIW1GW001 KRYIW2GW001, KRY129BGW001, KRYIW4GW001 KRYIW7GW001, KRYIW8GW001, KRY113BGW001 KRY113AGW001
H06060263	Benzoic acid	KRY130BGW001, KRYGW1GW001, KRY108AGW001 KRYKPT1GW001, KRYKPT7GW001, KRYKPT8GW001 KRYKPT5GW001, KRYKPT16GW001, KRYKPT16GW701
H06060298	Benzoic acid	KRYKPT6GW001, KRYKPT12GW001, KRYRW9GW001 KRYRW9AGW001, KRY139BGW001, KRY139AGW001 KRY125BGW001, KRY125AGW001, KRY122AGW001 KRYGW5GW001, KRYKPT10GW001, KRYKPT14GW001 KRYKPT15GW001, KRY125AQE001, KRY122AQE001

TABLE 5 (continued)
REJECTED RESULTS
DATA VALIDATION SUMMARY REPORT
KRY REMEDIAL INVESTIGATION

SDG Number	Analyte	Associated Samples
H06060332	Benzoic acid	KPT19GW001, KRY129AGW001, KRYPWS2GW001 KRYPWS1GW001, KRY128AGW001, KRY122BGW001 KRY121BGW001, KRYRW11GW001, KRYRW11GW701 KRYRW8GW001, KRYKPT20GW001, KRYKPT20GW701 KRYKPT21GW001, KRYKPT21GW001, KRYKPT13GW001 KRYKPT9GW001
H06060349	Benzoic acid	KRYKPT4GW001, KRYKPT3GW001, KRYKPT2GW001 KRY128BGW001, KRYKPT11GW001, KRYKPT18GW001 KRYRW1GW001, KRYRW12GW001, KRYSW9GW001 KRYSW9GW701, KRYPW3GW001, KRYKPT22GW001 KRYGWRR8GW001, KRY114AGW001, KRYGWRR4GW001 KRYGWRR1GW001, KRYKPT17GW001, KRYNTLMW4GW001 KRYRW6GW001, KRY121BQE001, KRYGWRR4QE001 KRYNTLMW4QE001
H06070055	Benzoic acid	KRY118AGW001, KRY118BGW001, KRY114BGW001 KRYGWY13GW001, KRYCLCW1GW001, KRYRW10GW001 KRYGWY14GW001, KRYGWY3GW001, KRYGWY4GW001 KRYGWY12GW001, KRYGWRR2GW001, KRYGWRR5GW001 KRYGWRR6GW001, KRYGWRR3GW001, KRYGWRR7GW001 KRYGWRR9GW001, KRYGWY10GW001, KRYGWRM1GW001 KRYGWRM2GW002, KRYPW1GW001, KRYRW13GW001
H06070135	Zinc	KRY200SW01, KRY201SW001, KRY203SW001, KRY204SW001

Notes:

SDG Sample delivery group

APPENDIX A

KALISPELL POLE AND TIMBER, RELIANCE REFINERY, AND YALE OIL FACILITIES
REMEDIAL INVESTIGATION GROUNDWATER ANALYTICAL DATABASE
APRIL THROUGH JULY 2006

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06070142
Sample Numbers:	KRY200QE001, KRY560BKDSS001, KRY561BKDSS001, KRY562BKDSS001, and One Trip Blank
Matrix:	Three Background Surface Soil Samples, One Equipment Rinsate Sample, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	12 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06070142

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	METALS
KRY200QE001	Water	07/14/06	X	X	X	X	X	X
KRY560BKDSS001	Soil	07/14/06	X	X	X	X	X	X
KRY561BKDSS001	Soil	07/14/06	X	X	X	X	X	X
KRY562BKDSS001	Soil	07/14/06	X	X	X	X	X	X
Trip Blank	Water	07/14/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation

Reported detection limits
Sample result verification
Tentatively identified compounds (TICs)
System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
Other method-specific QC measures
Graphite furnace atomic absorption QC measures
Analyte identification
Analyte quantitation
Reported detection limits
Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With one exception, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. The exception was acrolein in the continuing calibration performed on 25 July 2006 at 1131, which yielded a recovery of 142 percent versus QC limits of 75 to 125 percent. Acrolein was not detected in any of the associated samples, so no qualifications were applied.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes. The equipment rinsate blank contained low concentrations of the common laboratory contaminants acetone and methyl ethyl ketone (2-butanone) and a trace concentration (less than 1 microgram per liter) of the trihalomethane chloroform, which is often found in chlorinated drinking water. No qualifications were made on the basis of equipment rinsate contamination.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. Although a number of irregularities were observed, no qualifications were warranted based on a sample collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Almost all recoveries were within QC limits. The exception was chloroethane in the LCS analyzed on 25 July 2006 at 1228, which yielded a recovery of 23 percent versus laboratory-specified QC limits of 45 to 139 percent. The following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- Chloroethane in samples KRY560BKDSS001, KRY561BKDSS001, and KRY562BKDSS001.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exceptions were some QC samples (method blank, LCS) with the recovery of only one surrogate outside the QC limits. No qualifications are required when only one SVOC surrogate is outside of QC limits or for field samples associated with QC samples with surrogate irregularities.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on soil samples collected from another site and on soil sample KRY560BKDSS001 for the SIM analytes, as well as all aqueous analytes on samples collected from another site. All of the recoveries and RPD for the SIM analytes were within QC limits. Irregular recoveries were observed for 4-bromophenyl phenyl ether in MS/MSD analyses performed on soil samples collected from another site. No qualifications were applied based on these irregularities.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within their QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No other problems were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exceptions involved surrogate recoveries in the MS/MSD analyses prepared from a sample in another SDG. Therefore, no qualifications were applied to the samples in this data package.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample from another SDG. All recoveries of analytes and all RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY561BKDSS001 and an aqueous sample collected from another site. All results were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

Almost all of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. No problems were observed with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Method blanks were analyzed as required and contained trace concentrations of several analytes. The accompanying samples were either not detected or contained much higher concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples collected from another site. Recoveries of a few analytes (manganese in the aqueous sample, aluminum and iron in the soil sample) could not be determined because the unspiked sample contained much higher concentrations than the spike. A few irregular recoveries were also observed in the soil MS/MSD analyses involving the usual problem metals such as antimony and selenium. All other recoveries and all RPDs were within their QC limits. No qualifications are warranted for these minor irregularities in samples collected from another site.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Overall Assessment of the SDB

No significant irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06070135
Sample Numbers:	KRY204SW001, KRY204SE001, KRY203SW001, KRY203SE001, KRY202SW001, KRY202SE001, KRY201SW001, KRY201SE001, KRY200SW001, KRY200SE001, and One Trip Blank
Matrix:	Five Surface Water Samples, Five Sediment Samples, and One Trip Blank
QA Level:	Full validation on this SDG
Report Date:	15 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06070135

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	METALS
KRY204SW001	Water	07/13/06	X	X	X	X	X	X
KRY204SE001	Sediment	07/13/06	X	X	X	X	X	X
KRY203SW001	Water	07/13/06	X	X	X	X	X	X
KRY203SE001	Sediment	07/13/06	X	X	X	X	X	X
KRY202SW001	Water	07/13/06	X	X	X	X	X	X
KRY202SE001	Sediment	07/13/06	X	X	X	X	X	X
KRY201SW001	Water	07/13/06	X	X	X	X	X	X
KRY201SE001	Sediment	07/13/06	X	X	X	X	X	X
KRY200SW001	Water	07/13/06	X	X	X	X	X	X
KRY200SE001	Sediment	07/13/06	X	X	X	X	X	X
Trip Blank	Water	07/13/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

<u>Organic Analyses</u>

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance

* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.

R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

The data package included all materials required for full validation.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. The initial calibration for the instrument used for the sediment samples gave fully satisfactory results. The first initial calibration for the instrument used for the water samples gave acceptable results for all analytes except methylene chloride, which yielded a relative standard deviation (RSD) of 40 percent, versus the QC limit of 30 percent. The aberrant standards (the lower concentration ones) were re-analyzed and the final initial calibration yielded a 5.2 percent RSD for methylene chloride, so no qualifications are required.

With one exception, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. The exception was acrolein in the continuing calibration performed on 25 July 2006 at 1131, which yielded a recovery of 142 percent versus QC limits of 75 to 125 percent. Acrolein was not detected in any of the associated samples, so no qualifications were applied.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes. The associated equipment rinsate blank (sample KRY200QE001) was analyzed in a different SDG and is therefore discussed in a separate report.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

All internal standard recoveries were within the QC limits of 50 to 200 percent of the recovery from the preceding continuing calibration standard. Relative retention times (RRT) were within plus or minus 30 seconds of the retention times for that preceding continuing calibration standard.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY204SW001 (water) and KRY200SE001 (sediment). In the water MS/MSD analyses, chloromethane yielded recoveries of 58 and 98 percent, versus laboratory-specified QC limits of 63 to 149 percent. Because the average recovery was within the QC limits, no qualifications were applied. In the sediment MS/MSD analyses, chloroethane yielded recoveries of 17 and 16 percent, versus laboratory-specified QC limits of 45 to 139 percent. Therefore, the following result was flagged "UJ" to indicate that the sample quantitation limit is considered estimated and may be biased low:

- Chloroethane in samples KRY200SE001

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. Almost all recoveries were within QC limits. The exception was chloroethane in the solid-phase LCS analyzed on 25 July 2006 at 1228, which yielded a recovery of 23 percent versus laboratory-specified QC limits of 45 to 139 percent. The following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- Chloroethane in samples KRY204SE001, KRY203SE001, KRY202SE001, KRY201SE001, and KRY200SE001.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Compound Identification

No analytes were detected in the samples, so no mass spectra were included in the data package. The analytes in the spiked samples (LCS and MS/MSD samples) were properly identified by RRT and the instruments' verification software.

Compound Quantitation

The numerical results for a few analytes in the spiked samples were checked and were found to have been quantitated in accordance with the method procedures and the actual sample amounts purged. Sediment reporting limits were corrected to dry-weight basis.

Reported Detection Limits

Sample reporting limits were compatible with the laboratory-required reporting limits (LRRL) in Appendix D of the SAP.

Sample Result Verification

The calculated results for a few MS/MSD analytes in each medium (water and sediment) were verified.

Tentatively Identified Compounds (TICs)

The laboratory did not report TICs in these analyses.

System Performance

The performance of each instrument was verified with bromofluorobenzene before any other samples were analyzed. There was no evidence of significant deterioration of performance during the instrument runs.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

The data package included all materials required for full validation. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 day (water) and 14 days (solid) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. The initial calibration for the ordinary (non-SIM) analytes yielded an excessive RSD (42 percent, versus QC limit of 30 percent) for benzo(b)fluoranthene. Because benzo(b)fluoranthene was quantitated by SIM analysis, which yielded a fully acceptable initial calibration, no qualifications are warranted. On the continuing calibrations, all of the %Ds were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exceptions were some QC samples (method blank and LCS) that yielded one surrogate recovery in each sample outside the QC limits. No qualifications are required when only one SVOC surrogate is outside of QC limits, and none are required for field samples when a QC sample has surrogate irregularities.

Internal Standard Performance

All internal standard recoveries were within the QC limits of 50 to 200 percent of the recovery from the preceding continuing calibration standard. Relative retention times (RRT) were within plus or minus 30 seconds of the retention times for that preceding continuing calibration standard.

Matrix Spike/Matrix Spike Duplicate Performance

Aqueous MS/MSD analyses were performed on samples KRY203SW001 and KRY201SW001 (SIM analytes). All recoveries were within QC limits, but excessive RPDs were exhibited for diethyl phthalate (48 percent, versus laboratory-specified QC limit of 40 percent) and hexachlorobutadiene (41 percent, versus the same QC limit). Neither compound was detected in the samples, so no qualifications were applied.

Solid phase MS/MSD analyses were performed on sample KRY200SE001 and a sample collected from another site (SIM analytes). All RPDs were within QC limits in sample KRY200SE001, but the recoveries for 4-bromophenyl phenyl ether were 120 and 105

percent, versus laboratory-specified QC limits of 62 to 111 percent. Again, the compound was not detected in any sample, so no qualifications were applied.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within their QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No other problems were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Compound Identification

The mass spectra of the detected analytes were good matches to the reference spectra and RRTs met acceptance criteria.

Compound Quantitation

The numerical results for the few positive results were checked and found to be correctly quantitated in accordance with the method procedures and the actual sample amounts extracted. Sediment sample results were corrected to a dry-weight basis, which was quite significant for one relatively wet sample, KRY204SE001, about 50 percent water.

Reported Detection Limits

Sample reporting limits were compatible with the LRRLs in Appendix D of the SAP.

Sample Result Verification

The calculated results for some of the positive results were verified.

Tentatively Identified Compounds (TICs)

The laboratory did not report TICs in these analyses.

System Performance

The performance of the instrument was verified with decafluorotriphenylphosphine before other samples were analyzed. There was no evidence of significant deterioration of performance during the instrument runs.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

The data package included all materials required for full validation.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. All initial calibration results had RSDs well within the QC limit of 25 percent. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most of the surrogate recoveries were within QC limits. The exceptions involved the sediment samples. Specifically, recoveries of the aliphatic surrogate were somewhat below QC limits of 70 to 130 percent in samples KRY204SE001 (68 percent), KRY202SE001 (65 percent), KRY201SE001 (61 percent), and KRY200SE001 (68 percent). In addition, the recovery of the aromatic surrogate from sample KRY201SE001 was 66 percent versus QC limits of 70 to 130 percent. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated and may be biased low:

- C5-C8 Aliphatics, C9-C12 aliphatics, and methyl tert-butyl ether in samples KRY204SE001, KRY202SE001, and KRY200SE001

- All VPH analytes in sample KRY201SE001.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY204SW001 and KRY200SE001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed.

Compound Identification

Two positive results were correctly identified by retention times. Neither result (both for toluene) was confirmed by the VOC analysis. These results were not confirmed by VOC analysis, because both results for the VPH analysis were detected below the reporting limits for the VOC analysis. However, the possibility for false positives may exist.

Compound Quantitation

The results were correctly quantitated in accordance with the method, the actual sample amounts purged, and corrections to a dry-weight basis (for the sediment samples).

Reported Detection Limits

The sample reporting limits are compatible with the LRRLs in Appendix D of the SAP.

Sample Result Verification

The calculated results for toluene in two sediment samples were verified.

System Performance

Chromatographic resolution was adequate for the VPH analyses. There was no evidence of significant deterioration of performance during the analytical runs.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

The data package included all materials required for full validation.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. All initial calibration results were well within the method-specified QC limit of 25 percent for RSDs. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. All results were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Compound Identification

The few positive results were properly identified by retention times.

Compound Quantitation

The positive results were properly quantified in accordance with the method, the sample amounts extracted, and the percent moisture (for sediments).

Reported Detection Limits

Sample reporting limits were compatible with the LRRLs in Appendix D of the SAP.

Sample Result Verification

The calculated results for a few positive results were verified.

System Performance

Chromatographic resolution was adequate for the EPH analyses. There was no evidence of significant deterioration of performance during the analytical runs.

Overall Assessment of This SDG

Many of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

The data package included all materials for full review.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (solid) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. The initial calibration yielded a coefficient of determination greater than 0.999, well above the method requirement of greater than 0.99. The %Ds in the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analyte.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY202SW001 and KRY200SE001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Compound Identification

Pentachlorophenol was not detected in any of the field samples. Pentachlorophenol was properly identified by RRT in the spiked samples (LCS and MS/MSD samples).

Compound Quantitation

The numerical results for spiked samples were quantified in accordance with the method procedures and actual sample amounts extracted. Sediment sample reporting limits were corrected to a dry-weight basis.

Reported Detection Limits

Sample reporting limits were compatible with the LRRLs specified in Appendix D of the SAP.

Sample Result Verification

The calculated results for the MS/MSD samples were verified.

System Performance

Resolution was adequate for the pentachlorophenol analyses. There was no evidence of significant deterioration of performance during the analytical runs.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

The data package contained all materials required for full validation.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

Calibrations were performed at the appropriate intervals with the appropriate standard solutions. Almost all calibration results were within QC limits. The exceptions involved the low-concentration standards (called "CRI standards") in the aqueous analyses. Method 200.7 CRI standards yielded recoveries of 173 percent for silver and 28 percent for zinc, versus QC limits of 50 to 130 percent. None of the aqueous samples contained silver, so no qualifications were applied for this irregularity. Because the zinc recovery was less than 30 percent, the following nondetected results were flagged "R" to indicate that they are considered rejected, that zinc may or may not be present at levels near the sample quantitation limit:

- Zinc in samples KRY204SW001, KRY203SW001, KRY201SW001, and KRY200SW001

The method 200.8 CRI standard yielded a recovery of 161 percent for aluminum versus QC limits of 50 to 130 percent. Therefore, the following results were flagged "J" to indicate that they are considered estimated because of the uncertainty of results near the detection limit of the instrument:

- Aluminum in samples KRY204SW001, KRY203SW001, and KRY202SW001

Blanks

Method blanks were analyzed as required and contained trace concentrations of several analytes. The accompanying samples were either nondetected or contained much higher concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on aqueous samples collected from another site and on sample KRY200SE001. All aqueous results were acceptable. Recoveries of aluminum and iron in sediment sample KRY200SE001 could not be determined because the unspiked sample results were much higher than the spike concentrations. No qualifications are warranted for this data gap. However, antimony yielded recoveries of 43 and 43 percent, manganese yielded recoveries of 66 and 74 percent, selenium yielded recoveries of 69 and 67 percent, and silver yielded recoveries of 74 and 74 percent, all versus QC limits of 75 to 125 percent. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that the results are considered estimated and may be biased low because of apparent matrix interference:

- Antimony, manganese, selenium, and silver in samples KRY204SE001, KRY203SE001, KRY202SE001, KRY201SE001, and KRY200SE001.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

The aqueous ICP serial dilution results were unusable because the sample (collected from another site) contained such low concentrations of the analytes. No soil or sediment ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

Almost all ICP interference check sample (ICS) results were within QC limits of 80 to 120 percent. The exception was the aluminum recovery of 73 percent in the ICS analyzed with the Method 200.8 CRI sample. Because associated results were previously qualified for the CRI irregularity, no further qualifications are warranted.

Graphite Furnace Atomic Absorption QC Measures

No graphite furnace atomic absorption methods were used in these analyses.

Analyte Identification

The instruments provided two or three choices (emission lines or masses) for most analytes. The laboratory consistently made the same choice for all measurements.

Analyte quantitation

The numerical results for a few results by each method were checked and were found to have been quantitated in accordance with the method procedures and the actual sample amounts digested. Sediment results were corrected to dry weight.

Reported Detection Limits

All of the soil detection limits and some of the aqueous reporting limits were at or below the LRRLs specified in Appendix D of the SAP. However, quite a few of the metals, especially those analyzed by Method 200.7, yielded reporting limits above the LRRLs. The laboratory was inconsistent when reporting metals results. The same metal was reported by Method 200.7 in some samples and Method 200.8 (which gives lower reporting limits and generally met the specified LRRLs) in other samples. The following metals yielded nondetected results at reporting limits above the LRRLs:

- Barium, with an actual reporting limit of 100 micrograms per liter (µg/L) and an LRRL of 5 µg/L.
- Chromium, with an actual reporting limit of 10 µg/L and an LRRL of 1 µg/L.
- Copper, with an actual reporting limit of 10 µg/L and an LRRL of 1 µg/L.
- Lead, with an actual reporting limit of 10 µg/L and an LRRL of 0.5 µg/L.
- Vanadium, with an actual reporting limit of 100 µg/L and an LRRL of 10 µg/L.

In some cases, the Method 200.8 reporting limits were also above the LRRLs. In that same sample, this applies to the following nondetected results:

- Arsenic, with an actual reporting limit of 5 µg/L and an LRRL of 1 µg/L.
- Thallium, with an actual reporting limit of 5 µg/L and an LRRL of 0.2 µg/L.

Sample Result Verification

The calculated results for a few analytes in each method and matrix (LCS results for mercury, because all field sample results were nondetected) were verified.

Overall Assessment of the SDG

One significant procedural irregularity was observed in these analyses, which also applies to aqueous metals results from other data packages. Sample reporting limits for a number of metals in all or most aqueous samples were higher than the LRRLs.

The only significant technical irregularity observed in these analyses involved low concentrations of zinc from aqueous samples (the Method 200.7 CRI standard). Therefore, the associated non-detected results were rejected. The remaining results may be used, as qualified, for the purposes stated in the workplan, with due note of the reporting limit issues.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06070055
Sample Numbers:	KRY118AGW001, KRY118BGW001, KRY114BGW001, KRYGWY13GW001, KRYCLCW1GW001, KRYRW10GW001, KRYGWY14GW001, KRYGWY3GW001, KRYGWY4GW001, KRYGWY12GW001, KRYGWRR2GW001, KRYGWRR5GW001, KRYGWRR6GW001, KRYGWRR3GW001, KRYGWRR7GW001, KRYGWRR9GW001, KRYGWY10GW001, KRYGWRM1GW001, KRYGWRM2GW002, KRYPW1GW001, KRYRW13GW001, and Trip Blank
Matrix:	Twenty-one Ground Water Samples and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	8 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06070055

Sample ID	Matrix	Date Collected	Analyses								
			VOC	SVOC	VPH	EPH	PCP	Metals	Formaldehyde	Chlorine	Bromate
KRY118AGW001	Water	07/05/06	X	X	X	X	X	X			
KRY118BGW001	Water	07/05/06	X	X	X	X	X	X			
KRY114BGW001	Water	07/05/06	X	X	X	X	X	X	X	X	X
KRYGWY13GW001	Water	07/06/06	X	X	X	X	X				
KRYCLCW1GW001	Water	07/06/06	X	X	X	X	X				
KRYRW10GW001	Water	07/06/06	X	X	X	X	X				
KRYGWY14GW001	Water	07/06/06	X	X	X	X	X	X			
KRYGWY3GW001	Water	07/06/06	X	X	X	X	X				
KRYGWY4GW001	Water	07/06/06	X	X	X	X	X	X			
KRYGWY12GW001	Water	07/07/06	X	X	X	X	X				
KRYGWRR2GW001	Water	07/05/06	X	X	X	X	X	X			
KRYGWRR5GW001	Water	07/05/06	X	X	X	X	X	X			
KRYGWRR6GW001	Water	07/06/06	X	X	X	X	X				
KRYGWRR3GW001	Water	07/06/06	X	X	X	X	X				
KRYGWRR7GW001	Water	07/06/06	X	X	X	X	X	X			
KRYGWRR9GW001	Water	07/06/06	X	X	X	X	X	X			
KRYGWY10GW001	Water	07/06/06	X	X	X	X	X	X			
KRYGWRM1GW001	Water	07/06/06	X	X	X	X	X				
KRYGWRM2GW002	Water	07/06/06	X	X	X	X	X				
KRYPW1GW001	Water	07/07/06	X	X	X	X	X	X			
KRYRW13GW001	Water	07/07/06	X	X	X	X	X				
Trip Blank	Water	07/07/06	X								

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06070055

Notes:

VOC	=	Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC	=	Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH	=	Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH	=	Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP	=	Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals	=	Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 5471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
Formaldehyde	=	Analyzed by a modification of National Institute of Occupational Safety and Health (NIOSH) Method 3500.
Chlorine	=	Analyzed for residual chlorine by Standard Method 4500-Cl-B.
Bromate	=	Analyzed by EPA Method 300.1 by Underwriters' Laboratories, Inc., of South Bend, Indiana, under subcontract.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With one exception, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. In the continuing calibration performed at 0308 on 14 July 2006, acrolein yielded a %D of 39

percent, well over the QC limit of 25 percent. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- Acrolein in samples KRYGWRM2GW002, KRYPW1GW001, KRYRW13GW001, and Trip Blank

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY118BGW001. Almost all recoveries and all relative percent differences (RPD) were within QC limits. The exception was toluene, which yielded recoveries of 138 and 137 percent, versus SAP-specified QC limits of 76 to 125 percent. Toluene was not detected in the parent sample, so no qualifications were applied for this minor exceedance.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

Sample KRYPW1GW001 was analyzed at a 10-fold dilution because of matrix interference from the high concentration of VOCs, including many non-target analytes for this analysis that were reported as volatile petroleum hydrocarbons. Sample reporting limits are increased accordingly. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. Four samples (KRYGWRR3GW001, KRYGWRR7GW001, KRYGWRM1GW001, and KRYGWRM2GW002) yielded recoveries for the surrogate 2-fluorobiphenyl ranging from 36 to 42 percent, all below the SAP-specified QC limits of 43 to 116 percent. One sample (KRYPW1GW001) yielded a 32 percent recovery for the surrogate terphenyl-d14, versus SAP-specified QC limits of 33 to 141 percent. No qualifications are applied when only one SVOC surrogate in a sample is outside QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY118BGW001, while MS/MSD analyses for the SIM analytes were performed on sample KRYPW1GW001. All recoveries and RPDs for the SIM analytes were within QC limits.

However, the MS/MSD analyses for sample KRY118BGW001 yielded recoveries of many compounds outside the generic QC limits of 70 to 130 percent. These included recoveries of 68 and 65 percent for 1-methylnaphthalene, 71 and 52 percent for 2,3,4,5-tetrachlorophenol, 87 and 60 percent for 2,3,4-trichlorophenol, 56 and 39 percent for 2,3,5,6-tetrachlorophenol, 70 and 62 percent for 2,6-dimethylnaphthalene, 74 and 69 percent for 3,3'-dichlorobenzidene, 68 and 57 percent for benzo(e)pyrene, 10 and 9 percent for benzoic acid, 47 and 40 percent for benzyl alcohol, 74 and 62 percent for bis(2-ethylhexyl)adipate, and 58 and 57 percent for tetraethyllead. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are estimated and may be biased low:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY118AGW001, KRY118BGW001, KRY114BGW001, KRYGWY13GW001, KRYCLCW1GW001, KRYRW10GW001, KRYGWY14GW001, KRYGWY3GW001, KRYGWY4GW001, KRYGWY12GW001, KRYGWRR2GW001, KRYGWRR5GW001, KRYGWRR6GW001, KRYGWRR3GW001, KRYGWRR7GW001, KRYGWRR9GW001, KRYGWY10GW001, KRYGWRM1GW001, KRYGWRM2GW002, KRYPW1GW001, and KRYRW13GW001

Because of the extremely low recovery from the MS/MSD samples, the following nondetected results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY118AGW001, KRY118BGW001, KRY114BGW001, KRYGWY13GW001, KRYCLCW1GW001, KRYRW10GW001, KRYGWY14GW001, KRYGWY3GW001, KRYGWY4GW001, KRYGWY12GW001, KRYGWRR2GW001, KRYGWRR5GW001, KRYGWRR6GW001, KRYGWRR3GW001, KRYGWRR7GW001, KRYGWRR9GW001, KRYGWY10GW001, KRYGWRM1GW001, KRYGWRM2GW002, KRYPW1GW001, and KRYRW13GW001

2,3,4-Trichlorophenol and 3,3'-dichlorobenzidene results were not qualified because the average recoveries were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. Most recoveries were within QC limits. The exceptions were benzoic acid with 9 percent recovery, benzyl alcohol with 43 percent recovery, and tetraethyllead with 1 percent recovery, all versus generic QC limits of 70 to 130 percent. All sample results were previously flagged because of similar MS/MSD irregularities, so no further qualifications are warranted.

Tetraethyllead results were qualified as estimated rather than rejected because the spiking standard has apparently undergone severe degradation.

Field Duplicate Samples

No field duplicate samples are included in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were inherent in the characteristics of the analytes, specifically the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis for preserved samples. However, two samples (KRYGWRR7GW001 and KRYPW1GW001) were found to be unpreserved, at a pH of 7 rather than a pH less than 2, and exceeded the 7-day holding time for unpreserved samples. Therefore the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- All VPH analytes in samples KRYGWRR7GW001 and KRYPW1GW001.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY118BGW001 and KRYGWRR7GW001. All recoveries and RPDs were within QC limits in sample KRY118BGW001, but recoveries of 63 and 71 percent were exhibited for methyl tert-butyl ether in sample KRYGWRR7GW001, versus QC limits of 70 to 130 percent. The results for sample KRYGWRR7GW001 were previously qualified for holding time issues, so no further qualifications were applied.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY118BGW001. Almost all recoveries and all RPDs were within QC limits. The exceptions were n-decane, with recoveries of 29 and 35 percent, and naphthalene, with recoveries of 38 and 56 percent, both versus QC limits of 40 to 140 percent. All recoveries for the other 9 alkanes and 13 aromatics were within QC limits, so no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

Many samples had total EPH concentrations that were so low, so fractionation into specific compounds and classes was not possible. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were initially analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis. Because of a low recovery of the surrogate, sample KRYGWRR3GW001 was re-extracted after expiration of the 7-day holding time. As detailed below, the original result was reported in the database, so no qualifications are warranted for this holding time exceedance.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. Sample KRYGWRR3GW001 yielded a surrogate recovery of 27 percent, versus the laboratory-specified QC limits of 57 to 125 percent. The laboratory re-extracted and re-analyzed the sample with similar results. Because the pentachlorophenol results were the essential identical in both

analyses, the re-analysis result was not reported in the database and the following result was flagged "UJ" to indicate that it is considered estimated and may be biased low:

- Pentachlorophenol in sample KRYGWRR3GW001.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY118BGW001 and KRYGWY14GW001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Matrix blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples were either not detected or contained much higher concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY118BGW001 and KRYGWRR5G001. In the MS/MSD analyses performed on sample KRYGWRR5G001, recoveries of manganese could not be determined because the sample contained much more than the spike. No qualifications are warranted for this data gap. All other recoveries and all RPDs were within their QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDB

A few minor irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.7 Formaldehyde Analysis

Deliverables

As originally delivered, the data package included all materials for cursory validation of this simple colorimetric method except for calibration information.

Holding Times

There are no specific requirements for holding time. The sample was analyzed within the VOC holding time of 14 days from collection to analysis.

Calibration

An initial calibration was performed at the start of the analytical run. All results were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analyte.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses are not required for this analysis. No sample duplicate analysis was reported. No qualifications are warranted for this data gap.

Laboratory Control Sample Recoveries

An LCS was analyzed and yielded a recovery were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the formaldehyde analysis. The result may be used, as reported, for the purposes stated in the workplan.

4.8 Chlorine Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial standardization of the iodine titrant.

Holding Times

There are no specific requirements for holding time, but the sample was analyzed less than 7 days after collection.

Calibration

The titrant was presumed to have been standardized as required. No qualifications were required for this data gap.

Blanks

A method blank was analyzed as required and contained no detectable chlorine.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits. A duplicate analysis of sample KRY114BGW001 yielded an acceptable RPD.

Laboratory Control Sample Recoveries

A LCS was analyzed and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the residual chlorine analysis. The result may be used, as reported, for the purposes stated in the workplan.

4.9 Bromate Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial calibration data. The data for this analysis had not been included in the EDD, so they were added manually.

Holding Times

The samples were analyzed within the holding time of 28 days for disinfection by-products.

Calibration

Continuing calibrations were performed as required and the closing continuing calibration yielded a recovery within QC limits of 90 to 110 percent. However, the continuing calibration standard analyzed before the sample yielded a recovery of only 76 percent. Therefore, the following result was flagged "UJ" to indicate that it is considered estimated and may be biased low:

- Bromate in sample KRY114BGW001.

Blanks

A method blank was analyzed as required and contained no detectable analyte.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY114BGW001. The recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with and had an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

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Overall Assessment of This SDG

There were no major problems with the bromate analysis. The result may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060349
Sample Numbers:	KRYKPT4GW001, KRYKPT3GW001, KRYKPT2GW001, KRY128BGW001, KRY121BQE001, KRYKPT11GW001, KRYKPT18GW001, KRYRW1GW001, KRYRW12GW001, KRYSW9GW001, KRYSW9GW701, KRYPW3GW001, KRYKPT22GW001, KRYGWRR8GW001, KRY114AGW001, KRYGWRR4GW001, KRYGWRR4QE001, KRYGWRR1GW001, KRYKPT17GW001, KRYNTLMW4GW001, KRYNTLMW4QE001, KRYRW6GW001, and Two Trip Blanks
Matrix:	Eighteen Ground Water Samples, One Field Duplicate Groundwater Sample, Three Equipment Rinsate (Aqueous) Samples, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	11 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060349

Sample ID	Matrix	Date Collected	Analyses								
			VOC	SVOC	VPH	EPH	PCP	Metals	Formaldehyde	Chlorine	Bromate
KRYKPT4GW001	Water	06/28/06	X	X	X	X	X				
KRYKPT3GW001	Water	06/28/06	X	X	X	X	X	X			
KRYKPT2GW001	Water	06/28/06	X	X	X	X	X	X			
KRY128BGW001	Water	06/28/06	X	X	X	X	X				
KRY121BQE001	Water	06/28/06	X	X	X	X	X				
KRYKPT11GW001	Water	08/28/06	X	X	X	X	X				
KRYKPT18GW001	Water	06/28/06	X	X	X	X	X				
KRYRW1GW001	Water	06/28/06	X	X	X	X	X				
KRYRW12GW001	Water	06/28/06	X	X	X	X	X				
KRYSW9GW001	Water	06/29/06	X	X	X	X	X				
KRYSW9GW701	Water	06/29/06	X	X	X	X	X				
KRYPW3GW001	Water	06/29/06	X	X	X	X	X				
KRYKPT22GW001	Water	06/28/06	X	X	X	X	X				
KRYGWRR8GW001	Water	06/29/06	X	X	X	X	X				
KRY114AGW001	Water	06/29/06	X	X	X	X	X	X	X	X	X
KRYGWRR4GW001	Water	06/29/06	X	X	X	X	X				
KRYGWRR4QE001	Water	06/29/06	X	X	X	X	X				
KRYGWRR1GW001	Water	06/29/06	X	X	X	X	X				
KRYKPT17GW001	Water	06/29/06	X	X	X	X	X				
KRYNTLMW4GW001	Water	06/29/06	X	X	X	X	X				
KRYNTLMW4QE001	Water	06/29/06	X	X	X	X	X				
KRYRW6GW001	Water	06/29/06	X	X	X	X	X				
Trip Blank	Water	06/28/06	X								
Trip Blank	Water	06/28/06	X								

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060349

Notes:

VOC	=	Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC	=	Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH	=	Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH	=	Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP	=	Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals	=	Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 5471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
Formaldehyde	=	Analyzed by a modification of National Institute of Occupational Safety and Health (NIOSH) Method 3500.
Chlorine	=	Analyzed for residual chlorine by Standard Method 4500-Cl-B.
Bromate	=	Analyzed by EPA Method 300.1 by Underwriters' Laboratories, Inc., of South Bend, Indiana, under subcontract.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks and the equipment rinsate blanks also contained no analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY128BGW001 and a sample collected from another site. Almost all recoveries and all relative percent differences (RPD) were within QC limits. The first exception was toluene in the MS/MSD analyses on sample KRY128BGW001, which yielded recoveries of 142 and 133 percent, versus SAP-specified QC limits of 76 to 125 percent. Toluene was detected in that sample, so the following result was flagged "J" to indicate that it is considered estimated and may be biased high:

- Toluene in sample KRY128BGW001

Chloromethane yielded a low recovery in the MS sample (but not the MSD sample) collected from another site, but no qualifications were warranted for an irregularity in a sample collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

Results from field duplicate pair (samples KRYSW9GW001 and KRYSW9GW701) in this SDG were in good agreement, with one exception. Methyl ethyl ketone (2-butanone) was not detected in the primary sample but was reported, at almost twice the sample quantitation limit, in the field duplicate sample. Methyl ethyl ketone is a common laboratory contaminant and has rarely been reported in samples from the site, so the positive result may be laboratory contamination. No qualifications are performed based on field duplicate results.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and on sample KRY128BGW001, while MS/MSD analyses for the SIM analytes were performed on sample KRYGWRR8GW001. All recoveries and RPDs for the SIM analytes were within QC limits. No qualifications were applied for the irregularities observed in the MS/MSD analyses performed on the sample collected from another site are not relevant to these samples.

However, the SIM MS/MSD analyses performed on sample KRY128BGW001 yielded many compounds with recoveries outside the generic QC limits of 70 to 130 percent. These included recoveries of 67 and 88 percent for 1-methylnaphthalene, 56 and 93 percent for 2,3,4,5-tetrachlorophenol, 50 and 64 percent for 2,3,5,6-tetrachlorophenol, 66 and 86 percent for 2,6-dimethylnaphthalene, 62 and 79 percent for 3,3'-dichlorobenzidene, 44 and 57 percent for benzo(e)pyrene, 17 and 20 percent for benzoic acid, 47 and 63 percent for benzyl alcohol, 69 and 90 percent for biphenyl, 34 and 47 percent for bis(2-ethylhexyl)adipate, and 58 and 57 percent for tetraethyllead. In addition, bis(2-ethylhexyl)phthalate yielded recoveries of 44 and 67 percent versus laboratory-specific QC limits of 47 to 128 percent and di-n-octyl phthalate yielded recoveries of 43 and 68 percent versus laboratory-specific QC limits of 45 to 134 percent. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- 2,3,5,6-Tetrachlorophenol, benzo(e)pyrene, benzyl alcohol, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRYKPT4GW001, KRYKPT3GW001, KRYKPT2GW001, KRY128BGW001, KRYKPT11GW001, KRYKPT18GW001, KRYRW1GW001, KRYRW12GW001, KRYSW9GW001, KRYSW9GW701, KRYPW3GW001, KRYKPT22GW001, KRYGWRR8GW001, KRY114AGW001, KRYGWRR4GW001, KRYGWRR1GW001, KRYKPT17GW001, KRYNTLMW4GW001, and KRYRW6GW001.

Because of the extremely low recovery from the MS/MSD analyses, the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRYKPT4GW001, KRYKPT3GW001, KRYKPT2GW001, KRY128BGW001, KRYKPT11GW001, KRYKPT18GW001, KRYRW1GW001, KRYRW12GW001, KRYSW9GW001, KRYSW9GW701, KRYPW3GW001, KRYKPT22GW001, KRYGWRR8GW001, KRY114AGW001, KRYGWRR4GW001, KRYGWRR1GW001, KRYKPT17GW001, KRYNTLMW4GW001, and KRYRW6GW001.

1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, biphenyl, bis(2-ethylhexyl)phthalate, and di-n-octyl phthalate results were not qualified because the average recoveries were within QC limits. Equipment

rinsate samples were not qualified, because these samples are considered a different matrix than ground water.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. Most recoveries were within QC limits. Analytes with recoveries outside the generic QC limits of 70 to 130 percent included 1-methylnaphthalene with 41 percent recovery, 2,3,4,5-tetrachlorophenol with recovery of 43 percent, 2,3,4-trichlorophenol with recovery of 65 percent, 2,3,5,6-tetrachlorophenol with recovery of 33 percent, 2,6-dimethylnaphthalene with recovery of 37 percent, 3,3'-dichlorobenzidene with recovery of 38 percent, benzo(e)pyrene with recovery of 46 percent, benzoic acid with recovery of 6 percent, benzyl alcohol with recovery of 26 percent, biphenyl with recovery of 39 percent, bis(2-ethylhexyl)adipate with recovery of 44 percent, and tetraethyllead with recovery of 1 percent. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3-'dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY KPT4GW001, KRYKPT3GW001, KRYKPT2GW001, KRY128BGW001, KRY121BQE001, KRYKPT11GW001, KRYKPT18GW001, KRYRW1GW001, KRYRW12GW001, KRYSW9GW001, KRYSW9GW701, KRYPW3GW001, KRYKPT22GW001, KRYGWRR8GW001, KRY114AGW001, KRYGWRR4GW001, KRYGWRR4QE001, KRYGWRR1GW001, KRYKPT17GW001, KRYNTLMW4GW001, KRYNTLMW4QE001, and KRYRW6GW001.

Because of the extremely low recovery from the LCS, the following nondetected results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY KPT4GW001, KRYKPT3GW001, KRYKPT2GW001, KRY128BGW001, KRY121BQE001, KRYKPT11GW001, KRYKPT18GW001, KRYRW1GW001, KRYRW12GW001, KRYSW9GW001, KRYSW9GW701, KRYPW3GW001, KRYKPT22GW001, KRYGWRR8GW001, KRY114AGW001, KRYGWRR4GW001, KRYGWRR4QE001, KRYGWRR1GW001, KRYKPT17GW001, KRYNTLMW4GW001, KRYNTLMW4QE001, and KRYRW6GW001.

Tetraethyllead results were qualified as estimated rather than rejected because the spiking standard had apparently undergone severe degradation because of internal interactions.

Field Duplicate Samples

The field duplicate pair (samples KRYSW9GW001 and KRYSW9GW701) included in this SDG yielded identical results, all non-detected.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were inherent in the characteristics of the analytes, specifically the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument. Because of the extremely low recoveries in those QC analyses, all of the benzoic acid results were rejected. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis for preserved samples. However, one sample (KRYKPT17GW001) was found to be unpreserved, at a pH of 4 rather than a pH less than 2, and exceeded the 7-day holding time for unpreserved samples. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- All VPH analytes in sample KRYKPT17GW001

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY128BGW001 and a sample from another SDG. All recoveries and RPDs were within QC limits in MS/MSD analyses for sample KRY128BGW001, but the second MS/MSD yielded recoveries of 63 and 71 percent for methyl tert-butyl ether, versus QC limits of 70 to 130 percent. No qualifications were applied because the parent sample was not a part of this data package.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The field duplicate pair (samples KRYSW9GW001 and KRYSW9GW701) included in this SDG had essentially identical results.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample from another SDG. Almost all recoveries and all RPDs were within QC limits. The exceptions were n-decane, with recoveries of 35 and 38 percent, versus QC limits of 40 to 140 percent. All recoveries for the other 9 alkanes and all 14 aromatics were within QC limits, so no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Almost all recoveries were within QC limits. The exception was n-decane in the LCS analyzed on 27 July 2006 at 2148, which yielded a recovery of 37 percent versus QC limits of 40 to 140 percent. All recoveries for the other 9 alkanes and all 14 aromatics were within QC limits, so no qualifications were applied for this minor irregularity.

Field Duplicate Samples

The field duplicate pair (samples KRYSW9GW001 and KRYSW9GW701) included in this SDG had identical, non-detected results.

Other Method-Specific QC Measures

Many samples had total EPH concentrations that were so low that the fractionation into specific compounds and classes was impossible. The laboratory flagged results below the calibration range “J” to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. Sample KRYKPT2GW001 yielded a surrogate recovery of 38 percent, versus the laboratory-specified QC limits of 57 to 125 percent. The laboratory re-extracted and re-analyzed the sample and the surrogate recovery was 65 percent, well within QC limits. The pentachlorophenol results were essentially the same in both analyses, so the results from the reanalysis was reported in the database.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY128BGW001 and on two samples collected from other sites. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The field duplicate pair (samples KRYSW9GW001 and KRYSW9GW701) included in this SDG yielded identical non-detected results.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory. In addition, the sample extracts with relatively high concentrations of pentachlorophenol, such as sample KRYKPT2GW001, were diluted as much as 1,000-fold to bring the results within the calibration range. No further qualifications are required.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Method blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples were either not detected or contained much higher concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRYKPT3GW001. All recoveries and RPDs were within their QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDB

No irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.7 Formaldehyde Analysis

Deliverables

As originally delivered, the data package included all materials for cursory validation of this simple colorimetric method except for calibration information.

Holding Times

There are no specific requirements for holding time. The sample was analyzed within the VOC holding time of 14 days from collection to analysis.

Calibration

An initial calibration was performed at the start of the analytical run. All results were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analyte.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses are not required for this analysis. No sample duplicate analysis was reported. No qualifications are warranted for this data gap.

Laboratory Control Sample Recoveries

An LCS was analyzed and yielded a recovery were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the formaldehyde analysis. The result may be used, as reported, for the purposes stated in the workplan.

4.8 Chlorine Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial standardization of the iodine titrant.

Holding Times

There are no specific requirements for holding time, but the sample was analyzed less than 7 days after collection.

Calibration

The titrant was presumed to have been standardized as required. No qualifications were required for this data gap.

Blanks

A method blank was analyzed as required and contained no detectable chlorine.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

A LCS was analyzed and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the residual chlorine analysis. The result may be used, as reported, for the purposes stated in the workplan.

4.9 Bromate Analysis

As originally delivered, the data package contained only the subcontractor's report of analysis, with no supporting information. Also, the data for this analysis was not included in the EDD, so it was manually added. Because of the lack of QC information, the following result was flagged "UJ" to indicate that the sample quantitation limit is considered estimated:

- Bromate in sample KRY114AGW001

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060332
Sample Numbers:	KRYKPT19GW001, KRY129AGW001, KRYPWS2GW001, KRYPWS1GW001, KRY128AGW001, KRY122BGW001, KRY121BGW001, KRYRW11GW001, KRYRW11GW701, KRYRW8GW001, KRYKPT20GW001, KRYKPT20GW701, KRYKPT21GW001, KRYKPT13GW001, KRYKPT9GW001 and Two Trip Blanks
Matrix:	Thirteen Groundwater Samples, Two Field Duplicate Groundwater Samples, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	7 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060332

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	METALS
KRYKPT19GW001	Water	06/27/06	X	X	X	X	X	
KRY129AGW001	Water	06/27/06	X	X	X	X	X	X
KRYPWS2GW001	Water	06/27/06	X	X	X	X	X	
KRYPWS1GW001	Water	06/27/06	X	X	X	X	X	
KRY128AGW001	Water	06/27/06	X	X	X	X	X	
KRY122BGW001	Water	06/28/06	X	X	X	X	X	
KRY121BGW001	Water	06/28/06	X	X	X	X	X	X
KRYRW11GW001	Water	06/28/06	X	X	X	X	X	
KRYRW11GW701	Water	06/28/06	X	X	X	X	X	
KRYRW8GW001	Water	06/28/06	X	X	X	X	X	
KRYKPT20GW001	Water	06/28/06	X	X	X	X	X	
KRYKPT20GW701	Water	06/28/06	X	X	X	X	X	
KRYKPT21GW001	Water	06/28/06	X	X	X	X	X	
KRYKPT13GW001	Water	06/28/06	X	X	X	X	X	
KRYKPT9GW001	Water	06/28/06	X	X	X	X	X	
Trip Blank	Water	06/27/06	X					
Trip Blank	Water	06/28/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier = Indicates the data are acceptable both qualitatively and quantitatively.

U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With two exceptions, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. Those exceptions were bromomethane in the continuing calibration performed on 7 July 2006 at 1205, which yielded a recovery of 68 percent versus QC limits of 75 to 125 percent, and acrolein in the continuing calibration performed on 7 July 2006 at 2343, which yielded a recovery of 63 percent, versus the same QC limits. Therefore, the following results were flagged “UJ” to indicate that the sample quantitation limit is considered estimated:

- Bromomethane in samples KRYKPT19GW001, KRY129AGW001, KRYPWS2GW001, KRYPWS1GW001, KRY128AGW001, KRY122BGW001,

KRY121BGW001, KRYRW11GW001, KRYRW11GW701, KRYRW8GW001, and KRYKPT20GW001.

- Acrolein in samples KRYKPT20GW701, KRYKPT21GW001, and KRYKPT13GW001.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed samples KRY122BGW001 and KRYKPT9GW001. Most of the recoveries and relative percent difference (RPD) results were within their QC limits. However, in the MS/MSD analyses involving sample KRY122BGW001, toluene yielded recoveries of 138 and 132 percent, versus SAP-specified QC limits of 76 to 125 percent, and vinyl acetate yielded an RPD of 21 percent versus the laboratory-specified QC limit of 20 percent. In the MS/MSD analyses involving sample KRYKPT9GW001, bromomethane yielded an RPD of 30 percent and chloromethane yielded an RPD of 23 percent, both versus the laboratory-specified QC limit 20 percent. None of the affected compounds were detected in any sample, so no qualifications were applied.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

This SDG included two sets of field duplicate samples. The first set (samples KRYRW11GW001 and KRYRW11GW701) included no detected analytes. The second set (samples KRYKPT20GW001 and KRYKPT20GW701) showed good agreement (comparable to the requirements for MS/MSD samples) between the analytes detected in the field duplicate pair

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exception was terphenyl-d14 in sample KRYKPT19GW001, which yielded a recovery of 31 percent, versus SAP-specified QC limits of 33 to 141 percent. No qualifications are required when only one SVOC surrogate is outside of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRYKPT9GW001. There were no irregularities in the SIM analyses, but in the usual SVOC analyses, a number of analytes yielded recoveries below their generic QC limits of 70 to 130 percent. These included 1-methylnaphthalene with recoveries of 55 and 65 percent, 2,3,4,5-tetrachlorophenol with recoveries of 62 and 84 percent, 2,3,4-trichlorophenol with recoveries of 62 and 68 percent, 2,3,5,6-tetrachlorophenol with recoveries of 50 and 68 percent, 2,6-dimethylnaphthalene with recoveries of 55 and 70 percent, 3,3'-dichlorobenzidene with recoveries of 43 and 57 percent, benzo(e)pyrene with recoveries of 37 and 65 percent, benzoic acid with recoveries of 17 and 27 percent, benzyl alcohol with recoveries of 4 and 54 percent, biphenyl with recoveries of 58 and 73 percent, bis(2-ethylhexyl)adipate with recoveries of 23 and 61 percent, and tetraethyllead with recoveries of 1 and 1 percent. In addition, benzo(a)anthracene yielded recoveries of 52 and 61 percent versus laboratory-specific QC limits of 57 to 115 percent, benzo(b)fluoranthene yielded recoveries of 52 and 61 percent versus laboratory-specific QC limits of 54 to 120 percent, bis(2-ethylhexyl)phthalate yielded recoveries of 41 and 60 percent versus laboratory-specific QC limits of 47 to 128 percent, and di-n-octylphthalate yielded recoveries of 41 and 59 percent versus laboratory-specific limits of 45 to 134 percent. Because of these low recoveries, the following groundwater results were flagged "J" or "UJ", as appropriate, to indicate that the results are considered estimated:

- 1-Methylnaphthalene, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyl lead in samples KRYKPT19GW001, KRY129AGW001, KRYPWS2GW001, KRYPWS1GW001, KRY128AGW001, KRY122BGW001, KRY121BGW001, KRYRW11GW001, KRYRW11GW701, KRYRW8GW001, KRYKPT20GW001, KRYKPT20GW701, KRYKPT21GW001, KRYKPT13GW001, and KRYKPT9GW001.

Because of the extremely low recovery from the MS/MSD analyses, the following results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KPT19GW001, KRY129AGW001, KRYPWS2GW001, KRYPWS1GW001, KRY128AGW001, KRY122BGW001, KRY121BGW001, KRYRW11GW001, KRYRW11GW701, KRYRW8GW001, KRYKPT20GW001, KRYKPT20GW701, KRYKPT21GW001, KRYKPT13GW001, and KRYKPT9GW001.

No qualifications were made for 2,3,4,5-tetrachlorophenol, benzo(a)anthracene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate, because thee average recoveries were within QC limits. No qualifications were made for benzo(a)anthracene and benzo(b)fluoranthene because they are reported by the SIM procedure and yielded acceptable recoveries in the MS/MSD analyses for that method variant. Also, the laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results were considered estimated rather than rejected.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. In this case, a number of analytes yielded recoveries below their generic QC limits of 70 to 130 percent. These included 1-methylnaphthalene with a recovery of 53 percent, 2,3,4-trichlorophenol with a recovery of 63 percent, 2,6-dimethylnaphthalene with a recovery of 68 percent, 3,3'-dichlorobenzidine with a recovery of 63 percent, benzo(e)pyrene with a recovery of 66 percent, benzoic acid with a recovery of 16 percent, benzyl alcohol with a recovery of 45 percent, biphenyl with a recovery of 65 percent, bis(2-ethylhexyl)adipate with a recovery of 69 percent, and tetraethyllead with a recovery of 1 percent. In addition, 2,6-dinitrotoluene yielded a recovery of 55 percent versus laboratory-specific QC limits of 59 to 100 percent. Because of these low recoveries, the following results were flagged "UJ" to indicate that the sample detection limits are considered estimated:

- 1-Methylnaphthalene, 2,3,4-trichlorophenol, 2,6-dimethylnaphthalene, 2,6-dinitrotoluene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyl lead in samples KRY19GW001, KRY129AGW001, KRYPWS2GW001, KRYPWS1GW001, KRY128AGW001, KRY122BGW001, KRY121BGW001, KRYRW11GW001, KRYRW11GW701, KRYRW8GW001, KRYKPT20GW001, KRYKPT20GW701, KRYKPT21GW001, KRYKPT13GW001, and KRYKPT9GW001.

Because of the extremely low recovery from the LCS, the following results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY19GW001, KRY129AGW001, KRYPWS2GW001, KRYPWS1GW001, KRY128AGW001, KRY122BGW001, KRY121BGW001, KRYRW11GW001, KRYRW11GW701, KRYRW8GW001, KRYKPT20GW001, KRYKPT20GW701, KRYKPT21GW001, KRYKPT13GW001, and KRYKPT9GW001.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so those results were considered estimated rather than rejected.

Field Duplicate Samples

Two sets of field duplicate samples were included in this SDG. Both pairs had good agreement for the SVOC analytes.

Other Method-Specific QC Measures

No other problems were observed in these analyses. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems are inherent in the characteristics of the analytes, namely the irregular responses in the LCS sample involving SVOCs known as "poor responders". The nondetected results for benzoic acid were rejected because of the extremely low recoveries in the LCS analysis, as well as in the MS/MSD analyses performed on a sample from another SDG. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on two samples from this SDG. Almost all recoveries and all RPDs were within QC limits. The exceptions were methyl tert-butyl ether, which yielded recoveries of 63 and 71 percent in sample KRYKPT9GW001 and recoveries of 93 and 86 percent in sample KRY122BGW001, versus QC limits of 70 to 130 percent. Because of this low recovery, the following result was flagged "UJ" to indicate that it is estimated:

- Methyl tert-butyl ether in sample KRYKPT9GW001

There may be similar matrix interference in other samples, but the different recoveries from the two sets of samples may show that no general problem exists.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were two sets of field duplicate samples in this SDG. Results for one set (samples KRYRW11GW001 and KRYRW11GW701) were nondetected. In the other set (samples KRYKPT20GW001 and KRYKPT20GW701), results for individual analytes were similar, but the total purgeable hydrocarbons concentrations yielded an RPD of 41 percent, well above the SAP-specified QC limit of 30 percent for MS/MSD pairs. The concentrations are so low that the hydrocarbons may be fully dissolved. Therefore, this irregularity may reflect the inherent variation in the analysis, including the potential for losses in handling the samples.

Other Method-Specific QC Measures

No significant irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY122BGW001. Most results were within QC limits. However, n-decane, the first aliphatic hydrocarbon in the spikes, yielded recoveries of 35 and 38 percent, versus QC limits of 40 to 140 percent. All RPDs and all recoveries for the other 9 aliphatic hydrocarbons and all 14 aromatic hydrocarbons were within their QC limits. Therefore, no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits except for n-decane in the LCS analyzed on 27 July 2006 at 2146, which yielded a recovery of 37 percent versus QC limits of 40 to 140 percent. All other hydrocarbons yielded acceptable recoveries, so no qualifications were applied..

Field Duplicate Samples

There were two sets of field duplicate samples in this SDG. In each pair, results were essentially identical.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

Almost all of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analyte.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY122BGW001 and KRYKPT9GW001. All RPDs and the recoveries from sample KRYKPT9GW001 were within QC limits, but recoveries from sample KRY122BGW001 were 22 and 18 percent, versus QC limits of 55 to 120 percent. Because of this apparent matrix interference, the

following result was flagged “UJ” to indicate that the sample quantitation limit is considered estimated:

- Pentachlorophenol in sample KRY122BGW001

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were two sets of field duplicate samples in this SDG. RPDs were within the acceptable range for MS/MSD samples.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged the results below the calibration range “J” to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Method blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples were either not detected or contained much higher concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and on sample KRY129AGW001. On the sample from another site, recoveries for cobalt, copper, and manganese could not be determined because the unspiked sample contained much higher concentrations than the spike. All other recoveries and all RPDs were within their QC limits. No qualifications were warranted for irregularities in a sample collected from another site.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Overall Assessment of the SDG

No major irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060298
Sample Numbers:	KRYKPT6GW001, KRYKPT12GW001, KRYRW9GW001, KRYRW9AGW001, KRY139BGW001, KRY139AGW001, KRY125BGW001, KRY125AGW001, KRY125AQE001, KRY122AGW001, KRY122AQE001, KRYGW5GW001, KRYKPT10GW001, KRYKPT14GW001, KRYKPT15GW001 and One Trip Blank
Matrix:	Thirteen Groundwater Samples, Two Equipment Rinsate Samples, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	6 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060298

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	METALS
KRYKPT6GW001	Water	06/23/06	X	X	X	X	X	
KRYKPT12GW001	Water	06/23/06	X	X	X	X	X	
KRYRW9GW001	Water	06/23/06	X	X	X	X	X	
KRYRW9AGW001	Water	06/27/06	X	X	X	X	X	
KRY139BGW001	Water	06/27/06	X	X	X	X	X	
KRY139AGW001	Water	06/27/06	X	X	X	X	X	
KRY125BGW001	Water	06/27/06	X	X	X	X	X	
KRY125AGW001	Water	06/27/06	X	X	X	X	X	
KRY125AQE001	Water	06/27/06	X	X	X	X	X	
KRY122AGW001	Water	06/27/06	X	X	X	X	X	
KRY122AQE001	Water	06/27/06	X	X	X	X	X	
KRYGW5GW001	Water	06/27/06	X	X	X	X	X	
KRYKPT10GW001	Water	06/27/06	X	X	X	X	X	
KRYKPT14GW001	Water	06/27/06	X	X	X	X	X	
KRYKPT15GW001	Water	06/27/06	X	X	X	X	X	X
Trip Blank	Water	06/27/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With two exceptions, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. Those exceptions were acrolein in the continuing calibration performed on 3 July 2006 at 0949, which yielded a recovery of 59 percent versus QC limits of 75 to 125 percent, and bromomethane in the continuing calibration performed on 3 July 2006 at 1207, which yielded a recovery of 64 percent, versus the same QC limits. Therefore, the following results were flagged “UJ” to indicate that the sample quantitation limits are considered estimated:

- Acrolein and bromomethane in samples KRYKPT6GW001, KRYKPT12GW001, KRYRW9GW001, and KRYRW9AGW001

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes. One of the equipment rinsate blanks (KRY125AQE001) contained a trace concentration (less than 1 microgram per liter) of the common laboratory contaminant methylene chloride and the other one (KRY122AQE001) contained no target analytes. No qualifications were made on the basis of rinsate contamination.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site, which yielded a number of irregularities. No qualifications were warranted for irregularities in a sample collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exception was terphenyl-d14 in sample KRY139AGW001, which yielded a recovery of 28 percent, versus SAP-specified QC limits of 33 to 141 percent. No qualifications are required when only one SVOC surrogate is outside of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRYKPT6GW001 and on sample KRY122AQE001 (for the SIM analytes). Most of the recoveries and RPDs for the SIM analytes were within QC limits. The exceptions were chrysene, with recoveries of 100 and 133 percent versus laboratory-specific QC limits of 54 to 122 percent, and dibenz(a,h)anthracene, which yielded an RPD of 48 percent, versus the laboratory-

specified limit of 40 percent. Neither analyte was detected in either of the equipment rinsate samples; therefore, no qualifications were applied for these minor irregularities.

On the other hand, numerous irregularities were exhibited in the MS/MSD analyses performed on sample KRYKPT6GW001. A number of analytes yielded recoveries below the generic QC limits of 70 to 130 percent. These included 1-methylnaphthalene with recoveries of 63 and 58 percent, 2,3,4,5-tetrachlorophenol with recoveries of 69 and 61 percent, 2,3,4-trichlorophenol with recoveries of 59 and 66 percent, 2,3,5,6-tetrachlorophenol with recoveries of 50 and 46 percent, 2,6-dimethylnaphthalene with recoveries of 58 and 57 percent, 3,3'-dichlorobenzidene with recoveries of 53 and 51 percent, benzoic acid with recoveries of 17 and 13 percent, benzyl alcohol with recoveries of 45 and 44 percent, biphenyl with recoveries of 72 and 66 percent, bis(2-ethylhexyl)adipate with recoveries of 49 and 36 percent, and tetraethyllead with recoveries of 1 and 1 percent. In addition, 2,4,5-trichlorophenol yielded recoveries of 100 and 109 percent versus laboratory-specific QC limits of 47 to 96 percent and benzo(a)anthracene yielded recoveries of 59 and 55 percent versus laboratory-specific limits of 57 to 119 percent. Because of these low recoveries, the following groundwater results were flagged "UJ" to indicate that their sample detection limits are considered estimated:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyl lead in samples KRYKPT6GW001, KRYKPT12GW001, KRYRW9GW001, KRYRW9AGW001, KRY139BGW001, KRY139AGW001, KRY125BGW001, KRY125AGW001, KRY122AGW001, KRYGW5GW001, KRYKPT10GW001, KRYKPT14GW001, and KRYKPT15GW001.

Because of the extremely low recovery from the groundwater MS/MSD samples, the following results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KPT6GW001, KRYKPT12GW001, KRYRW9GW001, KRYRW9AGW001, KRY139BGW001, KRY139AGW001, KRY125BGW001, KRY125AGW001, KRY122AGW001, KRYGW5GW001, KRYKPT10GW001, KRYKPT14GW001, and KRYKPT15GW001.

No qualifications were made for 2,4,5-trichlorophenol, because this compound was not detected in any of the associated field samples. No qualifications were applied for benzo(a)anthracene because this compound is reported from the SIM procedure and yielded acceptable recoveries in that analysis. No qualifications were made for biphenyl because the average recovery was so close to the lower QC limit. Also, the laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results were considered estimated rather than rejected.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. In this case, a few analytes yielded recoveries below their generic QC limits of 70 to 130 percent. These included benzoic acid with a recovery of 14 percent, benzyl alcohol with a recovery of 54 percent, and tetraethyllead with a recovery of 1 percent. Because of these low recoveries, the following results were flagged "UJ" to indicate that the sample detection limits are considered estimated:

- Benzyl alcohol and tetraethyl lead in samples KRY125AQE001 and KRY122AQE001.

Because of the extremely low recovery from the LCS, the following results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY125AQE001 and KRY122AQE001.

No further qualifications were made because the groundwater samples had been previously qualified because of MS/MSD irregularities. The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so those results were considered estimated rather than rejected.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No other problems were observed in these analyses. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems are inherent in the characteristics of the analytes, namely the irregular responses in the LCS sample involving SVOCs known as "poor responders". The nondetected results for benzoic acid were rejected because of the extremely low recoveries in the LCS analysis, as well as in the MS/MSD analyses. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample from another SDG (but from this site). Almost all recoveries and all RPDs were within QC limits. The exception was methyl tert-butyl ether, which yielded recoveries of 63 and 71 percent, versus QC limits of 70 to 130 percent. Because of these low recoveries, the following results were flagged "UJ" to indicate that they are considered estimated:

- Methyl tert-butyl ether in samples KRYKPT6GW001, KRYKPT12GW001, KRYRW9GW001, KRYRW9AGW001, KRY139BGW001, KRY139AGW001, KRY125BGW001, KRY125AGW001, KRY122AGW001, KRYGW5GW001, KRYKPT10GW001, KRYKPT14GW001, and KRYKPT15GW001.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRYKPT6GW001. Most results were within QC limits. However, n-decane, the first aliphatic hydrocarbon in the spikes, yielded recoveries of 47 and 37 percent, versus QC limits of 40 to 140 percent. All RPDs and all recoveries for the other 9 aliphatic hydrocarbons and all 14 aromatic

hydrocarbons were within their QC limits. Therefore, no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

Almost all of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and on sample KRYKPT6GW001. All recoveries and the RPD from sample KRYKPT6GW001 were within QC limits. Some irregularities were exhibited in the results for the sample collected from another site, but no qualifications were warranted.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Method blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples were either not detected or contained much higher concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and RPDs were within their QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Overall Assessment of the SDB

No major irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060263
Sample Numbers:	KRY130BGW001, KRYGW1GW001, KRY108AGW001, KRYKPT1GW001, KRYKPT7GW001, KRYKPT8GW001, KRYKPT5GW001, KRYKPT16GW001, KRYKPT16GW701, and Trip Blank
Matrix:	Eight Ground Water Samples, One Field Duplicate Ground Water Sample, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	6 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060263

Sample ID	Matrix	Date Collected	Analyses								
			VOC	SVOC	VPH	EPH	PCP	Metals	Formaldehyde	Chlorine	Bromate
KRY130BGW001	Water	06/22/06	X	X	X	X	X				
KRYGW1GW001	Water	06/22/06	X	X	X	X	X				
KRY108AGW001	Water	06/22/06	X	X	X	X	X				
KRYKPT1GW001	Water	06/22/06	X	X	X	X	X	X			
KRYKPT7GW001	Water	06/23/06	X	X	X	X	X		X	X	X
KRYKPT8GW001	Water	06/23/06	X	X	X	X	X		X	X	X
KRYKPT5GW001	Water	06/23/06	X	X	X	X	X				
KRYKPT16GW001	Water	06/23/06	X	X	X	X	X				
KRYKPT16GW701	Water	06/23/06	X	X	X	X	X				
Trip Blank	Water	06/22/06	X								

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 5471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
Formaldehyde = Analyzed by a modification of National Institute of Occupational Safety and Health (NIOSH) Method 3500.
Chlorine = Analyzed for residual chlorine by Standard Method 4500-Cl-B.
Bromate = Analyzed by EPA Method 300.1 by Underwriters' Laboratories, Inc., of South Bend, Indiana, under subcontract.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY130BGW001. Almost all recoveries and all relative percent differences (RPD) were within QC limits. The exception was acetone, which yielded recoveries of 131 and 130 percent, versus laboratory-specific QC limits of 62 to 130 percent. Acetone was not detected in any of the samples, so no qualifications were applied for this minor exceedance.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The field duplicate sample pair in this SDG (samples KRYKPT16GW001 and KRYKPT16GW701) yielded identical results.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS analyses were performed on samples KRYKPT8AGW001 and KRYKPT16GW701, while MS/MSD analyses for the SIM analytes were performed on sample KRYKPT5GW001. All recoveries and RPDs for the SIM analytes were within QC limits.

The MS analysis performed on sample KRYKPT8GW001 yielded recoveries of 24 percent for benzoic acid, 69 percent for benzyl alcohol, 63 percent for bis(2-ethylhexyl)adipate, and 1 percent for tetraethyllead, all versus generic QC limits of 70 to 130 percent. In addition, there was a 103 percent recovery for 2,4,5-trichlorophenol,

versus laboratory-specific QC limits of 47 to 96 percent. Therefore, the following results were flagged "UJ" to indicate that they are considered estimated and may be biased low:

- Benzyl alcohol, bis(2-ethylhexyl)adipate, and tetraethyllead in sample KRYKPT8GW001

No qualifications were warranted for 2,4,5-trichlorophenol, because the recovery was biased high and this compound was not detected in the parent sample.

The MS analysis performed on sample KRYKPT16GW701 yielded recoveries of 61 percent for 1-methylnaphthalene, 65 percent for 2,3,4,5-tetrachlorophenol, 68 percent for 2,3,5,6-tetrachlorophenol, 62 percent for 2,6-dimethylnaphthalene, 69 percent for 3,3'-dichlorobenzidene, 63 percent for benzo(e)pyrene, 19 percent for benzoic acid, 49 percent for benzyl alcohol, 65 percent for biphenyl, 38 percent for bis(2-ethylhexyl)adipate, and 1 percent for tetraethyllead, all versus generic QC limits of 70 to 130 percent. In addition, hexachloroethane yielded a recovery of 41 percent, versus SAP-specified QC limits of 43 to 76 percent. Therefore, the following results were flagged "UJ" to indicate that they are considered estimated and may be biased low:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, hexachloroethane, and tetraethyllead in sample KRYKPT16GW701.

Because of the extremely low recovery from the MS/MSD samples, the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRYKPT8GW001 and KRYKPT16GW701.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results in the above samples were qualified as estimated rather than rejected.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. Most recoveries were within QC limits. The exceptions were benzoic acid with 12 percent recovery, benzyl alcohol with 57 percent recovery, and tetraethyllead with 1 percent recovery, all versus generic QC limits of 70 to 130 percent. Because of these low recoveries, the following results were flagged "UJ" to indicate that they are considered estimated and may be biased low:

- Benzyl alcohol and tetraethyllead in samples KRY130BGW001, KRYGW1GW001, KRY108AGW001, KRYKPT1GW001, KRYKPT7GW001, KRYKPT8GW001, KRYKPT5GW001, KRYKPT16GW001, and KRYKPT16GW701.

Because of the extremely low recovery from the LCS, the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRY130BGW001, KRYGW1GW001, KRY108AGW001, KRYKPT1GW001, KRYKPT7GW001, KRYKPT8GW001, KRYKPT5GW001, KRYKPT16GW001, and KRYKPT16GW701.

Again, tetraethyllead results were qualified as estimated rather than rejected because the spiking standard has apparently undergone severe degradation due to internal interactions.

Field Duplicate Samples

The field duplicate sample pair in this SDG (samples KRYKPT16GW001 and KRYKPT16GW701) yielded identical results.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were inherent in the characteristics of the analytes, specifically the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument. Because of the extremely low recoveries in those QC analyses, all of the benzoic acid results were rejected. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The field duplicate sample pair in this SDG (samples KRYKPT16GW001 and KRYKPT16GW701) yielded identical results.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY130BGW001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The field duplicate sample pair in this SDG (samples KRYKPT16GW001 and KRYKPT16GW701) yielded identical results.

Other Method-Specific QC Measures

All samples had total EPH concentrations were so low that the fractionation into specific compounds and classes was not possible.

Overall Assessment of This SDG

There were no significant problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRYGW1GW001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The field duplicate sample pair in this SDG (samples KRYKPT16GW001 and KRYKPT16GW701) yielded identical results.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range “J” to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory. No irregularities were observed.

Overall Assessment of This SDG

There were no serious problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Method blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples were either not detected or contained much higher concentrations, s no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. Almost all recoveries and all RPDs were within their QC limits. However, silver recoveries were 85 and 65 percent, versus SAP-specified QC limits of 75 to 125 percent and the RPD between those results was 27 percent, versus the SAP-specified QC limit of 20 percent. Therefore, the following result was flagged "UJ" to indicate that the sample reporting limit is considered estimated because of apparent matrix interference:

- Silver in sample KRYKPT1GW001

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDB

A few minor irregularities were observed in these analyses. The results may be used, as qualified, for the purposes stated in the workplan.

4.7 Formaldehyde Analysis

Deliverables

As originally delivered, the data package included all materials for cursory validation of this simple colorimetric method except for calibration information.

Holding Times

There are no specific requirements for holding time. The sample was analyzed within the VOC holding time of 14 days from collection to analysis.

Calibration

An initial calibration was performed at the start of the analytical run. All results were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses are not required for this analysis. No sample duplicate analysis was reported. No qualifications are warranted for this data gap.

Laboratory Control Sample Recoveries

An LCS was analyzed with and had a recovery were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the formaldehyde analysis. The results may be used, as reported, for the purposes stated in the workplan.

4.8 Chlorine Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial standardization of the iodine titrant.

Holding Times

There are no specific requirements for holding time, but the samples were analyzed less than 7 days after collection.

Calibration

The titrant was presumed to have been standardized as required.

Blanks

A method blank was analyzed as required and contained no detectable analyte.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

A LCS was analyzed with and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the residual chlorine analysis. The result may be used, as reported, for the purposes stated in the workplan.

4.9 Bromate Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial calibration data. The data for this analysis had not been included in the EDD, so they were added manually.

Holding Times

The samples were analyzed within the holding time of 28 days for disinfection by-products.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap.

Blanks

A method blank was analyzed as required and contained no detectable analyte.

Matrix Spike/Matrix Spike Duplicate Performance

No MS/MSD analyses were reported. No qualifications are warranted for this data gap.

Laboratory Control Sample Recoveries

A LCS was analyzed and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

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Overall Assessment of This SDG

There were no problems with the bromate analyses. The results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060247
Sample Numbers:	KRYIW5GW001, KRYIW6GW001, KRYIW1GW001, KRYIW2GW001, KRY129BGW001, KRYIW4GW001, KRYIW7GW001, KRYIW8GW001, KRY113BGW001, KRY113AGW001, and One Trip Blank
Matrix:	Ten Groundwater Samples and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	5 September 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060247

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	METALS
KRYIW5GW001	Water	06/21/06	X	X	X	X	X	
KRYIW6GW001	Water	06/21/06	X	X	X	X	X	
KRYIW1GW001	Water	06/21/06	X	X	X	X	X	
KRYIW2GW001	Water	06/21/06	X	X	X	X	X	
KRY129BGW001	Water	06/21/06	X	X	X	X	X	X
KRYIW4GW001	Water	06/22/06	X	X	X	X	X	
KRYIW7GW001	Water	06/22/06	X	X	X	X	X	
KRYIW8GW001	Water	06/22/06	X	X	X	X	X	
KRY113BGW001	Water	06/22/06	X	X	X	X	X	
KRY113AGW001	Water	06/22/06	X	X	X	X	X	
Trip Blank	Water	06/22/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance

* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With two exceptions, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. Those exceptions were acrolein in the continuing calibration performed on 3 July 2006 at 0949, which yielded a recovery of 59 percent versus QC limits of 75 to 125 percent, and bromomethane in the continuing calibration performed on 3 July 2006 at 1207, which yielded a recovery of 64 percent, versus the same QC limits. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limit is considered estimated:

- Acrolein and bromomethane in samples KRY113BGW001 and KRY113AGW001.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY129BGW001 and on a sample collected from another site. All recoveries and relative percent differences (RPD) for the MS/MSD analyses on sample KRY129BGW001 were within QC limits. There were a

number of irregularities in the MS/MSD analyses on the sample collected from another site. No qualifications are warranted for these minor problems in a sample collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Almost all of the %Ds were within QC limits. The exception was chrysene in the SIM continuing calibration performed on 28 June 2006 at 2211, which yielded a recovery of 122 percent versus QC limits of 80 to 120 percent. No chrysene was detected in the associated samples, so no qualifications were applied.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exceptions were 2-fluorobiphenyl in samples KRYIW5GW001, KRYIW6GW001, and KRYIW1GW001, which yielded recoveries of 38 to 42 percent, versus SAP-specified QC limits of 43 to 116 percent. No qualifications are required when only one SVOC surrogate is outside of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and on sample KRY129BGW001 (for the SIM analytes). The results for the sample collected from another site were similar to the LCS analyses, discussed below. Therefore, no further qualifications were applied for the irregular results for a sample collected from another site. The recoveries and RPDs for the SIM analytes were all within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. As observed in recent SDGs, quite a few recoveries were outside QC limits. Specifically, a number of analytes had recoveries below their generic QC limits of 70 to 130 percent. These included 1-methylnaphthalene with a recovery of 48 percent, 2,3,4,5-tetrachlorophenol with a recovery of 55 percent, 2,3,4-trichlorophenol with a recovery of 55 percent, 2,3,5,6-tetrachlorophenol with a recovery of 41 percent, 2,6-dimethylnaphthalene with a recovery of 49 percent, 3,3'-dichlorobenzidene with a recovery of 51 percent, benzo(e)pyrene with a recovery of 59 percent, benzoic acid with a recovery of 5 percent, benzyl alcohol with a recovery of 34 percent, biphenyl with a recovery of 50 percent, bis(2-ethylhexyl)adipate with a recovery of 51 percent, and tetraethyllead with a recovery of 0 percent. In addition, 2-chloronaphthalene yielded a recovery of 49 percent versus laboratory-specific QC limits of 52 to 89 percent and hexachlorobutadiene yielded a recovery of 37 percent versus laboratory-specific limits of 38 to 94 percent. Because of these low recoveries, the following results were flagged "UJ" to indicate that their sample detection limits are considered estimated:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 2-chloronaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-

ethylhexyl)adipate, hexachlorobutadiene, and tetraethyl lead in samples KRYIW5GW001, KRYIW6GW001, KRYIW1GW001, KRYIW2GW001, KRY129BGW001, KRYIW4GW001, KRYIW7GW001, KRYIW8GW001, KRY113BGW001, and KRY113AGW001.

Because of the extremely low recovery from the LCS, the following results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRYIW5GW001, KRYIW6GW001, KRYIW1GW001, KRYIW2GW001, KRY129BGW001, KRYIW4GW001, KRYIW7GW001, KRYIW8GW001, KRY113BGW001, and KRY113AGW001.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results were considered estimated rather than rejected.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No other problems were observed in these analyses. The laboratory flagged the results below the calibration range "J" to indicate that they are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were inherent in the characteristics of the analytes, namely the irregular responses in the LCS sample involving SVOCs known as "poor responders". The nondetected results for benzoic acid were rejected because of the extremely low recoveries in the LCS analysis, as well as in the MS/MSD analyses performed on a sample from another site. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDB. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRYIW5GW001. Most results were within QC limits. However, n-decane, the first aliphatic hydrocarbon in the spikes, yielded recoveries of 40 and 37 percent, versus QC limits of 40 to 140 percent. All RPDs and all recoveries for the other 9 aliphatic hydrocarbons and all 14 aromatic hydrocarbons were within their QC limits. Therefore, no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

Almost all of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and on sample KRY129BGW001. Recoveries could not be determined from the latter sample, because it contained a much higher concentration than the spike concentration. All other recoveries and RPDs were within QC limits, so no qualifications are warranted for the data gap.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Method blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples were either nondetected or contained much higher concentrations than the spike, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY129BGW001 and a sample collected from another site. Recoveries of silver from the analyses on sample KRY129BGW001 were 85 and 65 percent, versus SAP-specified limits of 75 to 125 percent. In addition, the RPD for silver was 27 percent, versus the SAP-specified limit of 20 percent.

Therefore, the following result was flagged “UJ” to indicate that the sample quantitation limit is considered estimated:

- Silver in sample KRY129BGW001

All other recoveries and RPDs were within their QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

There were no field duplicate samples in this SDG.

Overall Assessment of the SDB

No major irregularities were observed in these analyses. The results may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060219
Sample Numbers:	KRY121AGW001, KRY121AGW701, KRY130AGW001, KRY123AGW001, KRY127AGW001, KRY126AGW001, and One Trip Blank
Matrix:	Five Groundwater Samples, One Field Duplicate Groundwater Sample, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	30 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060219

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	METALS
KRY121AGW001	Water	06/20/06	X	X	X	X	X	X
KRY121AGW701	Water	06/20/06	X	X	X	X	X	X
KRY130AGW001	Water	06/20/06	X	X	X	X	X	
KRY123AGW001	Water	06/21/06	X	X	X	X	X	X
KRY127AGW001	Water	06/21/06	X	X	X	X	X	X
KRY126AGW001	Water	06/21/06	X	X	X	X	X	X
Trip Blank	Water	06/21/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures

Compound identification
Compound quantitation
Reported detection limits
Sample result verification
Tentatively identified compounds (TICs)
System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With one exception, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. That exception was naphthalene in the continuing calibration performed on 26 June 2006 at 2113, which yielded a recovery of 8 percent versus QC limits of 75 to 125 percent. The only samples analyzed after this standard were the trip blank and the MS/MSD samples. The latter had acceptable recoveries of naphthalene. Therefore, the following result was flagged "UJ" to indicate that the sample quantitation limit is considered estimated:

- Naphthalene in the Trip Blank sample.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY130AGW001. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There was good agreement between samples of the field duplicate pair (samples KRY121AGW001 and KRY121AGW701) in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exceptions were 2-fluorobiphenyl in the field duplicate pair, which yielded recoveries of 38 and 34 percent, respectively, versus SAP-specified QC limits of 43 to 116 percent. No qualifications are required when only one SVOC surrogate is outside of QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and a sample from another SDG (for the SIM analytes). The results for the sample from another site were substantially like those for the LCS analyses, discussed below. Therefore, no further qualifications were applied for the irregular results for a sample from elsewhere. The recoveries and RPDs for the SIM analytes were all within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. As observed in recent SDGs, quite a few recoveries were outside QC limits. Specifically, a number of analytes had recoveries below their generic QC limits of 70 to 130 percent. These included 1-methylnaphthalene with a recovery of 48 percent, 2,3,4,5-tetrachlorophenol with a recovery of 55 percent, 2,3,4-trichlorophenol with a recovery of 55 percent, 2,3,5,6-tetrachlorophenol with a recovery of 41 percent, 2,6-dimethylnaphthalene with a recovery of 49 percent, 3,3'-dichlorobenzidene with a recovery of 51 percent, benzo(e)pyrene with a recovery of 59 percent, benzoic acid with a recovery of 5 percent, benzyl alcohol with a recovery of 34 percent, biphenyl with a recovery of 50 percent, bis(2-ethylhexyl)adipate with a recovery of 51 percent, and tetraethyllead with a recovery of 0 percent. In addition, 2-chloronaphthalene yielded a recovery of 49 percent versus laboratory-specific QC limits of 52 to 89 percent and hexachlorobutadiene yielded a recovery of 37 percent versus laboratory-specific limits of 38 to 94 percent. Because of these low recoveries, the following results were flagged "UJ" to indicate that their sample detection limits are estimated:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 2-chloronaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, hexachlorobutadiene, and tetraethyllead in samples KRY121AGW001, KRY121AGW701, KRY130AGW001, KRY123AGW001, KRY127AGW001, and KRY126AGW001.

Because of the extremely low recovery from the LCS, the following results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY121AGW001, KRY121AGW701, KRY130AGW001, KRY123AGW001, KRY127AGW001, and KRY126AGW001.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results were qualified as estimated rather than rejected.

Field Duplicate Samples

There was exact agreement between the field duplicate pair (samples KRY121AGW001 and KRY121AGW701) in this SDG. Both were free of detectable analytes.

Other Method-Specific QC Measures

No other problems were observed in the analysis of these relatively clean samples.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were inherent in the characteristics of the analytes namely the irregular responses in the LCS sample involving SVOC known as "poor responders". The nondetected results for benzoic acid were rejected because of the extremely low recoveries in the LCS analysis. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY130AGW001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There was good agreement between the field duplicate pair (samples KRY121AGW001 and KRY121AGW701) in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY130AGW001. Most results were within QC limits. However, n-decane, the first aliphatic hydrocarbon in the spikes, yielded recoveries of 29 and 30 percent and naphthalene, the first aromatic hydrocarbon in the spikes, yielded recoveries of 38 and 33 percent, both versus QC limits of 40 to 140 percent. All RPDs and all recoveries for the other 9 aliphatic hydrocarbons and 13 aromatic hydrocarbons were within their QC limits. Therefore, no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There was good agreement between the field duplicate pair (samples KRY121AGW001 and KRY121AGW701) in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

Most of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample from another SDG and a sample collected from another site. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

There was good agreement between the field duplicate pair (samples KRY121AGW001 and KRY121AGW701) in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All calibration results were within QC limits.

Blanks

Method blanks were analyzed as required and contained trace concentrations of several analytes. The accompanying samples contained much higher concentrations or were not detected, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY121AGW001 and a sample collected from another site. Recoveries of barium could not be determined because the sample contained a much high concentration of barium than the spike concentration. No qualifications are warranted for this data gap. All other recoveries and all RPDs were within their QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

There was good agreement between the field duplicate pair (samples KRY121AGW001 and KRY121AGW701) in this SDG.

Overall Assessment of the SDB

No irregularities were observed in these analyses. The results may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060173
Sample Numbers:	KRY116BGW001, KRY101AGW001, KRY101BGW001, KRY103BGW001, KRY100AGW001, KRY110AGW001, KRY103AGW001, KRY106BGW001, KRY106AGW001, KRY105AGW001, KRY110BGW001, KRY107BGW001, KRY107AGW001, KRY111BGW001, KRY111AGW001, KRY111AQE001, KRY109AGW001, and Trip Blank
Matrix:	Sixteen Ground Water Samples, One Equipment Rinsate (Water) Sample, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	30 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060173

Sample ID	Matrix	Date Collected	Analyses								
			VOC	SVOC	VPH	EPH	PCP	Metals	Formaldehyde	Chlorine	Bromate
KRY116BGW001	Water	06/14/06	X	X	X	X	X				
KRY101AGW001	Water	06/14/06	X	X	X	X	X	X	X	X	X
KRY101BGW001	Water	06/15/06	X	X	X	X	X		X	X	X
KRY103BGW001	Water	06/15/06	X	X	X	X	X	X			
KRY100AGW001	Water	06/15/06	X	X	X	X	X	X			
KRY110AGW001	Water	06/15/06	X	X	X	X	X				
KRY103AGW001	Water	06/15/06	X	X	X	X	X	X			
KRY106BGW001	Water	06/15/06	X	X	X	X	X				
KRY106AGW001	Water	06/15/06	X	X	X	X	X				
KRY105AGW001	Water	06/15/06	X	X	X	X	X				
KRY110BGW001	Water	06/16/06	X	X	X	X	X				
KRY107BGW001	Water	06/16/06	X	X	X	X	X	X			
KRY107AGW001	Water	06/16/06	X	X	X	X	X	X			
KRY111BGW001	Water	06/16/06	X	X	X	X	X	X			
KRY111AGW001	Water	06/16/06	X	X	X	X	X	X			
KRY111AQE001	Water	06/16/06	X	X	X	X	X	X			
KRY109AGW001	Water	06/16/06	X	X	X	X	X				
Trip Blank	Water	06/16/06	X								

TABLE 1 (continued)
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060173

Notes:

VOC	=	Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC	=	Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH	=	Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH	=	Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP	=	Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals	=	Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 5471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
Formaldehyde	=	Analyzed by a modification of National Institute of Occupational Safety and Health (NIOSH) Method 3500.
Chlorine	=	Analyzed for residual chlorine by Standard Method 4500-Cl-B.
Bromate	=	Analyzed by EPA Method 300.1 by Underwriters' Laboratories, Inc., of South Bend, Indiana, under subcontract.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits with one exception. The continuing calibration performed on 26 June 2006 at 2119 yielded a recovery of only 8 percent for naphthalene, versus QC limits of 75 to 125 percent. The only samples

analyzed after this standard were the trip blank and the MS/MSD samples. The MS/MSD samples had acceptable recoveries for naphthalene, so the following result was flagged "UJ" to indicate that the sample quantitation limit is considered estimated:

- Naphthalene in the trip blank sample

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank contained no analytes but the equipment rinsate contained a trace (less than 1 microgram per liter) of the common laboratory contaminant methylene chloride. No groundwater data were qualified on the basis of rinsate contamination.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. All recoveries and relative percent differences (RPD) were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. Three samples (KRY105AGW001, KRY107BGW001, and KRY107AGW001) yielded recoveries of 2-fluorobiphenyl ranging from 40 percent to 42 percent, versus the SAP-specified QC limits of 43 to 116 percent. No qualifications are warranted for a single SVOC surrogate outside of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY101AGW001 and a sample from another SDG (for the SIM analytes). A number of recoveries were outside their QC limits. These included 1-methylnaphthalene with recoveries of 52 and 64 percent, versus generic QC limits of 70 to 130 percent; 2,3,4,5-tetrachlorophenol with recoveries of 53 and 52 percent, versus the same generic QC limits; 2,3,5,6-tetrachlorophenol yielded

recoveries or 43 and 54 percent, versus the same generic QC limits; 2,6-dimethylnaphthalene with recoveries of 66 and 73 percent, versus the same generic QC limits; 3,3'-dichlorobenzidene with recoveries of 57 and 70 percent, versus the same generic QC limits; benzo(e)pyrene with recoveries of 62 and 67 percent, versus the same generic QC limits; benzoic acid with recoveries of 11 and 17 percent, versus the same generic QC limits; benzyl alcohol with recoveries of 40 and 53 percent, versus the same generic QC limits; biphenyl with recoveries of 66 and 76 percent, versus the same generic QC limits; bis(2-ethylhexyl)adipate with recoveries of 57 and 59 percent versus the same generic QC limits of 70 to 130 percent; indeno(1,2,3-cd)pyrene with recoveries of 41 to 56 percent, versus laboratory-specific QC limits of 43 to 125 percent; tetraethyllead with recoveries of 1 and 1 percent, versus generic QC limits of 70 to 130 percent; benzo(a)anthracene with recoveries of 49 and 56 percent, versus laboratory-specific QC limits of 57 to 115 percent; benzo(b)fluoranthene with recoveries of 51 and 52 percent, versus laboratory-specific QC limits of 54 to 120; and pyrene with recoveries of 52 and 59 percent, versus laboratory-specific QC limits of 56 to 116 percent. As discussed below, there are similar low recoveries from the LCS, implying that this may be a laboratory problem rather than matrix interference from the sample. Therefore, the following results were flagged "UJ" or "J", as appropriate, to indicate that they are estimated and may be biased low:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, bis(2-ethylhexyl)adipate, tetraethyllead, benzo(a)anthracene, benzo(b)fluoranthene, and pyrene in samples KRY116BGW001, KRY101AGW001, KRY101BGW001, KRY103BGW001, KRY100AGW001, KRY110AGW001, KRY103AGW001, KRY106BGW001, KRY106AGW001, KRY105AGW001, KRY110BGW001, KRY107BGW001, KRY107AGW001, KRY111BGW001, KRY111AGW001, KRY111AQE001, and KRY109AGW001

Because of the extremely low recovery from the MS/MSD samples, the following nondetected results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY116BGW001, KRY101AGW001, KRY101BGW001, KRY103BGW001, KRY100AGW001, KRY110AGW001, KRY103AGW001, KRY106BGW001, KRY106AGW001, KRY105AGW001, KRY110BGW001, KRY107BGW001, KRY107AGW001, KRY111BGW001, KRY111AGW001, KRY111AQE001, and KRY109AGW001

Biphenyl and indeno(1,2,3-cd)pyrene results were not qualified because the average recoveries were within QC limits. Tetraethyllead results were qualified as estimated rather than rejected because the spiking standard has apparently undergone severe degradation due to internal interactions.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Many recoveries were within QC limits, but the exceptions are quite similar to the MS/MSD analyses. Results outside of the generic QC limits of 70 to 130 percent were 1-methylnaphthalene with a 54 percent recovery, 2,3,4,5-tetrachlorophenol with a 51 percent recovery, 2,3,4-trichlorophenol with a 65 percent recovery, 2,3,5,6-tetrachlorophenol with a 44 percent recovery, 2,6-dimethylnaphthalene with a 55 percent recovery, 3,3'-dichlorobenzidene with a 52 percent recovery, benzo(e)pyrene with a 58 percent recovery, benzoic acid with a 9 percent recovery, benzyl alcohol with a 41 percent recovery, biphenyl with a 58 percent recovery, bis(2-ethylhexyl)adipate with a 53 percent recovery, and tetraethyllead with a 1 percent recovery. In addition, benzo(b)fluoranthene yielded a 49 percent recovery versus laboratory-specific QC limits of 54 to 120 percent. Because of these low recoveries, the following results were flagged "UJ" or "J", as appropriate, to indicate that they are considered estimated and may be biased low:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzo(b)fluoranthene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY116BGW001, KRY101AGW001, KRY101BGW001, KRY103BGW001, KRY100AGW001, KRY110AGW001, KRY103AGW001, KRY106BGW001, KRY106AGW001, KRY105AGW001, KRY110BGW001, KRY107BGW001, KRY107AGW001, KRY111BGW001, KRY111AGW001, KRY111AQE001, and KRY109AGW001

Because of the extremely low recovery from the LCS, the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRY116BGW001, KRY101AGW001, KRY101BGW001, KRY103BGW001, KRY100AGW001, KRY110AGW001, KRY103AGW001, KRY106BGW001, KRY106AGW001, KRY105AGW001, KRY110BGW001, KRY107BGW001, KRY107AGW001, KRY111BGW001, KRY111AGW001, KRY111AQE001, and KRY109AGW001

Again, tetraethyllead results were qualified as estimated rather than rejected because the spiking standard had apparently undergone severe degradation.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were inherent in the characteristics of the analytes, specifically the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument. Because of the extremely low recoveries in the LCS and MS/MSD analyses, all of the nondetected benzoic acid results were rejected. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of the apparent degradation of calibration standards and spiking solutions. All other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY101AGW001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

All samples but one had total EPH concentrations that were so low that the fractionation into specific compounds and classes was impossible.

Overall Assessment of This SDG

There were no significant problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY101AGW001. The recoveries were only 8 and 9 percent, respectively, versus SAP-specified QC limits of 9 to 103 percent for aqueous samples. Therefore, the following nondetected result was flagged "UJ" to indicate that it is considered estimated and may be biased low:

- Pentachlorophenol in sample KRY101AGW001

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory. No irregularities were observed.

Overall Assessment of This SDG

There were no serious problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

Matrix blanks were analyzed and required and contained trace concentrations of several analytes. The accompanying samples contained either none at all or much high concentrations, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY101AGW001. Recoveries of barium and manganese could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Almost all recoveries and all RPDs were within their QC limits. However, silver recoveries were 54 and 83 percent, versus QC limits of 75 to 125 percent. Therefore, the following results were flagged "UJ" to indicate that the sample reporting limits are considered estimated:

- Silver in samples KRY101AGW001, KRY103BGW001, KRY100AGW001, KRY103AGW001, KRY107BGW001, KRY107AGW001, KRY111BGW001, KRY111AGW001, and KRY111AQE001

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses. The results may be used as qualified for the purposes stated in the workplan.

4.7 Formaldehyde Analysis

Deliverables

As originally delivered, the data package included all materials for cursory validation of this simple colorimetric method except for calibration information.

Holding Times

There are no specific requirements for holding time. The samples were analyzed within the VOC holding time of 14 days from collection to analysis.

Calibration

An initial calibration was performed at the start of the analytical run. All results were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses are not required for this analysis. No sample duplicate analysis was reported. No qualifications are warranted for this data gap.

Laboratory Control Sample Recoveries

An LCS was analyzed and the recovery was within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the formaldehyde analysis. The results may be used, as reported, for the purposes stated in the workplan.

4.8 Chlorine Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial standardization of the iodine titrant.

Holding Times

There are no specific requirements for holding time, but the samples were analyzed less than 7 days after collection.

Calibration

The titrant was presumed to have been standardized as required. No qualifications were required for this data gap.

Blanks

A method blank was analyzed as required and contained no detectable chlorine.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

A LCS was analyzed and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the residual chlorine analysis. The results may be used, as reported, for the purposes stated in the workplan.

4.9 Bromate Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial calibration data. The data for this analysis were included in the EDD, so the results were added manually.

Holding Times

The samples were analyzed within the holding time of 28 days for disinfection by-products.

Calibration

Continuing calibrations were performed as required and were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable bromate.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY101BGW001. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

A LCS was analyzed and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

In sample KRY101AGW001 recovery of the surrogate dichloroacetate was 86 percent, versus QC limits of 90 to 115 percent. Therefore, the following result was flagged "UJ" to indicate that the sample quantitation limit is considered estimated and may be biased low:

- Bromate in sample KRY101AGW001.

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Overall Assessment of This SDG

There were no serious problems with the bromate analyses. The results may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060145
Sample Numbers:	KRY104AGW001, KRY112BGW001, KRY112AGW001, KRY116AGW001, and Two Trip Blanks
Matrix:	Four Groundwater Samples and Three Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	29 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060145

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH
KRY104AGW001	Water	06/14/06	X	X	X	X	X
KRY112BGW001	Water	06/14/06	X	X	X	X	X
KRY112AGW001	Water	06/14/06	X	X	X	X	X
KRY116AGW001	Water	06/14/06	X	X	X	X	X
Trip Blank	Water	06/14/06	X				
Trip Blank	Water	06/14/06	X				

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With one exception, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. The exception was acrolein in the continuing calibration performed on 21 June 2006 at 1216, which yielded a recovery of 62 percent versus QC limits of 70 to 130 percent. Therefore,

the following results were flagged "UJ" to indicate that the sample quantitation limits are estimated:

- Acrolein in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, KRY116AGW001, and two trip blanks.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001 from SDG H06060128. Most recoveries and all relative percent differences (RPD) for the MS/MSD analyses were within QC limits. The exceptions were styrene, with recoveries of 54 and 44 percent versus laboratory-specific QC limits of 76 to 132 percent; 1,2,4-trimethylbenzene, with recoveries of 65 and 66 percent versus laboratory-specific QC limits of 71 to 128 percent; and 1,3,5-trimethylbenzene, with recoveries of 66 and 57 percent versus laboratory-specific QC limits of 68 to 135 percent. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are estimated:

- Styrene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, KRY116AGW001, and two trip blanks.

Because all samples appeared to be very similar and these results are similar to those for the continuing calibration, these qualifications were applied to all field samples, rather than just to the one sample used for the MS/MDS analyses.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8270C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Almost all of the %Ds of the continuing calibrations from the initial calibrations were within QC limits. The exception was tetraethyllead in the standard analyzed on 20 June 2006 at 1616, which yielded a recovery of 63 percent versus laboratory-specific QC limits of 70 to 130 percent. The laboratory stated that tetraethyllead was degrading as a result of interactions with other compounds in the standards. The following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- Tetraethyllead in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, and KRY116AGW001.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001 and sample KRY115AGW001 (for the SIM analytes), both from SDG H06060128. There were a number of recoveries outside of QC limits. Specifically, 2,3,4,5-tetrachlorophenol yielded recoveries of 53 and 50 percent, 2,3,5,6-tetrachlorophenol yielded recoveries of 48 and 47 percent, 2,6-dimethylnaphthalene yielded recoveries of 65 and 65 percent, 3,3'-dichlorobenzidine yielded recoveries of 63 and 61 percent, benzo(e)pyrene yielded recoveries of 59 and 55 percent, benzoic acid yielded recoveries of 11 and 11 percent, benzyl alcohol yielded recoveries of 41 and 39 percent, biphenyl yielded recoveries of 61 and 62 percent, bis(2-ethylhexyl)adipate yielded recoveries of 38 and 42 percent, and tetraethyllead yielded recoveries of 1 and 1 percent, all versus generic QC limits of 70 to 130 percent. Because of these low recoveries and the similar results from the LCS (discussed below), the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- 2,3,4,5-Tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, and KRY116AGW001

Because of the extremely low recoveries from the spiked samples, the following results were flagged "R" to indicate that they are rejected:

- Benzoic acid in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, and KRY116AGW001

The tetraethyllead results were not rejected because of the apparent degradation of the spiking standard.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the LCS analyzed on 20 June 2006 at 1821 yielded recoveries of 58 percent for 1-methylnaphthalene, 49 percent for 2,3,4,5-tetrachlorophenol, 49 percent for 2,3,5,6-tetrachlorophenol, 58 percent for 2,6-dimethlynaphthalene, 54 percent for 2,6-dinitrotoluene, 63 percent for 3,3'-dichlorobenzidene, 65 percent for benzo(e)pyrene, 8 percent for benzoic acid, 37 percent for benzyl alcohol, 64 percent for biphenyl, 65 percent for bis(2-ethylhexyl)adipate, and only 1 percent for tetraethyllead, all versus generic QC limits of 70 to 130 percent. The following non-detected results were flagged "UJ" to indicate that they are considered estimated:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 2,6-dinitrotoluene, 63 percent 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, and KRY116AGW001.

Because of the extremely low recovery, the following results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRY104AGW001, KRY112BGW001, KRY112AGW001, and KRY116AGW001.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results were merely estimated rather than rejected.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No other problems were observed.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS sample involving SVOC known as "poor responders") or because of the sample matrix, especially the high extractable organic content of some samples. The nondetected results for benzoic acid were rejected because of the extremely low recoveries in the LCS and MS/MSD analyses. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of degradation of calibration standards and spiking solutions. All results except for benzoic acid may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001 from SDG H06060128. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY104AGW001. All results were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

All of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analyte.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060128
Sample Numbers:	KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, KRY115AGW001, and Three Trip Blanks
Matrix:	Four Groundwater Samples, One Field Duplicate Groundwater Sample, and Three Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	29 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060128

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH
KRY102BGW001	Water	06/13/06	X	X	X	X	X
KRY115BGW001	Water	06/13/06	X	X	X	X	X
KRY102AGW001	Water	06/13/06	X	X	X	X	X
KRY102AGW701	Water	06/13/06	X	X	X	X	X
KRY115AGW001	Water	06/13/06	X	X	X	X	X
Trip Blank	Water	06/13/06	X				
Trip Blank	Water	06/13/06	X				
Trip Blank	Water	06/13/06	X				

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification

Compound quantitation
Reported detection limits
Sample result verification
Tentatively identified compounds (TICs)
System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. With one exception, the percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits. The exception was acrolein in the continuing calibration performed on 21 June 2006 at 1216, which yielded a recovery of 62 percent versus QC limits of 70 to 130 percent. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- Acrolein in samples KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, KRY115AGW001, and three trip blanks.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001. Most recoveries and all relative percent differences (RPD) for the MS/MSD analyses were within QC limits. The exceptions were styrene, with recoveries of 54 and 44 percent versus laboratory-specific QC limits of 76 to 132 percent; 1,2,4-trimethylbenzene, with recoveries of 65 and 66 percent versus laboratory-specific QC limits of 71 to 128 percent; and 1,3,5-trimethylbenzene, with recoveries of 66 and 57 percent versus laboratory-specific QC limits of 68 to 135 percent. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are estimated:

- Styrene, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene in samples KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, KRY115AGW001, and three trip blanks.

Because all samples appeared to be very similar and these recoveries are similar to those for the continuing calibration, qualifications were applied to all field samples, rather than the usual one sample used for the MS/MDS analyses.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The results for the field duplicate pair (samples KRY102AGW001 and KRY102AGW701) were nondetected for all target analytes.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no serious problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Almost all of the %Ds of the continuing calibrations from the initial calibrations were within QC limits. The exception was tetraethyllead in the standard analyzed on 20 June 2006 at 1616, which yielded a recovery of 63 percent versus laboratory-specific QC limits of 70 to 130 percent. The laboratory stated that tetraethyllead was degrading because of interactions with other

compounds in the standards. The following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- Tetraethyllead in samples KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, and KRY115AGW001.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001 and sample KRY115AGW001(for the SIM analytes). A number of recoveries were outside of QC limits. Specifically, 2,3,4,5-tetrachlorophenol yielded recoveries of 53 and 50 percent, 2,3,5,6-tetrachlorophenol yielded recoveries of 48 and 47 percent, 2,6-dimethylnaphthalene yielded recoveries of 65 and 65 percent, 3,3'-dichlorobenzidine yielded recoveries of 63 and 61 percent, benzo(e)pyrene yielded recoveries of 59 and 55 percent, benzoic acid yielded recoveries of 11 and 11 percent, benzyl alcohol yielded recoveries of 41 and 39 percent, biphenyl yielded recoveries of 61 and 62 percent, bis(2-ethylhexyl)adipate yielded recoveries of 38 and 42 percent, and tetraethyllead yielded recoveries of 1 and 1 percent, all versus generic QC limits of 70 to 130 percent. Because of these low recoveries and the similar results from the LCS (discussed below), the following results were flagged "UJ" to indicate that the sample quantitation limits are estimated:

- 2,3,4,5-Tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, and KRY115AGW001

Because of the extremely low recoveries from the spiked samples, the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, and KRY115AGW001

The tetraethyllead results were not rejected because of the apparent degradation of the spiking standard. Because all samples appeared to be very similar, qualifications were applied to all field samples, rather than the usual one sample used for the MS/MDS analyses.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the LCS analyzed on 20 June 2006 at 1821 yielded recoveries of 58 percent for 1-methylnaphthalene, 49 percent for 2,3,4,5-tetrachlorophenol, 49 percent for 2,3,5,6-tetrachlorophenol, 58 percent for 2,6-dimethlynaphthalene, 54 percent for 2,6-dinitrotoluene, 63 percent for 3,3'-dichlorobenzidene, 65 percent for benzo(e)pyrene, 8 percent for benzoic acid, 37 percent for benzyl alcohol, 64 percent for biphenyl, 65 percent for bis(2-ethylhexyl)adipate, and only 1 percent for tetraethyllead, all versus generic QC limits of 70 to 130 percent. The following non-detected results were flagged "UJ" to indicate that they are estimated:

- 1-Methylnaphthalene, 2,3,4,5-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, 2,6-dimethylnaphthalene, 2,6-dinitrotoluene, 3,3'-dichlorobenzidene, benzo(e)pyrene, benzyl alcohol, biphenyl, bis(2-ethylhexyl)adipate, and tetraethyllead in samples KRY102BGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, and KRY115AGW001

Because of the extremely low recovery, the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Benzoic acid in samples KRY012AGW001, KRY115BGW001, KRY102AGW001, KRY102AGW701, KRY115AGW001.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the results were qualified as estimated rather than rejected.

Field Duplicate Samples

The results for the field duplicate pair (samples KRY102AGW001 and KRY102AGW701) were nondetected for all target analytes.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the

LCS sample involving SVOC known as “poor responders”) or because of the sample matrix, especially the high extractable organic content of some samples. The nondetected results for benzoic acid were rejected because of the extremely low recoveries in the LCS and MS/MSD analyses. Tetraethyllead yielded even lower recoveries, but the nondetected results were qualified as estimated because of degradation of calibration standards and spiking solutions. All other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The results for the field duplicate pair (samples KRY102AGW001 and KRY102AGW701) were nondetected for all analytes.

Other Method-Specific QC Measures

No significant irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Continuing calibrations were performed at the required frequencies and concentrations. The %D were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY102BGW001. All results were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The results for the field duplicate pair (samples KRY102AGW001 and KRY102AGW701) were nondetected for all analytes.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

All of the samples contained no detectable concentrations of total EPH, so fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

The results for the field duplicate pair (samples KRY102AGW001 and KRY102AGW701) were nondetected for the target analyte.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060064
Sample Numbers:	KRY672SB001, KRY672SB002, KRY672SB003, and One Trip Blank
Matrix:	Three Soil Samples and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	28 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060064

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH
KRY672SB001	Soil	06/02/06	X	X	X	X	X
KRY672SB002	Soil	06/02/06	X	X	X	X	X
KRY672SB003	Soil	06/02/06	X	X	X	X	X
Trip Blank	Water	06/02/06	X				

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.

2.0 DATA VALIDATION REQUIREMENTS

All items listed, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

<u>Organic Analyses</u>

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers were used in this data validation report.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY672SB001. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on a sample collected from another site. Major irregularities were exhibited in the MS/MSD results, but no qualifications were required based on a sample collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the soil LCS analyzed on 19 June 2006 at 0807 yielded recoveries of 66 percent for 3,3'-dichlorobenzidene and only 3 percent for tetraethyllead, both versus generic QC limits of 70 to 130 percent. No qualifications are warranted for the minor irregularity in the recovery of 3,3'-dichlorobenzidene, which is known to be a poor responder on the analytical instrument. However, the following nondetected results were flagged "UJ" to indicate that they are considered estimated:

- Tetraethyllead in samples KRY672SB001, KRY672SB002 and KRY672SB003.

The laboratory noted that the tetraethyllead in the spiking solution had degraded in storage, so the nondetected results were qualified as estimated rather than rejected.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

Sample KRY672SB003 was analyzed at a 2-fold dilution because of the high concentration of extractable organic compounds in it. Reporting limits were raised accordingly. No qualifications are warranted for this irregularity, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS sample involving a SVOC known as a "poor responder") or because of the sample matrix, especially the high extractable organic content of one sample. The results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY672SB001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. The results were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged one result below the calibration range "J" to indicate that it is an extrapolation from the calibration curve. The value should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

Two of the three samples contained such low concentrations of total EPH that fractionation was not practical. There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications

were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06060029
Sample Numbers:	KRY127ASS001, KRY127ASB001, KRY127ASB002, KRY515SS001, KRY483SS001, KRY483SS002, KRY483SS003, KRY558QE001, KRY118ASS001, KRY670SB001, KRY670SB002, KRY669SB001, KRY667SB001, KRY667SB002, and KRY604SB001
Matrix:	Fourteen Soil Samples and One Rinsate (Water) Sample
QA Level:	Cursory validation on this SDG
Report Date:	25 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06060029

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY127ASS001	Soil	05/31/06	X	X	X	X	X	X				
KRY127ASB001	Soil	05/31/06	X	X	X	X	X	X				
KRY127ASB002	Soil	05/31/06	X	X	X	X	X	X				
KRY515SS001	Soil	05/31/06	X	X	X	X	X					
KRY483SS001	Soil	05/31/06	X	X	X	X	X					
KRY483SS002	Soil	05/31/06			X							
KRY483SS003	Soil	05/31/06			X							
KRY558QE001	Water	05/31/06	X	X	X	X	X	X				
KRY118ASS001	Soil	06/01/06	X	X	X	X	X	X				
KRY670SB001	Soil	06/01/06	X	X	X	X	X	X				
KRY670SB002	Soil	06/01/06	X	X	X	X	X	X				
KRY669SB001	Soil	06/01/06							X	X	X	X
KRY667SB001	Soil	06/01/06	X	X	X	X	X					
KRY667SB002	Soil	06/01/06	X	X	X	X	X					
KRY604SB001	Soil	06/02/06	X	X	X	X	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
SPLP VOC = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 8260B.
SPLP SVOC = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 8270C.
SPLP Metals = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Methods 6010B and 7470A.
SPLP pH = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 99045C.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The equipment rinsate also contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY483SS001 and KRY558QE001. Almost all recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits. The exception was in the aqueous MS/MSD analyses, which yielded an RPD of 28 percent for bromomethane and 22 percent for chloromethane. Neither compound was detected in the equipment rinsate sample, so no qualifications were applied for these minor exceedances of a generic QC limit.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed samples KRY483SS001, KRY558QE001, and KRY670SB001 (for the SIM analytes). All results from the aqueous and SIM MS/MSD analyses were within QC limits.

In the MS/MSD analyses performed on sample KRY483SS001, recoveries for 2,3,5,6-tetrachlorophenol were 68 and 81 percent, those of 2,3,4-trichlorophenol were 123 and 144 percent, those of benzoic acid were 31 and 33 percent, and those of tetraethyllead were 3 and 4 percent, all versus generic QC limits of 70 to 130 percent. Therefore, the following results were flagged “UJ” to indicate that the sample quantitation limits are estimated because of apparent matrix interference:

- Benzoic acid and tetraethyllead in sample KRY483SS001.

No qualifications were applied to the chlorinated phenols because neither was detected in the associated samples and the average recoveries were either within or above the QC limits. The laboratory narrative noted that tetraethyllead in the spiking solution had degraded, so the nondetected results for that compound were considered estimated, rather than rejected.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the soil LCS analyzed on 10 June 2006 at 1546 yielded low recoveries for 3,3'-dichlorobenzidine (66 percent versus generic QC limits of 70 to 130 percent) and tetraethyl lead (3 percent, versus generic QC limits of 70 to 130 percent). Neither of these SVOCs was detected in the associated soil samples, so the following associated results were flagged "UJ" to indicate that the quantitation limits are considered estimated:

- Tetraethyllead in samples KRY127ASS001, KRY127ASB001, KRY127ASB002, KRY515SS001, KRY483SS001, KRY118ASS001, and KRY670SB001

No qualifications were applied for the slightly low recovery for 3,3'-dichlorobenzidene, because the generic QC limits may be inappropriate. The laboratory narrative noted that tetraethyllead in the spiking solution had degraded, so the nondetected results for that compound were considered estimated, rather than rejected.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, two samples contained such high concentrations of extractable organic compounds that the laboratory analyzed them at 5-fold dilutions. No qualifications are warranted for this irregularity, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" to the instrument) or because of

the sample matrix, especially the high extractable organic content of some samples. Results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY483SS001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on KRY483SS001. All results were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted.

Overall Assessment of This SDG

Most samples contained such low concentrations of total EPH that fractionation was not practical. There were no major problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY558QE001 and a soil sample collected from another site. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks contained traces of some analytes, but the sample was either nondetected or sample results were much higher than the blank contamination, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required, although some of the samples used were collected from other sites. All aqueous MS/MSD results, performed on sample KRY558QE001, were within QC limits.

In the soil MS/MSD analyses performed on sample KRY127ASS001, recoveries of aluminum and iron could not be determined because the sample contained much higher concentrations of these metals than the spike concentrations. No qualifications are warranted for these data gaps. Antimony recoveries were 30 and 31 percent (a re-analysis yielded recoveries of 39 and 41 percent), barium recoveries were 186 and 117 percent, lead recoveries were 106 and 152 percent, selenium recoveries were 66 and 69 percent, and tin recoveries were 72 and 81 percent, all versus SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are estimated because of apparent matrix interference, irregular distributions of the metal within the sample, or both:

- Antimony, barium lead, and selenium in samples KRY127ASS001, KRY127ASB001, KRY118ASS001, and KRY670SB001

Lead results were not qualified in samples KRY127ASB002 and KRY670SB002, because MS/MSD recoveries were biased high and lead was not detected in these samples. No qualifications were applied for tin because the average recovery was within QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The results for metals in soil may be used, as qualified, for the purposes stated in the workplan.

4.7 Synthetic Precipitation Leaching Procedure Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were within the holding times of 14 days from collection to SPLP extraction and 14 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

SPLP MS/MSD analyses were performed on sample KRY669SB001 and all recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the SPLP VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.8 Synthetic Precipitation Leaching Procedure Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to SPLP extraction, 7 days from SPLP extraction to preparative extraction, and 40 days from preparative extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

No SPLP MS/MSD analyses were performed. No qualifications are warranted for this data gap. The aqueous MS/MSD analyses are discussed in Section 4.2, above. No further qualifications are warranted.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the SPLP SVOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.9 Synthetic Precipitation Leaching Procedure Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration and continuing calibration blank data.

Holding Times

Samples were extracted and analyzed within the holding times of 28 days from collection to SPLP extraction and 28 days from SPLP extraction to analysis for mercury and 6 months from collection to SPLP extraction and 6 months from SPLP extraction to analysis for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The aqueous matrix blank contained low concentrations of several metals. The samples nondetected for those metals, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

No SPLP MS/MSD analyses were performed. No qualifications are warranted for this data gap. The aqueous MS/MSD analyses are discussed in Section 4.6, above. No further qualifications are warranted.

Laboratory Control Sample Recovery

LCSs were run with the analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

No significant irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.10 Synthetic Precipitation Leaching Procedure pH Analysis

Deliverables

As originally delivered, the data package included only the results of the analysis. No QC data were included, although a minimum of continuing calibration, LCS, and sample duplicate result were expected. Because of this lack of information, the following result was flagged "J" to indicate that it is considered estimated:

- SPLP pH in sample KRY669SB001

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050307
Sample Numbers:	KRY139ASB001, KRY129ASB001, KRY609SS001, KRY609SB001, KRY609SB002, KRY609SB003, KRY608SS001, KRY608SB001, KRY608SB002, KRY608SB003, KRY126ASS001, KRY126ASB001, KRY126ASB002, KRY608QE001, and Two Trip Blanks
Matrix:	Thirteen Soil Samples, One Equipment Rinsate (Aqueous) Sample, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	25 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050307

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY139ASB001	Soil	05/24/06	X	X	X	X	X	
KRY129ASB001	Soil	05/24/06	X	X	X	X	X	
KRY609SS001	Soil	05/24/06	X	X	X	X	X	X
KRY609SB001	Soil	05/24/06	X	X	X	X	X	X
KRY690SB002	Soil	05/24/06	X	X	X	X	X	X
KRY609SB003	Soil	05/24/06	X	X	X	X	X	X
KRY608SS001	Soil	05/25/06	X	X	X	X	X	X
KRY608SB001	Soil	05/25/06	X	X	X	X	X	X
KRY608SB002	Soil	05/25/06	X	X	X	X	X	X
KRY608SB003	Soil	05/25/06	X	X	X	X	X	X
KRY126ASS001	Soil	05/25/06	X	X	X	X	X	X
KRY126ASB001	Soil	05/25/06	X	X	X	X	X	X
KRY126ASB002	Soil	05/25/06	X	X	X	X	X	X
KRY608QE001	Water	05/25/06	X	X	X	X	X	X
Trip Blank	Water	05/24/06	X					
Trip Blank	Water	05/25/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks and equipment rinsate also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY608SS001 and aqueous MS/MSD analyses were performed on a sample collected from another site. Almost all recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits. The sole exception was naphthalene in the soil MS/MSD analyses, which yielded an RPD of 25 percent, versus the laboratory's QC limit of 20 percent. No naphthalene was detected in the sample used for the analyses, so no qualifications are warranted.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Almost all recoveries were within QC limits. The exception was a 133 percent recovery (versus QC limits of 62 to 130 percent) for acetone in the aqueous LCS analyzed on 5 June 2006 at 1015. No acetone was detected in the accompanying samples, so no qualifications are warranted for this minor exceedance.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. No SVOC analytes were detected in the equipment rinsate sample.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil and water MS/MSD analyses were performed on samples collected from another site. No qualifications were warranted for minor irregularities in the MS/MSD results for a sample from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the aqueous LCS analyzed on 2 June 2006 at 1049 yielded recoveries of 63 percent for 2-methylnaphthalene, 67 percent for 2,3,4-trichlorophenol, 56 percent for

2,3,5,6-tetrachlorophenol, 69 percent for 2,6-dimethylnaphthalene, 14 percent for benzoic acid, 46 percent for benzyl alcohol, 66 percent for biphenyl, 64 percent for bis(2-ethylhexyl)adipate, and 46 percent for tetraethyllead. Because of its extremely low recovery, the following nondetected result was flagged "UJ" to indicate that the reporting limit is considered estimated and may be biased low:

- Benzoic acid in sample KRY608QE001.

As the laboratory noted, the generic QC limits may not be appropriate for the other irregular compounds, many of which are known as poor responders to the analytical instrument. Therefore, no further qualifications were applied.

In addition, the soil LCS analyzed on 7 June 2006 at 1910 yielded recoveries of 97 percent for 2,4-dimethylphenol (versus laboratory-specific QC limits of 31 to 95 percent) and 4 percent (versus generic QC limits of 70 to 130 percent) for tetraethyllead. The other soil LCS, analyzed on 10 June 2006 at 1546, yielded recoveries of 66 percent for 3,3'-dichlorobenzidene and only 3 percent for tetraethyllead, both versus generic QC limits of 70 to 130 percent. As with the water LCS, no qualifications are warranted for the minor irregularities in the recoveries of 2,4-dimethylphenol and 3,3'-dichlorobenzidene, both well known as poor responders on the analytical instrument. However, the following nondetected results were flagged "R" to indicate that they are considered rejected because of the extremely poor recoveries (less than 10 percent):

- Tetraethyllead in samples KRY139ASB001, KRY129ASB001, KRY609SS01, KRY609SB001, KRY609SB002, KRY609SB003, KRY608SS001, KRY608SB001, KRY608SB002, KRY608SB003, KRY126ASS001, KRY126ASB001, and KRY126ASB002.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, three soil samples contained so much extractable organic compounds that they were analyzed at 5- to 20-fold dilution. Reporting limits were raised accordingly. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders") or because of the sample matrix, especially the high extractable organic content of some samples. The nondetected results for tetraethyllead in the soil samples were rejected. All other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY608SS001 and samples collected from another site. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY608SS001 and on a sample collected from another site. The results from the sample collected from another site were within

QC limits, as were most results for sample KRY608SS001. However, n-decane yielded recoveries of 30 and 45 percent, versus QC limits of 40 to 140 percent. No qualifications were applied for this minor irregularity in one of the components of hydrocarbon mixtures.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

Many samples contained such low concentrations of total EPH that fractionation was not practical. There were no serious problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY608QE001 and KRY608SS001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the samples contained either much higher concentrations or none at all, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The soil MS/MSD analyses were performed on sample KRY608SS001. Recoveries of aluminum, barium, and iron could not be determined because the sample contained much higher concentrations of these metals than the spike concentrations. No qualifications are warranted for these data gaps. Antimony recoveries were 22 and 23 percent, beryllium recoveries were 75 and 74 percent, cadmium recoveries were 73 and 72 percent, lead recoveries were 78 and 74 percent, manganese recoveries were 67 and 61 percent, nickel recoveries were 72 and 72 percent, selenium recoveries were 63 and 64 percent, thallium recoveries were 75 and 73 percent, and tin recoveries were 71 and 69 percent, all versus SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated because of apparent matrix interference:

- Beryllium, cadmium, manganese, nickel, selenium, thallium and tin in samples KRY609SS001, KRY609SB001, KRY609SB002, KRY609SB003, KRY608SS001, KRY608SB001, KRY608SB002, KRY608SB003, KRY126ASS001, KRY126ASB001, and KRY126ASB002

Because of the extremely low recoveries (less than 30 percent), the following nondetected results were flagged "R" to indicate that they are considered rejected:

- Antimony in sample KRY609SS001, KRY609SB001, KRY609SB002, KRY609SB003, KRY608SS001, KRY608SB001, KRY608SB002, KRY608SB003, KRY126ASS001, KRY126ASB001, and KRY126ASB002

Lead results were not qualified because the average recovery was within the QC limits.

The aqueous MS/MSD analyses were performed on a sample from a different site, with all results within QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and almost all results were within QC limits. The exception was silver recoveries of 67 percent, versus laboratory-specific QC limits of 85 to 115 percent, in the aqueous LCS. Therefore, the following result was flagged "UJ" to indicate that the quantitation limit is considered estimated:

- Silver in sample KRY608QE001.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders. The non-detected antimony results in the soil samples were rejected because of extremely low recoveries in the MS/MSD analyses. All other metal results may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050262
Sample Numbers:	KRY103ASS001, KRY103ASS002, KRY103ASS003, KRY103ASB001, KRY103ASB002, KRY103ASB003, KRY105ASS001, KRY105ASB001, KRY105ASB002, KRY499SS001, KRY660SS001, KRY660SB001, KRY660SB002, KRY501SS001, KRY660SB003, KRY660QE001, KRY113ASS001, KRY113ASB002, and Two Trip Blanks
Matrix:	Seventeen Soil Samples, One Equipment Rinsate (Aqueous) Sample, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	24 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050262

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY103ASS001	Soil	05/22/06	X	X	X	X	X	X
KRY103ASS002	Soil	05/22/06			X			
KRY103ASS003	Soil	05/22/06			X			
KRY103ASB001	Soil	05/22/06	X	X	X	X	X	X
KRY103ASB002	Soil	05/22/06	X	X	X	X	X	
KRY103ASB003	Soil	05/22/06	X	X	X	X	X	X
KRY105ASS001	Soil	05/22/06	X	X	X	X	X	
KRY105ASB001	Soil	05/22/06	X	X	X	X	X	X
KRY105ASB002	Soil	05/22/06	X	X	X	X	X	X
KRY499SS001	Soil	05/22/06	X	X	X	X	X	
KRY660SS001	Soil	05/22/06	X	X	X	X	X	
KRY660SB001	Soil	05/22/06	X	X	X	X	X	X
KRY660SB002	Soil	05/22/06	X	X	X	X	X	X
KRY501SS001	Soil	05/22/06	X	X	X	X	X	X
KRY660SB003	Soil	05/22/06	X	X	X	X	X	X
KRY660QE001	Water	05/23/06	X	X	X	X	X	X
KRY113ASS001	Soil	05/23/06	X	X	X	X	X	
KRY113ASB002	Soil	05/23/06	X	X	X	X	X	
Trip Blank	Water	05/22/06	X					
Trip Blank	Water	05/23/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes. The equipment rinsate sample (KRY660QE001) contained a trace quantity (less than 1 microgram per liter) of chloroform and some SVOCs. Chloroform is a trihalomethane that is commonly found in water that has been disinfected with active chlorine (chlorine gas, hypochlorite, or another chemical form). No qualifications were applied to the associated field samples because of this minor contamination in the equipment rinsate sample.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil and aqueous MS/MSD analyses were performed on samples collected from another site. Most recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits. No qualifications were required for the irregularities observed in one set of aqueous MS/MSD analyses because the sample was collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Almost all recoveries were within QC limits. The exception was a 133 percent recovery (versus QC limits of 62 to 130 percent) for acetone in the aqueous LCS analyzed on 5 June 2006 at 1015. No acetone was detected in the accompanying samples, so no qualifications are warranted for this minor exceedance.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range “J” to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. No SVOC analytes were detected in the source water sample.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY501SS001 and on a sample collected from another site. Aqueous MS/MSD samples were prepared from a sample collected from another site. There were minor irregularities in the MS/MSD results from

the soil sample collected from another site, but no qualifications were applied for these irregularities.

The MS/MSD analyses performed on sample KRY501ASS001 yielded recoveries of 65 and 99 percent for 2,3,4-trichlorophenol (versus generic QC limits of 70 to 130 percent), 141 and 122 percent for 2,4,5-trichlorophenol (versus laboratory-specific QC limits of 34 to 123 percent), 48 and 47 percent for 3,3'-dichlorobenzidene (versus generic limits of 70 to 130 percent), 57 and 50 percent for benzoic acid (versus generic QC limits of 70 to 130 percent), and 3 and 3 percent for tetraethyllead (versus generic QC limits of 70 to 130 percent). They analyses also yielded recoveries of 78 and −22 percent (versus generic QC limits of 70 to 130 percent for 2,3,4,6-tetrachlorophenol; the negative recovery is possible because the unspiked sample contained some of the spiking compound. Because of this apparent matrix interference, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- 3,3'-Dichlorobenzidine, benzoic acid, and 2,3,4,6-tetrachlorophenol in sample KRY501ASS001

Because the MS.MSD recoveries were less than 30 percent, the following nondetected result was flagged "R" to indicate that it is considered rejected, that the compound may or may not be present:

- Tetraethyllead in sample KRY501ASS001

Because the average recoveries were within or above QC limits, no qualifications were applied for the irregularities in recoveries of the two trichlorophenol isomers.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the soil LCS analyzed on 4 June 2006 at 2101 yielded recoveries of 133 percent for 2-nitrophenol (versus laboratory-specific QC limits of 35 to 97 percent) and 144 percent for isophorone (versus laboratory-specific QC limits of 29 to 130 percent). The soil LCS performed on 7 June 2006 at 1910 yielded a recovery of 97 percent for 2,4-dimethylphenol (versus laboratory-specific QC limits of 31 to 95 percent). No qualifications were applied for these minor exceedances of nondetected compounds.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, six soil samples contained such high concentrations of extractable organic compounds that the samples were analyzed at 2- or 5-fold dilutions. Reporting limits were raised accordingly. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders") or because of the sample matrix, especially the high extractable organic content of some samples. The nondetected result for tetraethyllead in one soil sample was rejected. All other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

A majority of surrogate recoveries were within QC limits. However, five samples yielded low recoveries (59 to 65 percent, versus QC limits of 70 to 130 percent) for the aliphatic surrogate. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- Methyl tert-butyl ether, C5 to C8 aliphatics, C9 to C12 aliphatics, and total purgeable hydrocarbons in samples KRY103ASB001, KRY103ASB003, KRY105ASS001, KRY105ASB001, and KRY105ASB002

One sample yielded a 54 percent recovery (versus QC limits of 70 to 130 percent) for the aromatic surrogate. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- Benzene, toluene, ethylbenzene, xylenes, naphthalene, C9 to C10 aromatics, and total purgeable hydrocarbons in sample KRY660SB003.

Finally, one sample had yielded low recoveries for both the aliphatic surrogate (58 percent) and the aromatic surrogate (65 percent). Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- All volatile petroleum hydrocarbons results in sample KRY103ASB002.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY501SS001 and samples collected from another site. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. In the screening analysis of sample KRY105ASS001, recovery of the surrogate o-terphenyl was 158 percent, above the QC limits of 40 to 140 percent. Therefore, the following result was flagged "J" to indicate that it is considered estimated and may be biased high:

- Total extractable hydrocarbons (screen) in sample KRY105ASS001

In another sample, the surrogate o-terphenyl yielded a recovery of 142 percent, versus the QC limits of 40 to 140 percent, in the fractionation analysis. Therefore, the following results were flagged "J" to indicate that they are considered estimated and may be biased high:

- C11-C22 Aromatics and total extractable hydrocarbons (fractionation) in sample KRY105ASB002

In another sample, the surrogate o-terphenyl yield excessive recoveries in both the screening analysis and the fractionation analysis. Therefore, the following results were flagged "J" to indicate that they are considered estimated and may be biased high:

- C11-C22 Aromatics and total extractable hydrocarbons (both screen and fractionation) results in sample KRY660SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY501SS001 and on a sample collected from another site. The results from the sample collected from another site were within QC limits, as were most of the recoveries from sample KRY501SS001. However, n-decane yielded recoveries of 22 and 34 percent, n-dodecane yielded recoveries of 37 and

45 percent, and naphthalene yielded recoveries of 34 and 45 percent, all versus QC limits of 40 to 140 percent. In addition, several alkanes yielded RPDs of 23 to 27 percent, versus the QC limit of 20 percent. No qualifications were applied for these minor irregularities in some of the components of hydrocarbon mixtures.

In the screening test MS/MSD analysis performed on sample KRY501SS001, recoveries were 38 and 63 percent, versus QC limits of 60 to 140 percent. Therefore, the following result was flagged "J" to indicate that it is considered estimated"

- Total extractable hydrocarbons (screen) in sample KRY501SS001

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. With one exception all recoveries were within QC limits. That exception was the solid LCS analyzed on 7 June 2006 at 1931, which yielded recoveries of 38 percent for n-decane and 39 percent for naphthalene, both versus QC limits of 40 to 140 percent. Results for all other components of the hydrocarbon mixtures were will within QC limits, so no qualifications were applied.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

Several samples contained such low concentrations of total EPH that fractionation was not practical. There were no serious problems with the EPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples collected from other sites. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the samples contained either much high concentrations or were nondetected, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The soil MS/MSD analyses were performed on sample KRY501SS001. Recoveries of aluminum, barium, iron, and zinc could not be determined because the sample contained much higher concentrations of these metals than the spike concentrations. No qualifications are warranted for these data gaps. Antimony recoveries were 43 and 44 percent, copper recoveries were 65 and 60 percent, lead recoveries were 33 and 18 percent, manganese recoveries were 65 and 71 percent, selenium recoveries were 65 and 71 percent, and arsenic recoveries were 61 and 77 percent, all versus SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated because of apparent matrix interference:

- Antimony, copper, lead, selenium, and arsenic in samples KRY103ASS001, KRY103ASB001, KRY103ASB003, KRY105ASB001, KRY105ASB002, KRY660SB001, KRY660SB002, KRY501SS001, and KRY660SB003

Manganese results were not qualified because the average recovery was within the QC limits.

The aqueous MS/MSD analyses were performed on a sample collected from another site, with all results within QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders. These results may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050232
Sample Numbers:	KRY100ASS001, KRY100ASB001, and KRY108ASS001
Matrix:	Three Soil Samples
QA Level:	Cursory validation on this SDG
Report Date:	17 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050232

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY100ASS001	Soil	05/19/06	X	X	X	X	X	X
KRY100ASB001	Soil	05/19/06	X	X	X	X	X	X
KRY108ASS001	Soil	05/19/06	X	X	X	X	X	

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on a sample collected from another site. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged the one result below the calibration range "J" to indicate that this result is an extrapolation from the calibration curve. The value should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear

aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exception was 2,4,6-tribromophenol in sample KRY100ASB001, with no detectable recovery versus QC limits of 19 to 122 percent, apparently a result of interference from non-target compounds in the sample. No qualifications are warranted for a single SVOC surrogate outside of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on a sample collected from another site. These analyses had minor irregularities. No qualifications are warranted for these minor problems in a sample collected from another site.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. Most recoveries were within QC limits. However, the soil LCS analyzed on 4 June 2006 at 2101 yielded recoveries of 133 percent, versus laboratory-specific QC limits of 35 to 97 percent, for 2-nitrophenol and 144 percent, versus laboratory-specific QC limits of 24 to 130 percent, for isophorone. The recoveries were biased high and neither compound was detected in the samples, so no qualifications were applied for these minor deviations from QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

Two soil samples contained such high concentrations of extractable organic compounds that the laboratory analyzed one at a 50-fold dilution and extracted a 2-gram portion, rather than the standard 30-gram portion, for the other sample. No qualifications are warranted for these modifications of standard practice, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no significant problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. All results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY100ASB001. All recoveries were within their laboratory-specific QC limits, but RPDs for n-hexacosane and n-octacosane exceeded the laboratory-specified QC limit of 20 percent. The RPDs were within the SAP-specified QC limit for diesel fuel spikes. Therefore, no qualifications were applied for these minor variations.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged the few results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blank were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. Recoveries could not be determined because the sample contained a much higher result than the spike concentration. However, the RPD was within QC limits. No qualifications are warranted for this data gap.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the samples contained either much higher results or were nondetected, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required using sample KRY100ASB001. Recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Arsenic recoveries were 16 and 22 percent, antimony recoveries were 45 and 47 percent, barium recoveries were 136 and 119 percent, and selenium recoveries were 71 and 70 percent, all versus SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated because of apparent matrix interference:

- Arsenic, antimony, barium, and selenium in samples KRY100ASS001 and KRY100ASB001

If arsenic results had been nondetected, the results would have been rejected because the MS/MSD recoveries were less than 30 percent.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The results for the metals may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050229
Sample Numbers:	KRY464SS001, KRY477SS001, KRY493SS001, KRY632SS001, KRY633SS001, KRY475SS001, KRY632SB001, KRY633SB001, KRY633SB002, KRY475QE001, KRY633SB003, KRY634SS001, KRY634SB001, KRY634SB002, KRY634SB003, KRY455SS001, KRY452SS001, KRY454SS001, KRY453SS001, KRY651SB001, and Two Trip Blanks
Matrix:	Nineteen Soil Samples, One Equipment Rinsate (Aqueous) Sample, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	16 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050229

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY464SS001	Soil	05/17/06	X	X	X	X	X	X
KRY477SS001	Soil	05/17/06	X	X	X	X	X	
KRY493SS001	Soil	05/17/06	X	X	X	X	X	
KRY632SS001	Soil	05/17/06	X	X	X	X	X	X
KRY633SS001	Soil	05/17/06	X	X	X	X	X	
KRY475SS001	Soil	05/17/06	X	X	X	X	X	
KRY632SB001	Soil	05/17/06	X	X	X	X	X	
KRY633SB001	Soil	05/17/06	X	X	X	X	X	X
KRY633SB002	Soil	05/17/06	X	X	X	X	X	X
KRY475QE001	Water	05/17/06	X	X	X	X	X	X
KRY633SB003	Soil	05/17/06	X	X	X	X	X	X
KRY634SS001	Soil	05/17/06	X	X	X	X	X	X
KRY634SB001	Soil	05/17/06	X	X	X	X	X	X
KRY634SB002	Soil	05/17/06	X	X	X	X	X	X
KRY634SB003	Soil	05/17/06	X	X	X	X	X	X
KRY455SS001	Soil	05/18/06	X	X	X	X	X	
KRY452SS001	Soil	05/18/06	X	X	X	X	X	
KRY454SS001	Soil	05/18/06	X	X	X	X	X	X
KRY453SS001	Soil	05/18/06	X	X	X	X	X	
KRY651SB001	Soil	05/18/06	X	X	X	X	X	
Trip Blank	Water	05/17/06	X					
Trip Blank	Water	05/17/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes. The source water sample (KRY475QE001) contained a trace quantity (less than 1 microgram per liter) of chloroform. This trihalomethane is commonly found in water that has been disinfected with active chlorine (chlorine gas, hypochlorite, or another chemical form). Chloroform was not detected in the associated soil samples.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY475SS001 and a sample collected from another site and aqueous MS/MSD analyses on sample KRY475QE001. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exception was nitrobenzene-d5 in sample KRY454SS001, with a recovery of 128 percent versus QC limits of 23 to 120 percent, a result of apparent interference from non-target compounds in the sample. No qualifications are warranted for a single SVOC surrogate outside of limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY475SS001 and a sample collected from another site. The analyses performed on the sample collected from another site had minor irregularities, but no qualifications were warranted because the sample was not collected from this site. The irregularities in the analyses performed on sample KRY475SS001 included recoveries of 59 and 59 percent for 2,3,5,6-tetrachlorophenol (versus generic QC limits of 70 to 130 percent), 125 and 128 percent for 2-nitrophenol (versus laboratory-specific limits of 35 to 97 percent), 112 and 109

percent for 4-chlorophenyl phenyl ether (versus laboratory-specific limits of 49 to 110 percent), 16 and 15 percent for benzoic acid (versus generic QC limits of 70 to 130 percent), and 127 and 132 percent for isophorone (versus generic QC limits of 70 to 130 percent). As the laboratory noted in its narrative, the generic limits may be inappropriate. The following result was flagged "UJ" to indicate that the sample quantitation limits are estimated and may be biased low:

- 2,3,5,6-Tetrachlorophenol in sample KRY475SS001.

Because of the extremely low recovery of benzoic acid, the follow non-detected result was flagged "R" to indicate that it is rejected and the compound may or may not be present:

- Benzoic acid in sample KRY475SS001.

2-Nitrophenol, 4-chlorophenyl phenyl ether, and isophorone were not detected in sample KRY475SS001 or any other sample, so these results were not qualified based on the high MS/MSD recoveries.

Sample KRY475QE001 was used for the aqueous MS/MSD analyses for the SIM analytes, with all recoveries within QC limits. A sample collected from another site was used for the other aqueous MS/MSD analytes, with a number of results out of QC limits. Because that sample was not collected at this site, no qualifications were applied.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the soil LCS analyzed on 2 June 2006 at 2005 yielded a recovery of 65 percent, versus generic QC limits of 70 to 130 percent, for 3,3'-dichlorobenzidine. The LCS analyzed on 4 June 2006 at 2101 yielded a recovery of 133 percent for 2-nitrophenol, versus laboratory-specific QC limits of 99 to 97 percent. No qualifications were applied for these minor deviations from QC limits.

The aqueous LCS (analyzed on 24 May 2006 at 2215) yielded recoveries of 17 percent for benzoic acid, 42 percent for benzyl alcohol, and 43 percent for tetraethyllead, all versus generic QC limits of 70 to 130 percent. The accompanying MS/MSD analyses, performed on a sample collected from another site, had similar irregularities for these compounds, as well as for several more compounds. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated and may be biased low:

- Benzyl alcohol and tetraethyllead in sample KRY475QE001.

Because of the extremely low recovery of benzoic acid, the following result was flagged "R" to indicate that it is rejected and that the compound may or may not be present:

- Benzoic acid in sample KRY475QE001.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, eight soil samples contained such high concentrations of extractable organic compounds that the laboratory analyzed them at a 2- to 50-fold dilution. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. Because LCS and MS/MSD recoveries for benzoic acid were extremely low, the nondetected results for benzoic acid in two samples were rejected. Because benzoic acid has not been reported at the site and is not expected to be detected (from the nature of the well-documented contamination sources), this should not be a critical data gap. With the exception of benzoic acid, all other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications

were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. In one sample, both surrogates yielded recoveries (55 and 65 percent, respectively, for the aromatic and aliphatic surrogate) below the QC limits of 70 to 130 percent. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- All VPH results in sample KRY633SB003.

In two other samples, recovery of the aliphatic surrogate was acceptable, but the aromatic surrogate yielded recoveries below the QC limits. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- Benzene, toluene, ethylbenzene, xylenes, naphthalene, C9 to C10 aromatics, and total purgeable hydrocarbons in samples KRY633SB002 and KRY634SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY475SS001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed, although nontarget compounds interfered with recovery of some surrogates. Some of the positive results were less than the reporting limits, which correspond to the lowest calibration standards. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. However, two samples had excessive recoveries of the one aliphatic surrogate (1-chloro-octadecane) and of the last (of three) aromatic surrogate (o-terphenyl) in both the screening analysis and the fractionated analysis. Therefore, the following results were flagged "J" to indicate that they are considered estimated:

- All EPH results in samples KRY632SB001 and KRY634SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY475SS001 and a sample from another SDG. In the MS/MSD analyses on sample KRY475SS001, all recoveries and RPDs were within QC limits except for n-decane, with recoveries of 30 and 43 percent versus QC limits of 40 to 140 percent. In the sample from another SDG, the RPDs for n-hexacosane and n-octacosane slightly exceeded the QC limit of 20 percent. No qualifications were applied for these minor variations.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

One soil sample, KRY452SS001, and the source water sample contained such low concentrations of total EPH that fractionation was not practical. There were no serious problems with the EPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

Method blank were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. However, surrogates were not recovered in two samples, apparently because of interference from non-target compounds. Therefore, the following results were flagged "J" to indicate that they are considered estimated:

- Pentachlorophenol in samples KRY632SS001 and KRY633SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY475SS001 and an aqueous sample from another site. All recoveries and RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the samples contained either much more or none at all, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The soil MS/MSD analyses were performed on samples from this site, but from another SDG. Recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Arsenic recoveries were 16 and 22 percent, antimony recoveries were 45 and 47 percent, barium recoveries were 136 and 119 percent, and selenium recoveries were 71 and 70 percent, all versus SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are estimated due to matrix interference:

- Arsenic, antimony, barium, and selenium in samples KRY464SS001, KRY632SS001, KRY633SB001, KRY633SB002, KRY633SB003, KRY634SS001, KRY634SB001, KRY634SB002, KRY634SB003, and KRY454SS001

Note that arsenic results would have been rejected if they had been non-detected.

The aqueous MS/MSD analyses were performed on a sample collected from a different site, with all results within QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were seen in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The results for the metals may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050205
Sample Numbers:	KRY657SS001, KRY657SB001, KRY657SB002, KRY657SB003, KRY657SS002, KRY507QE001, KRY659SS001, KRY659SB001, KRY659SB002, KRY659SB003, KRY502SS001, KRY504SS001, KRY505SS001, KRY658SS001, KRY658SB001, KRY658SB002, KRY658SB003, KRY658SB004, KRY664SS001, KRY664SB001, KRY664SB002, KRY664SB003, KRY665SS001, KRY665SB001, KRY665SB002, KRY665SB003, KRY662SS001, KRY662SB001, KRY662SB002, KRY662SB003, KRY662QE001, KRY663SS001, KRY663SB001, KRY663SB002, KRY663SB003, and Three Trip Blanks
Matrix:	Thirty-three Soil Samples, Two Rinsate (Water) Samples, and Three Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	15 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050205

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY657SS001	Soil	05/18/06	X	X	X	X	X					
KRY657SB001	Soil	05/15/06	X	X	X	X	X	X				
KRY657SB002	Soil	05/15/06	X	X	X	X	X	X				
KRY657SB003	Soil	05/15/06	X	X	X	X	X	X				
KRY657SS002	Soil	05/15/06							X	X	X	X
KRY507QE001	Water	05/15/06	X	X	X	X	X	X				
KRY659SS001	Soil	05/16/06	X	X	X	X	X					
KRY659SB001	Soil	05/16/06	X	X	X	X	X	X				
KRY659SB002	Soil	05/16/06	X	X	X	X	X	X				
KRY659SB003	Soil	05/16/06	X	X	X	X	X	X				
KRY502SS001	Soil	05/16/06	X	X	X	X	X					
KRY504SS001	Soil	05/16/06	X	X	X	X	X					
KRY505SS001	Soil	05/16/06	X	X	X	X	X					
KRY658SS001	Soil	05/16/06	X	X	X	X	X					
KRY658SB001	Soil	05/16/06	X	X	X	X	X	X				
KRY658SB002	Soil	05/16/06	X	X	X	X	X	X				
KRY658SB003	Soil	05/16/06	X	X	X	X	X	X				
KRY658SB001	Soil	05/16/06							X	X	X	X
KRY664SS001	Soil	05/16/06	X	X	X	X	X	X				
KRY664SB001	Soil	05/16/06	X	X	X	X	X	X				
KRY664SB002	Soil	05/16/06	X	X	X	X	X	X				
KRY664SB003	Soil	05/16/06	X	X	X	X	X	X				

TABLE 1 (continued)
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050205

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY665SS001	Soil	05/16/06	X	X	X	X	X					
KRY665SB001	Soil	05/16/06	X	X	X	X	X	X				
KRY665SB002	Soil	05/16/06	X	X	X	X	X	X				
KRY665SB003	Soil	05/16/06	X	X	X	X	X	X				
KRY662SS001	Soil	05/16/06	X	X	X	X	X					
KRY662SB001	Soil	05/16/06	X	X	X	X	X	X				
KRY662SB002	Soil	05/16/06	X	X	X	X	X	X				
KRY662SB003	Soil	05/16/06	X	X	X	X	X	X				
KRY662QE003	Water	05/16/06	X	X	X	X	X	X				
KRY663SS001	Soil	05/17/06	X	X	X	X	X	X				
KRY663SB001	Soil	05/17/06	X	X	X	X	X	X				
KRY663SB002	Soil	05/17/06	X	X	X	X	X	X				
KRY663SB003	Soil	05/17/06	X	X	X	X	X	X				
Trip Blank	Water	05/15/06	X									
Trip Blank	Water	05/15/06	X									
Trip Blank	Water	05/15/06	X									

Notes:

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

TABLE 1 (continued)
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050205

Notes (continued):

SPLP VOC	=	Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 8260B.
SPLP SVOC	=	Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 8270C.
SPLP Metals	=	Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Methods 6010B and 7470A.
SPLP pH	=	Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 99045C.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes. The two source water samples contained traces (less than 1 microgram per liter) of chloroform. This trihalomethane is commonly formed at such levels in water that has been disinfected with active chlorine (chlorine gas, hypochlorite ion, and similar forms). No qualifications were warranted because chloroform was not detected in the accompanying soil samples.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY505SS001 and a sample from another SDG. Aqueous MS/MDS analyses were performed on sample KRY507QE001. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

An aqueous MS/MSD analysis was performed on a sample collected from another site and had fully satisfactory results.

Soil MS/MSD analyses were performed on samples KRY657SS001 and KRY505SS001 and a sample from another SDG. There were no problems with the analyses performed on sample KRY657SS001. In the MS/MSD analyses performed on sample KRY505SS001, high recoveries were observed for 2,4-dinitrophenol (127 and 128 percent, versus laboratory-specific limits of 10 to 122 percent) and low recoveries for 3,3'-dichlorobenzidine (42 and 73 percent, versus generic QC limits of 70 to 130 percent) and benzoic acid (45 and 51 percent, versus the same generic QC limits). The sample

was diluted 5-fold for analysis because of the high concentrations of nontarget extractable compounds. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are estimated and possibly biased low:

- 3,3'-Dichlorobenzidine and tetraethyllead in sample KRY505SS001.

No qualifications were warranted for 2,4-dinitrophenol because this compound was not detected in the unspiked sample.

In the MS/MSD analyses performed on a sample from another SDG, several analytes had somewhat low recoveries. These irregularities are discussed in more detail in the report for that SDG.

Similar matrix interference may exist in other samples, especially with the extracts that were diluted because of the high content of extractable organic compounds in the samples.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the aqueous LCS had low recoveries for benzoic acid (17 percent versus generic QC limits of 70 to 130 percent), benzyl alcohol (42 percent, versus the same generic QC limits), and tetraethyl lead (43 percent, versus generic QC limits of 70 to 130 percent). None of these SVOC was detected in the associated source water samples and they were not target analytes in the SPLP SVOC analyses, so the following associated results were flagged "UJ" to indicate that the quantitation limits are considered estimated:

- Benzyl alcohol and tetraethyl lead in samples KRY507QE001 and KRY662QE001.

Because of the very low recovery of benzoic acid, the following results were flagged "R" to indicate that they are rejected, that the compound may or may not be present:

- Benzoic acid in samples KRY507QE001 and KRY662QE001.

One soil LCS, analyzed on 28 May 2006, yielded recoveries of 55 percent (versus generic QC limits of 70 to 130 percent) for 2,3,4-trichlorophenol, 65 percent (versus the same QC limits) for 2,6-dimethylnaphthalene, 69 percent (versus the same QC limits) for 3,3'-dichlorobenzidine, 48 percent (versus the same QC limits) for benzoic acid, 41 percent (versus the same QC limits) for benzyl alcohol, 57 percent (versus the same QC limits) for biphenyl, and 44 percent (versus the same generic QC limits) for tetraethyllead. Therefore, the following results in the associated samples were flagged "UJ" to indicate that the quantitation limits are considered estimated and may be biased low:

- 2,3,4-Trichlorophenol, 2,6-dimethylnaphthalene, 3,3'-dichlorobenzidine, benzoic acid, benzyl alcohol, biphenyl, and tetraethyllead in samples KRY657SS001, KRY657SB001, KRY657SB002, KRY657SB003, and KRY659SS001.

All other LCS results were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, 18 soil samples contained such high concentrations of extractable organic compounds that the laboratory analyzed them at dilutions ranging from 2- to 20-fold. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. Due to the extremely low result in the accompanying LCS, the nondetect results for benzoic acid in the source water samples were rejected. Benzoic acid has not been reported in source water samples in other SDGs and unlikely to be detected in such samples. All other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most of the surrogate recoveries were within QC limits. Two samples had recoveries below QC limits for both surrogates. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated and may be biased low:

- All VPH results in samples KRY657SB003 and KRY662SB003.

Two samples had low recoveries for the aromatic surrogate but not for the aliphatic surrogate. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are estimated and may be biased low:

- Benzene, toluene, ethylbenzene, xylenes, naphthalene, C9 to C10 aromatics, and total purgeable hydrocarbons in samples KRY659SB003 and KRY658SB002.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on three samples from this SDG (KRY505SS001, KRY663SB003, and KRY507QE001) plus one from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. However, some samples had one or more surrogates with recoveries above QC limits because of apparent interference from the large amounts of EPH in the samples. Four samples had high recoveries of 1-chloro-octadecane, the aliphatic surrogate; o-terphenyl, the third of three aromatic surrogates; and o-terphenyl, the only surrogate in the EPH screening analyses. Therefore, the following results were flagged "J" to indicate that they are estimated:

- All EPH results in samples KRY657SB003, KRY659SB003, KRY658SB003, and KRY662SB003.

One sample had similar high recoveries for 1-chloro-octadecane and o-terphenyl in the fractionation analysis but an acceptable recovery for o-terphenyl in the screening analysis. Therefore, the following results were flagged "J" to indicate that they are estimated:

- C9 to C18 Aliphatics, C19 to C36 aliphatics, C11 to C22 aromatics, and total extractable hydrocarbons in sample KRY664SB003.

One sample had a high recovery for o-terphenyl in the fractionation analysis and acceptable recoveries for all other surrogates. Therefore the following results were flagged "J" to indicate that they are estimated:

- C11 to C22 Aromatics and total extractable hydrocarbons in sample KRY665SB003.

Finally, one sample had a high recovery for 1-chloro-octadecane and acceptable recoveries for all other surrogates. Therefore the following results were flagged "J" to indicate that they are estimated:

- C9 to C18 Aliphatics, C19 to C36 aliphatics, and total extractable hydrocarbons in sample KRY663SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY505SS001, KRY663SB003, and one soil sample from this site in other SDG. In the MS/MSD analyses on sample KRY505SS001, n-octadecane and n-eicosane had acceptable recoveries, but their RPD were 26 and 23 percent, respectively, versus the laboratory's QC limit of 20 percent. No qualifications were applied for these minor irregularities.

In the MS/MSD EPH screening analyses on sample KRY663SB003, recoveries could not be determined because the native sample contained so much more EPH than the spikes. No qualifications are warranted for this data gap. However, the RPD was 35 percent, almost twice the laboratory's QC limit of 20 percent but within the SAP-specified QC limit of 50 percent. In the fractionation MS/MSD analyses on that sample, there were high recoveries (above the QC limits of 40 to 140 percent) for three of the ten alkanes in the MS sample, but not in the MSD sample. As a result of these irregularities, four of the alkanes had RPD ranging from 28 to 32 percent, above the laboratory's QC limit of 20 percent. These results do indicate a significant heterogeneity in the EPH concentration within the soil. The sample results have already been qualified for surrogate irregularities (and there were high recoveries of 1-chloro-octadecane in the MS and MSD samples, as well as in the primary sample), so no further qualifications were applied.

There were also some irregularities in the MS/MSD analyses on a soil sample from another site, but no qualifications are warranted for them.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted.

Overall Assessment of This SDG

A few of these samples, such as KRY658SB001, contained such low concentrations of total EPH that fractionation was not practical. There were no major problems with the EPH analyses, but data users should take into account the apparent heterogeneity of EPH distribution, at least in the more contaminated samples. Results may be used, as qualified, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

Method blanks were analyzed as required and most contained no detectable analytes. The method blank analyzed on 5 June 2006 at 1713 contained a trace concentration of pentachlorophenol. However, all samples analyzed in the same analytical run contained much higher concentrations, so no qualifications are warranted.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. However, the surrogate dichloroacetic acid was not recovered in one highly contaminated sample. Therefore, the following detected result was flagged "J" to indicate that it is considered estimated:

- Pentachlorophenol in sample KRY657SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY507QE001, one soil sample from another SDG, and two soil samples collected from other sites. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks contained traces of some analytes, but the samples were either not detected or much higher concentrations were detected, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The aqueous MS/MSD results from a sample collected from another site were within QC limits.

In the soil MS/MSD analyses performed on sample KRY657SB001, recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Antimony recoveries were 44 and 44 percent, arsenic recoveries were 104 and 132 percent, barium recoveries were 130 and 100 percent, chromium recoveries were 79 and 73 percent, and selenium recoveries were 72 and 73 percent, versus SAP-specified QC limits of 75 to 125 percent. In the other soil MS/MSD analyses, performed on a sample from this site but a part of another SDG, aluminum and iron recoveries could not be determined because the sample contained so much more than the spike. Antimony recoveries were 45 and 47 percent, barium recoveries were 136 and 119 percent and selenium recoveries were 71 and 70 percent, versus the SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- Antimony and selenium in samples KRY657SB001, KRY657SB002, KRY657SB003, KRY659SB001, KRY659SB002, KRY659SB003, KRY658SB001, KRY658SB002, KRY658SB003, KRY664S001, KRY664SB001, KRY664SB002, KRY664SB003, KRY665SB001, KRY665SB002, KRY665SB003, KRY662SB001, KRY662SB002, KRY662SB003, KRY663SS001, KRY663SB001, KRY663SB002, and KRY663SB003.

Because the average recoveries of arsenic, barium, and chromium were within QC limits, no qualifications were applied. All RPD results were within QC limits, so no further qualifications are warranted.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The results for metals in soil may be used, as qualified, for the purposes stated in the workplan.

4.7 Synthetic Precipitation Leaching Procedure Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 14 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

No SPLP MS/MSD analyses were performed. No qualifications are warranted for this data gap. The solid MS/MSD analyses are discussed in Section 4.1, above. No further qualifications are warranted.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the SPLP VOC analyses. Results may be used, as reported for the purposes, stated in the workplan.

4.8 Synthetic Precipitation Leaching Procedure Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to SPLP extraction, 7 days from SPLP extraction to preparative extraction, and 40 days from preparative extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

No SPLP MS/MSD analyses were performed. No qualifications are warranted for this data gap. The solid MS/MSD analyses are discussed in Section 4.2, above. No further qualifications are warranted.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the SPLP SVOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.9 Synthetic Precipitation Leaching Procedure Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration and continuing calibration blank data.

Holding Times

Samples were extracted and analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The aqueous method blank contained low concentration of several metals. The samples contained none of the metals, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY658SB001. The only irregularity was silver, which had recoveries of 72 and 99 percent, versus SAP-specified QC limits of 75 to 125 percent. Because the average recovery was will within QC limits, no qualifications were applied.

Laboratory Control Sample Recovery

LCSs were run with the analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

No significant irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.10 Synthetic Precipitation Leaching Procedure pH Analysis

Deliverables

As originally delivered, the data package included only the results of the analysis. No QC data were included, although a minimum of continuing calibration, LCS, and sample duplicate result were expected. Because of this lack of information, the following result was flagged "J" to indicate that it is considered estimated:

- SPLP pH in samples KRY657SS002 and KRY658SB004

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050176
Sample Numbers:	KRY628SB003, KRY628SB002, KRY628SB001, KRY628SS003, KRY628SS002, KRY628SS001, KRY627SB002, KRY627SB001, KRY624SB001, KRY626SB001, KRY655SB001, KRY506SS001, KRY507SS001, KRY508SS001, KRY656SS001, KRY656SB001, KRY656SB002, KRY656SB003, and One Trip Blank
Matrix:	Eighteen Soil Samples and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	14 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050176

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY628SB003	Soil	05/12/06	X	X	X	X	X	X
KRY628SB002	Soil	05/12/06	X	X	X	X	X	X
KRY628SB001	Soil	05/12/06	X	X	X	X	X	X
KRY628SS003	Soil	05/12/06			X			
KRY628SS002	Soil	05/12/06			X			
KRY628SS001	Soil	05/12/06	X	X	X	X	X	
KRY627SB002	Soil	05/12/06	X	X	X	X	X	
KRY627SB001	Soil	05/12/06	X	X	X	X	X	
KRY624SB001	Soil	05/15/06	X	X	X	X	X	
KRY626SB001	Soil	05/15/06	X	X	X	X	X	
KRY655SB001	Soil	05/15/06	X	X	X	X	X	
KRY506SS001	Soil	05/15/06	X	X	X	X	X	
KRY507SS001	Soil	05/15/06	X	X	X	X	X	
KRY508SS001	Soil	05/15/06	X	X	X	X	X	
KRY656SS001	Soil	05/15/06	X	X	X	X	X	X
KRY656SB001	Soil	05/15/06	X	X	X	X	X	X
KRY656SB002	Soil	05/15/06	X	X	X	X	X	X
KRY656SB003	Soil	05/15/06	X	X	X	X	X	X
Trip Blank	Water	05/15/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits, with a single exception. In the continuing calibration performed on 17 May 2006 at 2115, naphthalene yielded a

%D of 32 percent. Therefore, the following results were flagged "UJ" to indicate that the quantitation limits are considered estimated:

- Naphthalene in samples KRY506SS001, KRY507SS01, KRY508SS001, KRY656SS001, KRY656SB001, KRY656SB002, and KRY656SB003.

Note that unqualified naphthalene results were reported for these samples from the SVOC analysis.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY628SB001 and aqueous MS/MSD analyses on a sample collected from another site. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Almost all of the %Ds in the continuing calibrations were within QC limits. The exception was p-chloroaniline in the continuing calibration performed on 27 May 2006 at 1636, which yielded a recovery of 174 percent versus laboratory-specified QC limits of 70 to 130 percent and data validation limits of 75 to 125 percent. The compound was not detected in any of the samples analyzed after this continuing calibration, so no qualifications were applied.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY628SB001. For the SIM analyses, sample KRY628SB002 was used for MS/MSD analyses. The irregularities in these analyses were recoveries of 13 and 10 percent for benzoic acid, 36 and 38 percent for benzyl alcohol, and 35 and 34 percent for tetraethyl lead, versus generic QC limits of 70 to 130 percent recovery. As the laboratory noted in its narrative, these generic limits may not be appropriate. However, the recoveries were low and similar irregularities were observed in the accompanying LCS analysis. Qualifications are discussed below in the LCS section.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the soil LCS analyzed on 25 May 2006 at 1806 yielded low recoveries for benzoic acid (44 percent versus generic QC limits of 70 to 130 percent), benzyl alcohol (36 percent, versus the same generic QC limits), and tetraethyl lead (31 percent, versus generic QC limits of 70 to 130 percent). As noted above, similar problems were observed in the MS/MSD analyses performed after this LCS. Therefore, the following results from samples associated with the analysis of the MS/MSD samples and LCS were flagged "UJ" to indicate that the sample quantitation limits are estimated and may be biased low:

- Benzoic acid, benzyl alcohol, and tetraethyllead in samples KRY628SB003, KRY628SB002, KRY628SB001, and KRY628SS001.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, eight samples contained such high concentrations of extractable organic compounds that the laboratory analyzed them at 5- or 10-fold dilutions. No qualifications are warranted for this irregularity, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" to the instrument) or due because of the characteristics of the samples, especially the high

extractable organic content of some samples. Results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. In one sample, both surrogates yielded recoveries (42 and 54 percent, respectively, for the aromatic and aliphatic surrogate) below the QC limits of 70 to 130 percent. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- All VPH results in sample KRY628SB003.

In another sample, recovery of the aromatic surrogate was acceptable (75 percent), but the aliphatic surrogate yielded only 65 percent recovery. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- C5 to C8 Aliphatics, C9 to C12 aliphatics, methyl tert-butyl ether, and total purgeable hydrocarbons in sample KRY656SB003.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY628SB001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed, although nontarget compounds interfered with recovery of some surrogates. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. However, four samples had excessive recoveries of the one aliphatic surrogate (1-chloro-octadecane) and of the last (of three) aromatic surrogate (o-terphenyl) in both the screening analysis and the fractionated analysis. Therefore, the following detected results were flagged "J" to indicate that they are considered estimated:

- All EPH results in samples KRY628SB003, KRY627SB001, KRY624SB001, and KRY655SB001.

In addition, two samples had recoveries of the aliphatic surrogate and o-terphenyl in the fractionated analysis outside QC limits, but satisfactory recovery of o-terphenyl in the screening analysis. Therefore, the following detected results were flagged "J" to indicate that they are considered estimated:

- C9 to C18 Aliphatics, C19 to C38 aliphatics, C11 to C22 aromatics, and total extractable hydrocarbons by MA-EPH method in samples KRY626SB001 and KRY656SB003

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY628SB001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

Some samples, such as KRY628SB002, contained such low concentrations of total EPH that fractionation was not practical. There were no serious problems with the EPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were initially analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis. As discussed below, four samples were analyzed with a contaminated method blank and the results were rejected. The samples were then re-extracted out of holding time (specifically 34 days after collection) and re-analyzed, with a clean method blank. Therefore the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- Pentachlorophenol in samples KRY628SB002, KRY628SB001, KRY628SS003, and KRY628SS001 from the re-analyses conducted on 30 June 2006.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and, with one exception, contained no detectable analytes. The method blank analyzed on 9 June 2006 at 0439 yielded a readily measurable concentration of pentachlorophenol. The concentration would have required qualifying three of the four accompanying results as nondetected. The laboratory re-extracted the samples, along with a new method blank, and analyzed the new extracts. This method blank from the reanalysis had no detectable pentachlorophenol. Therefore, these results were accepted, but qualified on the basis of excessive holding time, as previously discussed. The following results were flagged "R" to indicate that they are rejected because of significant method blank contamination:

- Pentachlorophenol in samples KRY628SB002, KRY628SB001, KRY628SS003, and KRY628SS001 from the original analyses conducted on 9 through 10 June 2006.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY628SB001. All recoveries and the RPD were within QC limits. Additional MS/MSD analyses were performed on a sample collected from another site that had so much pentachlorophenol that recoveries could not be measured. No qualifications are warranted for this data gap, especially because the RPD were well within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the samples contained either much more or none at all, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. Two soil MS/MSD analyses were performed on samples collected from this site, one on sample KRY628SB001 and the other on a sample from another SDG. In the first, recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Arsenic recoveries were 73 and 71 percent, barium recoveries were 41 and 125 percent, selenium recoveries were 59 and 61 percent, thallium recoveries were 71 and 72 percent, and tin recoveries were 62 and 57 percent, all versus SAP-specified QC limits of 75 to 125 percent. In the second MS/MSD analyses, aluminum, barium, manganese, and iron recoveries could not be determined because the sample contained much more than the spike. Again, no qualifications are warranted for these data gaps. In addition, lead had recoveries of 78 and 71 percent, selenium had recoveries of 61 and 62 percent and tin had recoveries of 71 and 62 percent, versus the SAP-specified QC limits of 75 to 125 percent. The following results were flagged "J" or "UJ", as appropriate, to indicate that they are estimated due to matrix interference:

- Arsenic, barium, lead, selenium, thallium, and tin in samples KRY628SB003, KRY628SB002, KRY628SB001, KRY656SS001, KRY656SB001, KRY656SB002, and KRY656SB003

In the first MS/MSD analyses, recoveries of antimony were 26 and 26 percent, while in the second they were 31 and 28 percent, versus the SAP-specified limits of 75 and 125 percent. The following nondetected results were flagged "R" to indicate that they are considered rejected; the analyte may or may not be present :

- Antimony in samples KRY628SB003, KRY628SB002, KRY628SB001, KRY656SS001, KRY656SB001, KRY656SB002, and KRY656SB003

In the second MS/MSD analyses, the recoveries of nickel were 77 and 73 percent and those of zinc 83 and 72 percent, versus the same generic QC limits. Because the average recoveries were within the QC limits, no qualifications were applied. All RPD results were within QC limits, so no further qualifications were applied.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders, such as selenium and thallium. However, the recoveries of antimony from the site soils were so poor that the nondetected results for that metal were rejected. The results for all other metals in soil may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050161
Sample Numbers:	KRY482SS001, KRY482S2002, KRY482SS003, KRY481SS001, KRY480SS001, KRY479SS001, KRY478SS001, KRY494SS001, KRY631SS001, KRY629SB001, KRY467SS001, KRY496SS001, KRY631SB001, KRY429SS001, KRY429SS002, KRY429SS003, KRY430SS001, KRY430SS002, KRY430SS003, KRY623SB001, KRY623SB002, KRY625SB001, KRY430QE001, and Two Trip Blanks
Matrix:	Twenty-two Soil Samples, One Rinsate (Water) Sample, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	11 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050161

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY482SS001	Soil	05/11/06	X	X	X	X	X	
KRY482SS002	Soil	05/10/06			X			
KRY482SS003	Soil	05/10/06			X			
KRY481SS001	Soil	05/10/06	X	X	X	X	X	
KRY480SS001	Soil	05/10/06	X	X	X	X	X	
KRY479SS001	Soil	05/10/06	X	X	X	X	X	
KRY478SS001	Soil	05/10/06	X	X	X	X	X	
KRY494SS001	Soil	05/10/06	X	X	X	X	X	
KRY631SS001	Soil	05/10/06	X	X	X	X	X	X
KRY629SB001	Soil	05/1/06	X	X	X	X	X	
KRY467SS001	Soil	05/10/06	X	X	X	X	X	
KRY496SS001	Soil	05/10/06	X	X	X	X	X	
KRY631SB001	Soil	05/10/06	X	X	X	X	X	
KRY429SS001	Soil	05/11/06	X	X	X	X	X	
KRY429SS002	Soil	05/11/06			X			
KRY429SS003	Soil	05/11/06			X			
KRY430SS001	Soil	05/11/06	X	X	X	X	X	
KRY430SS002	Soil	05/11/06			X			
KRY430SS003	Soil	05/11/06			X			
KRY623SB001	Soil	05/11/06	X	X	X	X	X	X
KRY623SB002	Soil	05/11/06	X	X	X	X	X	X
KRY625SB001	Soil	05/11/06	X	X	X	X	X	
KRY430QE001	Water	05/11/06	X	X	X	X	X	X
Trip Blank	Water	05/10/06	X					
Trip Blank	Water	05/10/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exception was dibromofluoromethane in sample KRY480SS001, which yielded a recovery of 134 percent, versus laboratory-specified QC limits of 70 to 130 percent. (Energy used this surrogate in addition to the three specified in the SAP.) No qualifications were required because the surrogate recovery was biased high and no target compounds were detected in this sample.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on sample KRY482SS001 and aqueous MS/MSD analyses on a sample collected from another site. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits.

Laboratory Control Sample Recoveries

LCS were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Almost all of the %Ds were within QC limits. The exception was p-chloroaniline in the continuing calibration performed on 22 May 2006 at 1636, which yielded a recovery of 174 percent versus laboratory-specified QC limits of 70 to 130 percent and data validation limits of 75 to 125 percent. p-Chloroaniline was not detected in the associated samples, so no qualifications were applied.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

An aqueous MS/MSD analysis was performed on a sample collected from another site. Some results were unsatisfactory, and resembled those from the accompanying LCS. Qualifications were applied based on the LCS results and are discussed below.

Soil MS/MSD analyses were performed on sample KRY482SS001. For the SIM analyses, MS/MSD analyses were performed on sample KRY479SS001. The only

irregularities were recoveries of 67 and 77 percent for 3,3'-dichlorobenzidine and 66 and 71 percent for tetraethyl lead, versus generic QC limits of 70 to 130 percent recovery. No qualifications were applied for these minor irregularities. As the laboratory noted in its narrative, these generic limits may be inappropriate. This irregularity may be especially true for compounds like 3,3'-dichlorobenzidine and tetraethyl lead that frequently give irregular responses on continuing calibrations and other QC samples.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the aqueous LCS yielded low recoveries for 1-methylnaphthalene (62 percent versus generic QC limits of 70 to 130 percent), 2,3,4,5-tetrachlorphenol (66 percent versus the same generic limits) 2,3,4,6-tetrachlorophenol (58 percent, versus the same generic QC limits, 3,3'-dichlorobenzidine (69 percent, versus the same generic limits), benzo(e)pyrene (64 percent versus the same generic limits), bis(2ethylhexyl)adipate (57 percent, versus the same generic QC limits), and tetraethyl lead (41 percent, versus generic QC limits of 70 to 130 percent). No qualifications were applied for these minor irregularities versus generic QC limits, which may be inappropriate.

However, in that same LCS, benzoic acid yielded a recovery of only 7 percent, versus the generic QC limits of 70 to 130 percent. Because of this extremely low recovery, the following associated result was flagged "R" to indicate that it is rejected, that the analyte may or may not be present:

- Benzoic acid in sample KRY430QE001.

One soil LCS, analyzed on 27 May 2006, yielded recoveries of 69 percent for benzoic acid and 63 percent for tetraethyl lead, versus generic QC limits of 70 to 130 percent. No qualifications were applied for these minor irregularities versus generic QC limits, which may be inappropriate.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, four samples contained such high concentrations of extractable organic compounds that the laboratory analyzed them at a 5- or 10-fold dilution. No qualifications are warranted for this irregularity, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no critical problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. The one serious problem was the rejection of the non-detected benzoic acid result in the source water sample because of an extremely low LCS recovery. Benzoic acid is not a common contaminant in reagent and drinking water and has not been detected in other source water samples. With that one exception, results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY482SS001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY482SS001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Almost all recoveries were within QC limits. The exception was n-decane, the first alkane, which yielded a recovery of 38 percent versus laboratory-specified QC limits of 40 to 140 percent. The nine heavier alkanes had acceptable recoveries, ranging from 48 to 86 percent, and all aromatics had similar acceptable recoveries. No qualifications were applied for this minor irregularity in one component of EPH.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

Some samples, such as KRY482SS001, contained such low concentrations of total EPH that fractionation was not practical. There were no significant problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY482SS001 and a liquid sample collected from another site. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used as reported for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank results.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The aqueous and soil method blanks and calibration blanks contained traces of some analytes, but the samples contained either much higher concentrations or none was detected, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The aqueous MS/MSD analyses were performed on a sample collected from another site and all results were within QC limits.

Two soil MS/MSD analyses were performed on samples from this site, but from other SDGs. In the first MS/MSD analyses performed on 20 May 2006, recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Barium recoveries were 41 and 125 percent, selenium recoveries were 59 and 61 percent, thallium recoveries were 71 and 72 percent, and tin recoveries were 62 and 57 percent, all versus SAP-specified QC limits of 75 to 125 percent. In the second MS/MSD analyses, performed on 22 May 2006, aluminum, barium, manganese, and iron recoveries could not be determined because the sample contained much more than the spike. Again, no qualifications are warranted for these data gaps. In addition, selenium yielded recoveries of 61 and 62 percent and tin yielded recoveries of 71 and 62 percent, versus the SAP-specified QC limits of 75 to 125 percent. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- Barium, selenium, thallium, and tin in samples KRY631SS001, KRY623SB001, and KRY623SB002

In the first MS/MSD analyses, recoveries of antimony were 26 and 26 percent, while in the second they were 31 and 28 percent, versus the SAP-specified limits of 75 and 125 percent. The following nondetected results were flagged "R" to indicate that they are considered rejected; the analyte may or may not be present:

- Antimony in samples KRY631SS001, KRY623SB001, and KRY623SB002

In the second MS/MSD analyses, the recoveries of lead were 78 and 71 percent, nickel were 77 and 73 percent, and zinc were 83 and 72 percent, versus the same generic QC limits. Because the average recoveries were within the QC limits, no qualifications were applied. All RPD results were within QC limits, so no further qualifications were applied.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders, such as selenium and thallium. The MS/MSD recoveries of antimony from the site soils were so poor that the nondetected results for antimony were rejected. The results for all other metals in soil and all metals in the aqueous samples may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050109
Sample Numbers:	KRY639SB001, KRY639SS001, KRY638SB003, KRY638SB002, KRY638SB001, KRY638SS001, KRY640SB001, KRY635SB001, KRY635SB002, KRY471SS001, KRY447SS001, KRY653SS001, KRY484SS001, KRY465SS001, KRY466SS001, KRY486SS001, KRY637SB001, KRY902QS001, KRY636SB001, KRY636SS001, KRY637SS001, KRY636QE001, and Three Trip Blanks
Matrix:	Twenty Soil Samples, One Source Water Sample, One Equipment Rinsate (Aqueous) Sample, and Three Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	22 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050109

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY639SB001	Soil	05/08/06	X	X	X	X	X	
KRY639SS001	Soil	05/08/06	X	X	X	X	X	
KRY638SB003	Soil	05/08/06	X	X	X	X	X	X
KRY638SB002	Soil	05/08/06	X	X	X	X	X	X
KRY638SB001	Soil	05/08/06	X	X	X	X	X	X
KRY638SS001	Soil	05/08/06	X	X	X	X	X	X
KRY640SB001	Soil	05/08/06	X	X	X	X	X	
KRY635SB001	Soil	05/08/06	X	X	X	X	X	X
KRY635SB002	Soil	05/08/06	X	X	X	X	X	X
KRY471SS001	Soil	05/08/06	X	X	X	X	X	
KRY447SS001	Soil	05/08/06	X	X	X	X	X	
KRY653SS001	Soil	05/09/06	X	X	X	X	X	
KRY484SS001	Soil	05/09/06	X	X	X	X	X	
KRY465SS001	Soil	05/09/06	X	X	X	X	X	
KRY466SS001	Soil	05/09/06	X	X	X	X	X	
KRY486SS001	Soil	05/09/06	X	X	X	X	X	
KRY637SB001	Soil	05/09/06	X	X	X	X	X	
KRY902QS001	Water	05/09/06	X	X	X	X	X	X
KRY636SB001	Soil	05/09/06	X	X	X	X	X	
KRY636SS001	Soil	05/09/06	X	X	X	X	X	
KRY637SS001	Soil	05/09/06	X	X	X	X	X	
KRY636QE001	Water	05/09/06	X	X	X	X	X	X
Trip Blank	Water	05/08/06	X					
Trip Blank	Water	05/09/06	X					
Trip Blank	Water	05/09/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed blow, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes. The source water sample (KRY902QS001) contained a trace quantity (less than 1 microgram per liter) of the common laboratory contaminant methylene chloride and just over 1 microgram per liter of chloroform. Chloroform is a trihalomethane that is commonly detected in water that has been disinfected with active chlorine (chlorine gas, hypochlorite, or another chemical form). The equipment rinsate sample (KRY636QE001) contained low concentrations (around 1 microgram per liter) of the common laboratory contaminants acetone and methylene chloride, plus acrolein, chloroform, and 1,2-dichloroethane. No qualifications were applied because these compounds were not detected in the associated samples.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on samples KRY639SB001 and KRY638SS001 and aqueous MS/MSD analyses on sample KRY902QS001. All recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits for the MS/MSD analyses performed on samples KRY639SB001 and KRY902QS001. All recoveries and most RPDs for the MS/MSD analyses performed on sample KRY638SS001 were within QC limits, but bromomethane yielded an RPD of 21 percent and naphthalene yielded an RPD of 28 percent, both versus laboratory-specified QC limits of 20 percent. Neither compound was detected in the unspiked sample, so no qualifications were applied for these minor irregularities.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted. The laboratory flagged results below the calibration range “J” to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. No SVOC analytes were detected in the source water sample.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on samples KRY638SS001 and on a sample from another SDG. Aqueous MS/MSD samples were prepared from a sample collected from another site. There were minor irregularities in the aqueous MS/MSD results, but no qualifications were applied because the sample was collected from another site. There were also minor irregularities in the analyses performed on the soil sample from another SDG, which are discussed in the report for that SDG.

The MS/MSD analyses performed on sample KRY638SS001 yielded recoveries of 92 and 124 percent for 2,6-dinitrotoluene (versus laboratory-specified QC limits of 50 to 115 percent), 59 and 59 percent for 3,3'-dichlorobenzidine (versus generic QC limits of 70 to 130 percent), 117 and 97 percent for benzo(g,h,i)perylene (versus laboratory-specific limits of 46 to 116 percent), 22 and 24 percent for benzoic acid (versus generic QC limits of 70 to 130 percent), 42 and 45 percent for benzyl alcohol (versus the same generic QC limits), 91 and 114 percent for dimethylphthalate (versus laboratory-specific QC limits of 51 to 112 percent), 130 and 103 percent for fluoranthene (versus laboratory-specific QC limits of 54 to 119 percent), and 45 and 43 percent for tetraethyllead (versus generic QC limits of 70 to 130 percent). As such, the following result was flagged "UJ" to indicate that the sample quantitation limit is considered estimated:

- Benzoic acid in sample KRY638SS001.

The irregularities for 3,3'-dichlorobenzidiene, benzyl alcohol, and tetraethyllead were minimal and the recoveries were within the SAP QC limits for other SVOC compounds, such as 28 to 89 percent for 2,4-dinitrotoluene. Therefore, no qualifications were applied for these compounds. Because the average recoveries were within QC limits, no qualifications were applied for the irregularities in 2,6-dinitrotoluene, benzo(g,h,i)perylene, dimethylphthalate, and fluoranthene recovery.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the aqueous LCS analyzed on May 17, 2006 at 1917 yielded recoveries of 66 percent for 2,3,4,5-tetrachlorophenol, 58 percent for 2,3,5,6-tetrachlorophenol, 64 percent for benzo(e)pyrene, 57 percent for bis(2-ethylhexyl)adipate, 41 percent for tetraethyllead, 62 percent for 1-methylnaphthalene, 69 percent for 3,3'-dichlorobenzidine, and only 7 percent for benzoic acid, all versus generic QC limits of 70 to 130 percent. Because of the extremely low recovery, the following nondetected result was flagged "R" to indicate that it was rejected, that the compound may or may not be present:

- Benzoic acid in sample KRY636QE001.

The irregularities for 2,3,4,5-tetrachlorophenol, 2,3,5,6-tetrachlorophenol, benzo(e)pyrene, bis(2-ethylhexyl)adipate, tetraethyllead, 1-methylnaphthalene, and 3,3'-dichlorobenzidine were minimal and the recoveries were within the SAP QC limits for other SVOC compounds, such as 28 to 89 percent for 2,4-dinitrotoluene. Therefore, no qualifications were applied for these compounds.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, four soil samples contained so much extractable organic compounds that they were analyzed at 5- or 10-fold dilution. Reporting limits were raised accordingly. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no major problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders") or to the organic content of some samples. The analytical instrument gives irregular responses to oxygenated compounds, and extremely low recovery was observed in one LCS analysis. Therefore, the nondetected result for benzoic acid in the equipment rinsate sample was rejected. All other results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY638SS001 and samples from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. In the analysis of sample KRY638SB003, recovery of the aliphatic surrogate 1-chloro-octadecane was 345 percent, well above the QC limits of 40 to 140 percent. Therefore, the following results were flagged "J" to indicate that they are considered estimated:

- C9-C18 Aliphatics, C19-C36 aliphatics, and total extractable hydrocarbons in sample KRY638SB003.

In two other samples, the surrogates 1-chloro-octadecane and o-terphenyl (in both the screening analysis and the fractionation analysis) had recoveries of more than 400 percent, well above the QC limits of 40 to 140 percent. Therefore, the following results were flagged "J" to indicate that they are considered estimated:

- All EPH results in samples KRY637SB001 and KRY636SB001.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY638SS001 for soil and on a sample from another SDG for water. The aqueous MS/MSD analyses yielded recoveries and RPDs well within QC limits. In the soil MS/MSD analyses, the only result outside QC limits was for naphthalene, with recoveries of 48 and 36 percent, versus generic QC limits of 40 to 140 percent. Because the average was within QC limits, no qualifications were applied.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. With one exception all recoveries were within QC limits. That exception was the LCS associated with the MS/MSD analyses performed on sample KRY638SS001, which yielded a recovery of 38 percent, versus generic QC limits of 40 to 140 percent, for naphthalene. All other results were will within QC limits, so no qualifications were applied.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted.

Overall Assessment of This SDG

Several soil samples and both water samples contained such low concentrations of total EPH that fractionation was not practical. There were no serious problems with the EPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY638SS001, samples from other SDGs, and an aqueous sample collected from another site. All recoveries and RPDs for the soil MS/MSD analyses were within QC limits. There were irregularities in the aqueous MS/MSD analyses, but no qualifications were applied because the sample was collected from another site.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range “J” to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained trace levels of some analytes, but the samples contained either much higher concentrations or none at all, so no qualifications are warranted. A low concentration of zinc was detected in the source water sample, which may have resulted from storage in a galvanized container or from passage through zinc-containing plumbing. Zinc results in the associated samples were significantly higher than the blank contamination, so no qualifications were applied.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The soil MS/MSD analyses were performed on sample KRY638SS001. Recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Antimony recoveries were 43 and 36 percent, barium recoveries were 186 and 88 percent, manganese recoveries were 167 and 97 percent, thallium recoveries were 81 and 73 percent, and tin recoveries were 12 and 14 percent, all versus SAP-specified QC limits of 75 to 125 percent.

The following nondetected results were flagged “R” to indicate that they are rejected and that tin may or may not be present:

- Tin in samples KRY638SB003, KRY638SB002, KRY638SB001, KRY635SB001, and KRY635SB002.

The following results were flagged “J” or “UJ”, as appropriate, to indicate that they are considered estimated:

- Antimony, barium, and manganese in samples KRY638SB002, KRY638SB002, KRY638SB001,KRY638SS001, KRY635SB001, and KRY635SB002, and tin in sample KRY638SS001

Thallium results were not qualified because the average recovery was within the QC limits.

The aqueous MS/MSD analyses were performed on a sample collected from a different site, with all results within QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were seen in these analyses, mostly involving the usual poor responders. The nondetected tin results in five soil samples were rejected because of severe matrix interference. The results for all other metals may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050070
Sample Numbers:	KRY116ASS001 and KRY116ASB001
Matrix:	Two Soil Samples
QA Level:	Cursory validation on this SDG
Report Date:	9 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050070

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH
KRY116ASS001	Soil	05/05/06	X	X	X	X	X
KRY116ASB001	Soil	05/05/06	X	X	X	X	X

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on a sample collected from another site. All recoveries and most relative percent differences (RPD) for the MS/MSD analyses were within QC limits. Because the sample used for these analyses is unrelated to the site, no qualifications are warranted for the minor irregularities observed for RPDs.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site and had fully satisfactory results.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged one result below the calibration range "J" to indicate that it is as extrapolation from the calibration curve. The value should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the SVOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All results were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

Both samples contained such low concentrations of total EPH that fractionation was not practical. There were no major problems with the EPH analyses. Results may be used, as, reported for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06050049
Sample Numbers:	KRY432SS001, KRY433SS001, KRY436SS001, KRY437SS001, KRY438SS001, KRY439SS001, KRY442SS001, KRY443SS001, KRY444SS001, KRY445SS001, KRY111ASS001, KRY111ASS002, KRY111ASS003, KRY111ASB001, KRY440SS001, KRY440SS002, KRY112ASS001, KRY440QE001, and Two Trip Blanks
Matrix:	Seventeen Soil Samples, One Equipment Rinsate (Aqueous) Sample, and Two Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	21 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06050049

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY432SS001	Soil	05/01/06	X	X	X	X	X	
KRY433SS001	Soil	05/01/06	X	X	X	X	X	
KRY436SS001	Soil	05/01/06	X	X	X	X	X	
KRY437SS001	Soil	05/01/06	X	X	X	X	X	
KRY438SS001	Soil	05/01/06	X	X	X	X	X	
KRY439SS001	Soil	05/01/06	X	X	X	X	X	X
KRY442SS001	Soil	05/01/06	X	X	X	X	X	
KRY443SS001	Soil	05/01/06	X	X	X	X	X	
KRY445SS001	Soil	05/01/06	X	X	X	X	X	
KRY445SS001	Soil	05/01/06	X	X	X	X	X	X
KRY111ASS001	Soil	05/02/06	X	X	X	X	X	
KRY111ASS002	Soil	05/02/06			X			
KRY111ASS003	Soil	05/02/06			X			
KRY111ASB001	Soil	05/02/06	X	X	X	X	X	
KRY440SS001	Soil	05/03/06	X	X	X	X	X	
KRY440SS002	Soil	05/03/06			X			
KRY112ASS001	Soil	05/03/06	X	X	X	X	X	
KRY440QE001	Water	05/03/06	X	X	X	X	X	X
Trip Blank	Water	05/01/06	X					
Trip Blank	Water	05/03/06	X					

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes. The equipment rinsate sample (KRY440QE001) contained a trace quantity (less than 1 microgram per liter) of chloroform. This trihalomethane is commonly found in water that has been disinfected with active chlorine (chlorine gas, hypochlorite, or another chemical form). No qualifications were warranted because chloroform was not detected in the associated soil samples.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. One MSD sample had a recovery of 75 percent for p-bromofluorobenzene, versus laboratory-specific QC limits of 78 to 160 percent and SAP-specified QC limits of 58 to 113 percent. As discussed below, all analyte recoveries from that sample were within QC limits. No qualifications were applied for this minor irregularity in a QC sample.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on samples KRY111ASS001 and KRY440SS001 and aqueous MS/MSD analyses on sample KRY440QE001. With one exception all recoveries and relative percent differences (RPD) for the MS/MSD analyses were within QC limits. The aqueous MS/MSD samples yielded an RPD of 24 percent for naphthalene, versus the laboratory's generic QC limit of 20 percent. Naphthalene was not detected in the aqueous sample, so no qualifications were applied.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

Three soil samples were analyzed using less sample mass than usual, because of a limited sample mass or the very high (over 50 percent) moisture in the samples. The reporting limits for these samples were raised accordingly. No other irregularities were noted. The laboratory flagged results below the calibration range "J" to indicate that these results are

extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on samples KRY440SS001 and KRY111ASS001 and on samples collected from other sites. Aqueous MS/MSD samples were prepared from a sample collected from another site. There were minor irregularities in the MS/MSD results for samples collected from other sites, but no qualifications are warranted in samples collected from another site.

The MS/MSD analyses performed on sample KRY440SS001 yielded recoveries of 38 and 48 percent for benzoic acid (versus generic QC limits of 70 to 130 percent) and 119 and 123 percent for benzo(b)fluoranthene (versus laboratory-specific QC limits of 48 to 122 percent). The irregularity for benzoic acid was minimal and the recovery was within the SAP QC limits for other SVOC compounds, such as 28 to 89 percent for 2,4-dinitrotoluene. Therefore, no qualifications were applied. No qualifications were applied for the irregularities in benzo(b)fluoranthene recovery, because this target compound was not detected in the parent sample.

The MS/MSD analyzes for the SIM analytes were performed on sample KRY111ASS001. Recoveries for benzo(b)fluoranthene were 137 and 135 percent (versus laboratory-specific QC limits of 48 to 122 percent) and dibenz(a,h)anthracene were 136 and 135 percent (versus laboratory-specific limits of 41 to 118 percent). Neither compound was detected in the parent sample, so no qualifications were made.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the aqueous LCS analyzed on May 10, 2006 at 2144 yielded recoveries of 109 percent (versus laboratory-specific QC limits of 50 to 94 percent) for 4-chloro-3-methylphenol, 58 percent (versus generic QC limits of 70 to 130 percent) for tetraethyllead, 108 percent (versus laboratory-specific QC limits of 53 to 101 percent) for acenaphthene, and 114 percent (versus laboratory-specific QC limits of 54 to 101 percent) for fluorene. None of these compounds was detected in the aqueous sample, so no qualifications were applied.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range “J” to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, soil samples contained such high levels of extractable organic compounds that they were analyzed at 20-fold (sample KRY112ASS001) or 5-fold (all others)

dilutions. Reporting limits were raised accordingly. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. The observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" or because of the sample matrix, especially the high extractable organic content of some samples. All results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Almost all surrogate recoveries were within QC limits. The exception was sample KRY433SS001 in which the aliphatic surrogate yielded a recovery of 67 percent, versus the QC limits of 70 to 130 percent. Therefore, the following results were flagged "UJ" to indicate that they are considered estimated:

- C5-C8 Aliphatics, C9-C12 aliphatics, methyl tert-butyl ether, and total purgeable hydrocarbons in sample KRY433SS001.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY111ASS001, KRY440SS001, and a sample collected from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No significant irregularities were observed, although nontarget compounds interfered with recovery of one surrogate. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no serious problems with the VPH analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY111ASS001, KRY440SS001, and KRY439SS001. In the MS/MSD analyses on sample KRY111ASS001, all recoveries and RPDs were within QC limits except for n-decane, with recoveries of 36 and 42 percent versus QC limits of 40 to 140 percent. In the analyses performed on sample KRY440SS001, recoveries of n-decane were 25 and 30 percent, of n-dodecane were 38 and 43 percent, and of naphthalene were 34 and 35 percent, all versus generic QC limits of 40 to 140 percent. Recoveries for all other aliphatics (a total of 10 were spiked) and aromatics (a total of 14 were spiked) were within QC limits. No qualifications were applied for these minor variations.

In the MS/MSD analyses for the EPH screen, unspiked samples KRY111ASS001 and KRY440SS001 had so much EPH that recoveries could not be determined. However, all RPDs, as well as recoveries for the MS/MSD analyses performed on sample KRY430SS001, were within QC limits, so no qualifications were applied.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. With one exception all recoveries were within QC limits. That exception was the LCS analyzed with the MS/MSD analyses performed on sample KRY440SS001, which yielded a recovery of 32 percent, versus generic QC limits of 40 to 140 percent, for n-decane. All other aliphatic results were will within QC limits, so no qualifications were applied.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted.

Overall Assessment of This SDG

Three soil sample and the equipment rinsate sample contained such low concentrations of total EPH that fractionation was not practical. There were no serious problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were originally analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis. The surrogate was not recovered in sample KRY445SS001, which may be a result of laboratory error (failure to spike) or serious matrix interference. The sample was re-extracted 30 days after collection and re-analyzed. This time, surrogate recovery was well within QC limits. Because of the exceeded extraction holding time, the following result was flagged "J" to indicate that it is considered estimated:

- Pentachlorophenol in sample KRY445SS001.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY440SS001 and on samples collected from other sites. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as qualified, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibration verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the samples contained either much higher concentration or were not detected, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required. The soil MS/MSD analyses were performed on sample KRY439SS001. Recoveries of aluminum and iron could not be determined because the unspiked sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Recoveries for antimony (46 and 44 percent), barium (59 and 30 percent), cadmium (73 percent), lead (72 percent), manganese (27 and 38 percent), selenium (69 percent), and zinc (65 and 51 percent) were

biased low and outside SAP-specified QC limits of 75 to 125 percent. As such, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- Antimony, barium, cadmium, lead, manganese, selenium, and zinc in samples KRY439SS001 and KRY445SS001

The aqueous MS/MSD analyses were performed on a sample collected from another site, with all results within QC limits.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were seen in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The results for the metals may be used, as qualified, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06040234
Sample Numbers:	KRY130QE001
Matrix:	One Equipment Rinsate (Water) Sample
QA Level:	Cursory validation on this SDG
Report Date:	21 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06040234

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals
KRY130QE001	Water	04/27/06	X	X	X	X	X	X

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification

Tentatively identified compounds (TICs)
System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
Other method-specific QC measures
Graphite furnace atomic absorption QC measures
Analyte identification
Analyte quantitation
Reported detection limits
Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

The sample was analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

The MS/MSD analyses were performed on a sample collected from another site. The samples seemed to have been double-spiked, because all recoveries were about twice the expected concentrations (the expected concentrations were similar to those in the LCS, discussed in the next section). No qualifications were made for this aberration involving a sample collected from another site.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no significant problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

The MS/MSD analyses were performed on a sample collected from another site. These analyses had minor irregularities, No qualifications were made for these irregularities involving a sample collected from another site..

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other problems were observed.

Overall Assessment of This SDG

There were no significant problems with the SVOC analyses. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and RPDs were within their laboratory-specific QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the EPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY130QE001. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for some continuing calibration verification and all continuing calibration blank data. A subsequent submission corrected the deficiencies.

Holding Times

The sample was analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All calibration results were within QC limits.

Blanks

The method blanks and calibration blanks contained traces of some analytes, but the sample contained none at all, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required using a sample collected from another site. The recoveries for silver were below QC limits, but, as noted below, the LCS yielded an acceptable recovery. Therefore, no qualifications are warranted for this irregularity in a sample collected from another site.

Laboratory Control Sample Recovery

An LCS was run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

No significant irregularities were observed in these analyses. The results for the metals may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06040225
Sample Numbers:	KRY618SS001, KRY618SB001, KRY618SB002, KRY137ASB001, KRY115BSS001, KRY459SS001, KRY457SS001, KRY451SS001, KRY635SS001, KRY640SS001, KRY456SS001, KRY514SS001, KRY402SS001, KRY403SS001, KRY462SS001, KRY134ASS001, KRY463SS001, KRY460SS001, KRY603SS001, KRY603SB001, KRY603SB002, KRY603SB002, KRY403QE001, KRY606SS001, KRY606SB001, KRY606SB003, KRY605SS001, KRY605SS002, KRY605SS003, KRY605SB001, KRY601SS001, KRY601SB001, KRY601SB002, KRY601SB003, KRY666SS001, KRY666SB001, KRY666SB002, KRY666SB003, and Three Trip Blanks
Matrix:	Thirty-seven Soil Samples, One Rinsate (Water) Sample, and Three Trip Blanks
QA Level:	Cursory validation on this SDG
Report Date:	8 August 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06040225

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY618SS001	Soil	04/25/06	X	X	X	X	X					
KRY618SB001	Soil	04/25/06	X	X	X	X	X	X				
KRY618SB002	Soil	04/25/06	X	X	X	X	X	X				
KRY137ASB001	Soil	04/25/06							X	X	X	X
KRY115BSS001	Soil	04/26/06	X	X	X	X	X					
KRY459SS001	Soil	04/26/06	X	X	X	X	X					
KRY457SS001	Soil	04/26/06	X	X	X	X	X					
KRY451SS001	Soil	04/26/06	X	X	X	X	X					
KRY635SB001	Soil	04/26/06	X	X	X	X	X	X				
KRY640SS001	Soil	04/26/06	X	X	X	X	X					
KRY456SS001	Soil	04/26/06	X	X	X	X	X					
KRY514SS001	Soil	04/26/06	X	X	X	X	X					
KRY402SS001	Soil	04/26/06	X	X	X	X	X					
KRY403SS001	Soil	04/26/06	X	X	X	X	X					
KRY462SS001	Soil	04/26/06	X	X	X	X	X					
KRY134ASS001	Soil	04/26/06	X	X	X	X	X					
KRY463SS001	Soil	04/26/06	X	X	X	X	X	X				
KRY460SS001	Soil	04/26/06	X	X	X	X	X					
KRY603SS001	Soil	04/26/06	X	X	X	X	X	X				
KRY603SB001	Soil	04/26/06	X	X	X	X	X	X				
KRY603SB002	Soil	04/26/06	X	X	X	X	X	X				
KRY603SB003	Soil	04/26/06	X	X	X	X	X	X				
KRY403QE001	Water	04/26/06	X	X	X	X	X	X				
KRY606SS001	Soil	04/26/06	X	X	X	X	X	X				
KRY606SB001	Soil	04/26/06	X	X	X	X	X	X				
KRY606SB003	Soil	04/26/06	X	X	X	X	X	X				
KRY605SS001	Soil	04/26/06	X	X	X	X	X					

Sample Identification	Matrix	Date Collected	VOC	SVOC	PCP	VPH	EPH	Metals	SPLP VOC	SPLP SVOC	SPLP Metals	SPLP pH
KRY605SS002	Soil	04/26/06			X							
KRY605SS003	Soil	04/26/06			X							
KRY605SB001	Soil	04/26/06	X	X	X	X	X	X				
KRY601SS001	Soil	04/27/06	X	X	X	X	X					
KRY601SB001	Soil	04/27/06	X	X	X	X	X					
KRY601SB002	Soil	04/27/06	X	X	X	X	X					
KRY601SB003	Soil	04/27/06	X	X	X	X	X					
KRY666SS001	Soil	04/27/06	X	X	X	X	X	X				
KRY666SB001	Soil	04/27/06	X	X	X	X	X	X				
KRY666SB002	Soil	04/27/06	X	X	X	X	X	X				
KRY666SB003	Soil	04/27/06	X	X	X	X	X	X				
Trip Blank	Water	04/25/06	X									
Trip Blank	Water	04/26/06	X									
Trip Blank	Water	04/27/06	X									

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
SPLP VOC = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 8260B.
SPLP SVOC = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 8270C.
SPLP Metals = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Methods 6010B and 7470A.
SPLP pH = Synthetic precipitation leaching procedure extraction by EPA SW-846 Method 1312 followed by analysis of the extract by EPA SW-846 Method 9045C.

2.0 DATA VALIDATION REQUIREMENTS

All items listed, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits, with one exception. In one opening continuing calibration verification (CCV) for soil samples, No. A050206,

bromomethane yielded a recovery of 138 percent, versus the laboratory's QC limits of 70 to 130 percent. That compound was not detected in any of the analyses performed on that day and the closing CCV was well within QC limits. Therefore, no qualifications were applied for this minor exceedance.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blanks also contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

Soil MS/MSD analyses were performed on samples KRY618SS001 and KRY605SS001. All recoveries and relative percent differences (RPD) for the MS/MSD analyses performed on sample KRY618S001 were within QC limits. In the MS/MSD analyses performed on sample KRY605SS001, all recoveries were within QC limits, but the RPD for 2-butanone was 23 percent, versus the laboratory's generic QC limit of 20 percent. 2-Butanone, which frequently responds poorly on the instrument, was not detected in the sample, so no qualifications were applied for this minor exceedance of a generic QC limit.

The aqueous MS/MSD analyses were performed on a sample collected from another site. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. One sample (KRY635SS001) had a recovery of 132 percent for 2,4,6-tribromophenol, versus the SAP-specified QC limits of 19 to 122 percent. No qualifications are warranted for a single acid surrogate out of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

An aqueous MS/MSD analysis was performed on a sample collected from another site and yielded fully satisfactory results.

Soil MS/MSD analyses were performed on samples KRY115BSS001 and KRY605SS001. For the SIM analyses, only sample KRY115BSS001 was used for MS/MSD analyses. In the first non-SIM MS/MSD analysis, 2,3,4,5-tetrachlorophenol, 2,3,4,6-tetrachlorophenol, 2,3,4-trichlorophenol, and 3,3'-dichlorobenzidine yielded low recoveries. In the MS/MSD analyses on sample KRY605SS001, 2,3,5,6-tetrachlorophenol and 3,3'-dichlorobenzidine yielded similar low recoveries. Both samples were diluted 5-fold for analysis due to the high concentrations of nontarget extractable compounds. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated because of apparent matrix interference:

- 2,3,4,5-Tetrachlorophenol, 2,3,4,6-tetrachlorophenol, 2,3,4-trichlorophenol, and 3,3'-dichlorobenzidine in sample KRY115BSS001.
- 2,3,5,6-Tetrachlorophenol and 3,3'-dichlorobenzidiene in sample KRY605SS001.

In the SIM MS/MSD analyses, all SVOC compounds except anthracene and benzo(b)fluoranthene yielded recoveries below their QC limits. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated because of apparent matrix interference:

- Acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluorene, phenanthrene, and pyrene in sample KRY115BSS001.

Similar matrix interference may exist in other samples, especially those with extracts that were diluted because of the high content of extractable organic compounds in the samples.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. However, the aqueous LCS had low recoveries for 1-methylnaphthalene (67 percent versus generic QC limits of 70 to 130 percent), 2,3,5,6-tetrachlorophenol (52 percent, versus the same generic QC limits, 2,6-dimethylnaphthalene (67 percent, versus the same generic limits), bis(2ethylhexyl)phthalate (58 percent, versus the same generic QC limits), and tetraethyl lead (35 percent, versus generic QC limits of 70 to 130 percent). None of these SVOCs was detected in the associated soil samples, so the following associated results were flagged "UJ" to indicate that the quantitation limits are considered estimated:

- 1-Methylnaphthalene, 2,3,5,6-tetrachlorophenol, 2,3-dimethylnaphthalene, bis(2-ethylhexyl)phthalate, and tetraethyl lead in sample KRY403QE001.

One soil LCS, analyzed on May 5, 2006, yielded a recovery of 96 percent for 2,4-dimethylphenol, versus laboratory-specific QC limits of 31 to 95 percent, and a recovery of 68 percent for 3,3'-dichlorobenzidine, versus generic QC limits of 70 to 130 percent. Another soil LCS, analyzed on May 11, 2006, also yielded a recovery of 68 percent for 3,3'-dichlorobenzidine. No qualifications were applied for these minor irregularities in nondetected compounds.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In addition, several samples contained such high concentrations of extractable organic compounds that the laboratory analyzed them at dilutions. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on three samples from the site. Most recoveries and RPDs were within QC limits. The exception involved slightly high recoveries of m+p-xylenes from a sample in another SDG. That result is discussed in the SDG the sample is a part of, so no qualifications are warranted for this SDG.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no significant problems with the VPH analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on three samples from this site from other SDG and on sample KRY605SS001. The irregularities observed in one of the MS/MSD analyses performed on a sample from another SDG are discussed with that SDG. In the MS/MSD analyses on sample KRY605SS001, recoveries of decane were 30 and 44 percent, respectively, versus the laboratory's generic QC limits of 40 to 140 percent for individual spiked compounds, and SAP-specific QC limits of 50 to 150 percent for diesel. Recoveries of naphthalene were 31 and 50 percent, respectively, versus the same QC limits. However, the all other recoveries were within the laboratory-specified limits for both the 10 heavier alkanes (42 to 88 percent recoveries) and the 13 heavier aromatics (48 to 90 percent recoveries). No qualifications were applied for these relatively minor irregularities. However, 5 of the 14 aromatics yielded excessive RPDs. Examples include naphthalene, with an RPD of 48 percent versus the laboratory-specified QC limit of 40 percent and acenaphthylene, with an RPD of 36 percent versus the laboratory-specified QC limit of 20 percent. Because of the apparent irregularities in responses, especially in the lighter aromatics, the following result was flagged "J" to indicate that it may be considered estimated:

- C11 to C22 Aromatics in sample KRY605SS001.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

Some samples, such as KRY618SB001, contained such low concentrations of total EPH that fractionation was not practical. There were no major problems with the EPH analyses. Results may be used, as qualified. for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples KRY618SS001 and KRY605SS001. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed. The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no major problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, some continuing calibrations verification, and all continuing calibration blank data.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The aqueous matrix blanks contained traces of some analytes, but the sample contained none of these metals, so no qualifications are warranted.. The soil matrix blank contained

low concentrations of several metals. The samples contained much higher concentrations (as with barium and zinc) or none at all (as with silver) so, again, no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required, although some of the samples used were collected from other sites. Most aqueous MS/MSD results were within QC limits. The exception was irregular manganese recoveries in one EPA Method 200.7 set. Because the sample was collected from another site, no qualifications are warranted.

In the soil MS/MSD analyses performed on sample KRY618SS001, recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Antimony recoveries were 47 and 47 percent, lead recoveries were 74 and 75 percent, manganese recoveries were 104 and 56 percent, and selenium recoveries were 62 and 61 percent, versus SAP-specified QC limits of 75 to 125 percent. As such, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are considered estimated:

- Antimony, lead, manganese, and selenium in samples KRY618SB001, KRY618SB002, KRY635SB001, KRY463SS01, KRY603SS001, KRY603SB001, KRY603SB002, KRY603SB003, KRY606SS001, KRY606SB001, KRY606SB003, KRY605SB001, KRY666SS001, KRY666SB001, KRY666SB002 and KRY666SS003

All RPD results were within QC limits, so no further qualifications are warranted.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were observed in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The results for metals in soil may be used, as qualified, for the purposes stated in the workplan.

4.7 Synthetic Precipitation Leaching Procedure Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were within the holding times of 14 days from collection to TCLP extraction and 14 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

No SPLP MS/MSD analyses were performed. No qualifications are warranted for this data gap. The aqueous MS/MSD analyses are discussed above in Section 4.1. No further qualifications are warranted.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the SPLP VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.8 Synthetic Precipitation Leaching Procedure Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to TCLP extraction, 7 days from TCLP extraction to preparative extraction, and 40 days from preparative extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

No SPLP MS/MSD analyses were performed. No qualifications are warranted for this data gap. The aqueous MS/MSD analyses are discussed above in Section 4.2. No further qualifications are warranted.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the SPLP SVOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.9 Synthetic Precipitation Leaching Procedure Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration and continuing calibration blank data.

Holding Times

Samples were extracted and analyzed within the holding times of 28 days from collection to TCLP extraction and 28 days from TCLP extraction to analysis for mercury and 6 months from collection to TCLP extraction and 6 months from TCLP extraction to analysis for all other metals.

Calibrations

All furnished calibration results were within QC limits.

Blanks

The aqueous matrix blank contained low concentration of several metals. The samples contained none at all of the metals so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

All aqueous MS/MSD results, which are relevant to SPLP analyses, were within QC limits or from samples collected from another site.

Laboratory Control Sample Recovery

LCSs were run with the analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

No significant irregularities were observed in these analyses. The results may be used, as reported, for the purposes stated in the workplan.

4.10 Synthetic Precipitation Leaching Procedure pH Analysis

Deliverables

As originally delivered, the data package included only the results of the analysis. No QC data were included, although a minimum of continuing calibration, LCS, and sample duplicate result were expected. Because of this lack of information, the following result was flagged "J" to indicate that it is considered estimated:

- SPLP pH in sample KRY137ASS001.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06040170
Sample Numbers:	KRY121CSS001, KRY121CSB001, KRY121CSB002, KRY612SB001, KRY612SB002, KRY607SS001, KRY607SS002, KRY607SS003, KRY607SB001, KRY607SB002, KRY123ASS001, KRY123ASB001, KRY612QE001, and Trip Blank
Matrix:	Twelve Soil Samples, One Rinsate (Water) Sample, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	26 July 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06040170

Sample ID	Matrix	Date Collected	VOC	SVOC	VPH	EPH	PCP	Metals	TOC
KRY121CSS001	Soil	04/20/06	X	X	X	X	X		
KRY121CSB001	Soil	04/20/06							X
KRY121CSB002	Soil	04/20/06	X	X	X	X	X		X
KRY612SB001	Soil	04/21/06	X	X	X	X	X	X	
KRY612SB002	Soil	04/21/06	X	X	X	X	X	X	
KRY607SS001	Soil	04/21/06	X	X	X	X	X		
KRY607SS002	Soil	04/21/06					X		
KRY607SS003	Soil	04/21/06					X		
KRY607SB001	Soil	04/21/06	X	X	X	X	X	X	
KRY607SB002	Soil	04/21/06	X	X	X	X	X	X	
KRY123ASS001	Soil	04/21/06	X	X	X	X	X		
KRY123ASB001	Soil	04/20/06	X	X	X	X	X	X	
KRY612QE001	Water	04/21/06		X	X	X	X	X	
Trip Blank	Water	04/19/06	X						

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 7471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
TOC = Total organic carbon analyzed by American Soil Association Method 29-3.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes. The trip blank also contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a soil sample collected from another site. All recoveries and relative percent differences (RPD) were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VOC analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. One sample (KRY612SBS001) had a recovery of nitrobenzene-d5 of 143 percent, versus the laboratory's QC limits of 23 to 120 percent. No qualifications are warranted for a single base-neutral surrogate being out of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

An aqueous MS analysis was performed on a sample collected from this site, but from another SDG. All recoveries were within QC limits except for 2,4,5-trichlorophenol (106 percent versus QC limits of 47 to 96 percent) and 4-chloro-3-methylphenol (96 percent versus QC limits of 50 to 94 percent). Neither compound was detected in the aqueous sample, so no qualifications were applied for these minor exceedances.

MS/MSD analyses were performed on a soil sample collected from another site. Most recoveries and all RPDs were within QC limits, and the irregularities were minimal. No qualifications are warranted for these minor problems in a sample collected from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. The aqueous LCS had irregular recoveries for 1-methylnaphthalene (53 percent versus generic QC limits of 70 to 130 percent), 3,3'-dichlorobenzidine (62 percent versus

generic QC limits of 70 to 130 percent), benzoic acid (11 percent versus generic QC limits of 70 to 130 percent), benzyl alcohol (34 percent versus generic QC limits of 70 to 130 percent), and hexachloroethane (33 percent versus laboratory-specific QC limits of 34 to 74 percent). No qualifications were applied for the three compounds that were only slightly below their QC limits because the lower limit of the generic QC limits is much higher than the historical lower limits for other SVOC compounds and my not be appropriate. However, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated and may be biased low:

- Benzoic acid and benzyl alcohol in sample KRY612QE001

One of the solid LCS had excessive recoveries for 2-chloronaphthalene (102 percent, versus laboratory-specific QC limits of 53 to 98 percent), 2-nitrophenol (98 percent, versus laboratory-specific QC limits of 33 to 92 percent), benzo(e)pyrene (134 percent, versus generic QC limits of 70 to 130 percent), and benzyl alcohol (138 percent, versus generic QC limits of 70 to 130 percent). None of these SVOCs was detected in the associated soil samples, so no qualifications were applied to the data for these irregularities. The other soil LCS had fully satisfactory results.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged the many results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Sample KRY612SB001 contained such high levels of extractable organic compounds (the extract could not be concentrated down to the usual 1 milliliter) that it was analyzed at a 20-fold dilution. Samples KRY612SB002, KRY607SS001, and KRY607SB002 were also analyzed at 10-fold dilutions due to high extractable organic compound content. No qualifications are warranted for these irregularities, but note the resulting elevated sample reporting limits.

In the SIM analyses of two samples, the non-target compounds in the samples lowered the chromatographic resolution so that benzo(b)fluoranthene and benzo(k)fluoranthene could not be separated. The laboratory quantitated the total peak as benzo(b)fluoranthene. The following results were flagged "J" to indicate that the concentration is considered estimated because it may include some of one or both isomers:

- Benzo(b)fluoranthene in samples KRY607SS001 and KRY607SB001.

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOC known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another site. All recoveries and RPD were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. The analytical results may be used, as reported. for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

All surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY607SS001. All recoveries and RPD were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No other irregularities were noted.

Overall Assessment of This SDG

Some samples, such as KRY121CSS001, contained such low concentrations of EPH that fractionation was not practical . There were no significant problems with the EPH analyses. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples collected from another site. All recoveries and RPD were within QC limits.

Laboratory Control Sample Recoveries

An LCS was analyzed with the analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. Results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank data. A subsequent submission corrected the deficiencies.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All calibration results were within QC limits.

Blanks

The aqueous matrix blank contained a low concentration of zinc. Zinc was not detected in the associated sample, so no qualifications are warranted. The soil matrix blank contained low concentrations of copper and zinc. The samples contained much higher concentrations, so no qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required, although some of the samples used were collected from other sites. All aqueous MS/MSD results were within QC limits.

In the soil MS/MSD analyses performed on sample KRY612SB001, recoveries of aluminum and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Antimony recoveries were 25 and 29 percent, versus QC limits of 75 to 125 percent. Because of these very low recoveries and the fact that antimony was not reported in any associated sample, the following results were flagged "R" to indicate that the results are rejected. Antimony may or may not be present in the samples:

- Antimony in samples KRY612SB001, KRY612SB002, KRY607SB001, KRY607SB002, and KRY123ASB001

Cadmium recoveries were 72 and 72 percent and selenium recoveries were 65 and 67 percent, versus the same QC limits of 75 to 125 percent. The following results were flagged "UJ" to indicate that the sample reporting limits are considered estimated:

- Cadmium and selenium in samples KRY612SB001, KRY612SB002, KRY607SB001, KRY607SB002, and KRY123ASB001

Beryllium recoveries were 76 and 74 percent and thallium recoveries were 74 and 77 percent. Because the average recoveries are within the 75 to 125 percent QC limits, no qualifications were applied for these irregularities. Barium recoveries were 197 and 158 percent. Therefore, the following results were flagged "J" to indicate that they are considered estimated and may be biased high:

- Barium in samples KRY612SB001, KRY612SB002, KRY607SB001, KRY607SB002, and KRY123ASB001

All RPD results were within QC limits, so no further qualifications are warranted.

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDG

A few minor irregularities were seen in these analyses, mostly involving the usual poor responders, such as cadmium and selenium. The only serious problem was the very low (less than 30 percent) recoveries for antimony in the soil MS/MSD analyses. Therefore, the nondetected results for antimony in all soil samples were rejected. Many soil matrices will interfere with the analysis of antimony when EPA SW-846 Method 6010 or a similar inductively coupled plasma/atomic emission spectroscopy method is used. If it is suspected that antimony may be a contaminant of concern at this site, an alternative analytical method, such as EPA SW-846 Method 6020 or one of the EPA SW-846 7000 series methods, should be used. The results for all metals other than antimony in soil may be used, as qualified, for the purposes stated in the workplan.

4.7 Total Organic Carbon Analysis

Deliverables

As originally delivered, the data package included all materials for cursory validation of this method except for calibration information. Tetra Tech noted that the method was revised in the third edition (released in 1996) of the source document, although the laboratory cites the obsolete (1982) version.

Holding Times

There are no specific requirements for holding time. The samples were analyzed within the VOC holding time of 14 days from collection to analysis, the most restrictive organic holding time.

Calibration

No calibration data were reported. No qualifications were applied because of this data gap.

Blanks

A method blank was analyzed as required and contained no detectable analytes.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses are not required in this analysis.

Laboratory Control Sample Recoveries

An LCS was analyzed and the recovery was within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no apparent problems with the TOC analysis. The analytical results may be used, as reported, for the purposes stated in the workplan.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Energy Laboratories, Inc., Helena, Montana
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc.
SDG Number:	H06040167
Sample Numbers:	KRY114BSS001, KRY114BSB001, KRY617SB001, KRY616SB001, KRY616SB002, KRY900QS001, and Trip Blank
Matrix:	Five Soil Samples, One Source Water, and One Trip Blank
QA Level:	Cursory validation on this SDG
Report Date:	12 July 2006

1.0 INTRODUCTION

Data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Organic Data Review" dated October 1999, "National Functional Guidelines for Inorganic Data Review" dated October 2004, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA methods used here. The following Table 1 lists the samples and the analyses performed on each sample. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data by methodology. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

TABLE 1
SAMPLE CROSS REFERENCE TABLE
SAMPLE DELIVERY GROUP H06040167

Sample ID	Matrix	Date Collected	Analyses								
			VOC	SVOC	VPH	EPH	PCP	Metals	Formaldehyde	Chlorine	Bromate
KRY114BSS001	Soil	04/18/06	X	X	X	X	X				
KRY114BSB001	Soil	04/18/06	X	X	X	X	X				
KRY617SB001	Soil	04/19/06	X	X	X	X	X	X			
KRY616SB001	Soil	04/19/06	X	X	X	X	X	X			
KRY616SB002	Soil	04/19/06	X	X	X	X	X	X			
KRY900QS001	Water	04/19/06	X	X	X	X	X	X	X	X	X
Trip Blank	Water	01/19/06	X		X						

VOC = Volatile organic compounds analyzed by EPA SW-846 Method 8260B.
SVOC = Semivolatile organic compounds analyzed by EPA SW-846 Method 8270C.
VPH = Volatile petroleum hydrocarbons analyzed by the Massachusetts Department of Environmental Protection (DEP) VPH Method.
EPH = Extractable petroleum hydrocarbons analyzed by the Massachusetts DEP EPH Method.
PCP = Pentachlorophenol analyzed by EPA SW-846 Method 8151.
Metals = Metals analyzed by EPA SW-846 Methods 6010B, 6020, and 5471A for soil samples and EPA Methods 200.7, 200.8, and 245.1 for water samples.
Formaldehyde = Analyzed by a modification of National Institute of Occupational Safety and Health (NIOSH) Method 3500.
Chlorine = Analyzed for residual chlorine by Standard Method 4500-Cl-B.
Bromate = Analyzed by EPA Method 300.1 by Underwriters' Laboratories, Inc., of South Bend, Indiana, under subcontract.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Compound identification
  Compound quantitation
  Reported detection limits
  Sample result verification
  Tentatively identified compounds (TICs)
  System performance
* Overall assessment of the SDG.

Inorganic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Matrix spike, matrix duplicate, matrix spike duplicate (MS, MD, MSD) recovery
* Laboratory control sample (LCS) recovery
* Inductively coupled plasma (ICP) serial dilution results
* Field duplicate samples
  Other method-specific QC measures
  Graphite furnace atomic absorption QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.
N	=	Indicates presumptive evidence of the compound.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0. Analyses are listed in the same order as in Table 1.

4.1 Volatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The percent differences (%D) of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Internal Standard Performance

No data on internal standard recoveries was provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY900QS001 and a soil sample from another SDG. All recoveries and relative percent differences (RPD) were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Overall Assessment of This SDG

There were no problems with the VOC analyses. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.2 Semivolatile Organic Compound Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration and internal standard data. Note that certain polynuclear

aromatic hydrocarbons were analyzed separately by the selected-ion monitoring (SIM) variant of EPA SW-846 Method 8070C. The analytical variants are discussed together.

Holding Times

Samples were analyzed within the holding times of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations from the initial calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. Four samples (KRY114BSS01, KRY617SB001, KRY616SB001, and KRY616SB002) yielded recoveries of nitrobenzene-d5 ranging from 125 percent to 129 percent, versus the laboratories QC limits of 23 to 120 percent. No qualifications are warranted for a single SVOC base-neutral surrogate being out of QC limits.

Internal Standard Performance

No data on internal standard recoveries were provided. No qualifications were applied because of this data gap.

Matrix Spike/Matrix Spike Duplicate Performance

An aqueous MS analysis (there was insufficient sample volume for a SVOC MSD analysis) was performed on sample KRY900QS001. All recoveries were within QC limits except for 2,4,5-trichlorophenol (106 percent versus QC limits of 47 to 96 percent) and 4-chloro-3-methylphenol (96 percent versus QC limits of 50 to 94 percent). Neither compound was detected in this aqueous sample, so no qualifications were applied for these minor exceedances.

MS/MSD analyses were performed on a soil sample from another SDG. Most recoveries and all RPDs were within QC limits, and the irregularities were minimal. No qualifications are warranted for these minor problems in a sample from another site.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. Most recoveries were within QC limits. The aqueous LCS had irregular recoveries for 1-methylnaphthalene (53 percent versus generic QC limits of 70 to 130 percent), 3,3'-dichlorobenzidine (62 percent versus generic QC limits of 70 to 130 percent), benzoic acid (11 percent versus generic QC limits of 70 to 130 percent), benzyl alcohol (34 percent versus generic QC limits of 70 to 130 percent), and hexachloroethane (33 percent versus laboratory-specific QC limits of 34 to 74 percent). None of these SVOCs was detected in the one aqueous sample. No qualifications were applied for the three compounds that were only slightly below the QC limits. (As the laboratory noted in the case narrative, the generic limits may be inappropriate.) However, the non-detected results for the compounds with very low recoveries were flagged "UJ" to indicate that the sample quantitation limits are considered estimated and may be biased low. This affected:

- Benzoic acid and benzyl alcohol in sample KRY900QS001

The solid LCS had excessive recoveries for 2-chloronaphthalene (102 percent, versus laboratory-specific QC limits of 53 to 98 percent), 2-nitrophenol (98 percent, versus laboratory-specific QC limits of 33 to 92 percent), benzo(e)pyrene (134 percent, versus generic QC limits of 70 to 130 percent), and benzyl alcohol (138 percent, versus generic QC limits of 70 to 130 percent). None of these SVOCs was detected in the soil samples, so no qualifications were applied to the data.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory. In contrast, sample KRY114BSB001 contained such high levels of extractable organic compounds (the extract could not be concentrated down to the usual1 milliliter) that it was analyzed at a 20-fold dilution. No qualifications are warranted for this irregularity, but note the resulting elevated sample reporting limits.

In the SIM analyses of two samples, the non-target compounds detected in the samples lowered the chromatographic resolution so that benzo(b)fluoranthene and benzo(k)fluoranthene could not be separated. The laboratory quantitated the total peak as benzo(b)fluoranthene. The following results were flagged "J" to indicate that the concentration is considered estimated because it may include some of one or both isomers:

- Benzo(b)fluoranthene in samples KRY114BSS001 and KRY616SB002

Overall Assessment of This SDG

There were no serious problems with the SVOC analyses. Observed problems were either inherent in the characteristics of the analytes (such as the irregular responses in the LCS and MS/MSD samples involving SVOCs known as "poor responders" to the instrument) or because of the sample matrix, especially the high extractable organic content of some samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

4.3 Volatile Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY900QS001 and a soil sample from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the VPH analyses. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.4 Extractable Petroleum Hydrocarbon Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 14 days from collection to extraction and 40 days from extraction to analysis.

Calibration

As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. Continuing calibrations were performed at the required frequencies and concentrations. The %Ds of the continuing calibrations were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Most surrogate recoveries were within QC limits. Sample KRY114BSB001 contained such high concentrations of extractable hydrocarbons that these compounds interfered with determination of the surrogate. No qualifications are warranted for this irregularity.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on sample KRY900QS001 and a soil sample from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

Most total EPH concentrations were so low that the differentiation into specific compounds and classes was not possible.

Overall Assessment of This SDG

There were no significant problems with the EPH analyses. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.5 Pentachlorophenol Analyses

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for initial calibration data.

Holding Times

Samples were analyzed within the holding time of 7 days (water) and 14 days (soil) from collection to extraction and 40 days from extraction to analysis.

Calibration

Calibrations were performed at the required frequencies and concentrations. As indicated above, the initial calibration data was not included in the data package. No qualifications were applied because of this data gap. The %Ds in the continuing calibration were within QC limits.

Blanks

Method blanks were analyzed as required and contained no detectable analytes.

Surrogate Recoveries

Surrogate recoveries were within QC limits.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on samples from another SDG. All recoveries and RPDs were within QC limits.

Laboratory Control Sample Recoveries

LCSs were analyzed with each analytical run. All recoveries were within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the pentachlorophenol analyses. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.6 Metals Analyses

Deliverables

As originally delivered, the data package contained all materials for cursory validation except for initial calibration, continuing calibration verification, and continuing calibration blank data. A subsequent submission corrected the deficiencies.

Holding Times

Samples were analyzed within the holding times of 28 days for mercury and 6 months for all other metals.

Calibrations

All calibration results were within QC limits.

Blanks

The soil matrix blank contained a low concentration of zinc. Samples contained much higher concentrations, so no qualifications are warranted. The aqueous matrix blank contained low concentrations of barium, beryllium, and manganese. The following result

had a similar concentration, so the analyte was flagged "U" to indicate that it may be a laboratory artifact:

- Barium in sample KRY900QS001

Neither beryllium nor manganese was detected in that sample, so no further qualifications are warranted.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed as required, although a number of the samples used were collected from other sites and yielded irregularities involving silver and mercury, among other metals. Because the samples were collected from another site, no qualifications are warranted. In the soil MS/MSD analyses performed on sample KRY617SB001, recoveries of aluminum, barium, and iron could not be determined because the sample contained much more of these metals than the spike. No qualifications are warranted for these data gaps. Antimony recoveries were 49 and 48 percent and selenium recoveries were 76 and 71 percent, versus QC limits of 75 to 125 percent. Therefore, the following results were flagged "UJ" to indicate that the sample reporting limits are considered estimated:

- Antimony and selenium in samples KRY617SB001, KRY616SB001, and KRY616SB002

Laboratory Control Sample Recovery

LCSs were run with each analysis and produced results within QC limits.

Inductively Coupled Plasma Serial Dilution Results

No ICP serial dilution results were reported. No qualifications were applied because of this data gap.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Overall Assessment of the SDB

A few minor irregularities were seen in these analyses, mostly involving the usual poor responders, such as antimony and selenium. The analytical results may be used, as qualified, for the purposes stated in the workplan.

4.7 Formaldehyde Analysis

Deliverables

As originally delivered, the data package included all materials for cursory validation except for calibration information.

Holding Times

There are no specific requirements for holding time. The sample was analyzed within the VOC holding time of 14 days from collection to analysis.

Calibration

No calibration data were reported. No qualifications were applied because of this data gap.

Blanks

A method blank was analyzed as required and contained no detectable formaldehyde.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses are not required in this analysis. A sample duplicate analysis yielded acceptable precision results.

Laboratory Control Sample Recoveries

An LCS was analyzed and the recovery was within QC limits.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the formaldehyde analysis. The analytical results may be used, as reported, for the purposes stated in the workplan.

4.8 Chlorine Analysis

Deliverables

As originally delivered, the data package included all materials for cursory analysis except for the initial standardization of the iodine titrant.

Holding Times

There are no specific requirements for holding time, but the sample was analyzed less than 7 days after collection.

Calibration

The titrant was presumed to have been standardized as required. No qualifications were required for this data gap.

Blanks

A method blank was analyzed as required and contained no detectable chlorine.

Matrix Spike/Matrix Spike Duplicate Performance

MS/MSD analyses were performed on a sample collected from another SDG. All recoveries and the RPD were within QC limits.

Laboratory Control Sample Recoveries

A LCS was analyzed and yielded an acceptable recovery.

Field Duplicate Samples

No field duplicate samples were identified in this SDG.

Other Method-Specific QC Measures

No irregularities were observed.

Overall Assessment of This SDG

There were no problems with the residual chlorine analysis. The result may be used, as reported, for the purposes stated in the workplan.

4.9 Bromate Analysis

Deliverables

As originally delivered, the data package contained only the subcontractor's certificate of analysis. There were no apparent problems with the bromate analysis. The analytical result was flagged "UJ" to indicate that the reporting limit is considered estimated.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1036399
Sample Numbers:	KRYKPT3GW002
Matrix:	One groundwater sample
QA Level:	Cursory validation on this SDG
Report Date:	12 September 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The sample was extracted within the holding time limit of 30 days and the extract was analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. All calibration results were within QC limits.

Blanks

Method blanks were analyzed with the field sample on each day of analysis and yielded positive results for several analytes. However, the sample contained much higher concentrations, so no qualifications are warranted.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

All internal standard recoveries were within QC limits for the field sample, the LCS, and the other QC samples.

MS/MSD Recoveries

No MS/MSD analyses were performed with this SDG. Such analyses in other SDGs, plus the LCS included in this SDG, provided adequate evidence of precision and accuracy.

LCS Recoveries

The laboratory analyzed one LCS in this SDG. All recoveries, which ranged from 84 to 107 percent, were within the SAP-specified QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

Because of the high concentration of octachlorodibenzo(p)dioxin (OCDD) in sample KRYKPT3GW002, the extract was re-analyzed at a 10-fold dilution. The OCDD result for the re-analysis was within calibration range, so the result from the re-analysis was reported in the database.

In one case, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "E" to indicate that the peaks represented polychlorinated diphenyl ethers and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following result was flagged "U" to indicate that the analyte was not detected:

- 2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF) in sample KRYKPT3GW002

Overall Assessment of the SDG

There were no major problems with the analysis of this sample. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD). This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results)

to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS
(picograms/liter)

Samples	TEQ
KRYKPT3GW002	1,398

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1035349
Sample Numbers:	KRY203SW001, KRY203SE001, KRY202SW001, KRY202SE001, KRY202SW701, KRY200SW001, KRY200SE001, KRY560BKDSS001, KRY561BKDSS001, and KRY562BKDSS001
Matrix:	Three surface water samples, three sediment samples, three background soil samples, and one field duplicate surface water sample
QA Level:	Cursory validation on this SDG
Report Date:	18 August 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

All samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. Almost all calibration results were within QC limits. The exception was one closing calibration (P60801A_17) that had recoveries of the internal standards 1,2,3,4,6,7,8-heptachlorodibenzofuran-^{13}C (1,2,3,4,6,7,8-HpCDF-^{13}C), 1,2,3,4,7,8,9-HpCDF-^{13}C, 1,2,3,4,6,7,8-heptachlorodibenzo(p)dioxin-^{13}C (1,2,3,4,6,7,8-HpCDD-^{13}C), and octachlorodibenzo(p)dioxin-^{13}C (OCDD-^{13}C) outside of QC limits. Therefore, the following results were flagged "J" or "UJ", as appropriate, to indicate that they are estimated:

- 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, 1,2,3,4,6,7,8-HpCDD, OCDD, octachlorodibenzofuran (OCDF), total HpCDF, and total HpCDD in samples KRY203SE001, KRY203SE002, KRY203SE003, KRY560BKDSS001, KRY561BKDSS001, and KRY562BKDSS001.

Blanks

Method blanks were analyzed with the field samples on each day of analysis and had positive results for several analytes. When the sample had a concentration similar to that in the accompanying method blank the sample result was considered to be a probable laboratory artifact. Therefore the following results were flagged "U" to indicate the blank contamination:

- 1,2,3,4,6,7,8-HpCDF and OCDD in sample KRY203SW001.
- 2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF), 1,2,3,4,7,8-hexachlorodibenzo(p)dioxin (1,2,3,4,7,8-HxCDD), 1,2,3,6,7,8-HxCDD, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, total TCDF, total hexachlorodibenzofurans (HxCDF), total HxCDD, total HpCDF, and total HpCDD in sample KRY203SE001.

- OCDD in sample KRY202SW001.
- 2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, total TCDF, total HxCDD, and total HpCDD in sample KRY202SE001.
- 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, total HpCDF, and total HpCDD in sample KRY202SW701.
- 1,2,3,4,6,7,8-HpCDF, OCDD, total HpCDF, and total HpCDD in sample KRY200SW001.
- 2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, and total TCDF in sample KRY200SE001.
- 2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDD, OCDF, OCDD, and total TCDF in sample KRY560BKDSS001.
- 2,3,7,8-TCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,4,7,8-HxCDD, and total TCDF in sample KRY561BKDSS001.
- 2,3,7,8-TCDF in sample KRY562BKDSS001.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Almost all internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. The exceptions involved 2,3,7,8-TCDF-^{13}C, 2,3,7,8-tetrachlorodibenzo(p)dioxin-^{13}C (2,3,7,8-TCDD-^{13}C), and/or 1,2,3,7,8-pentachlorodibenzofuran-^{13}C (1,2,3,7,8-PeCDF-^{13}C) in three surface water samples, with recoveries ranging from 28 and 38 percent, below the method-specified QC limits of 40 to 135 percent. Therefore the following results were flagged "UJ" to indicate that the sample quantitation limits are estimated:

- 2,3,7,8-TCDF, 2,3,7,8-TCDD, total TCDF, and total TCDD in sample KRY203SW001.
- 2,3,7,8-TCDF, 2,3,7,8-TCDD, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, total TCDF, total TCDD, and total PeCDF in sample KRY202SW001.
- 2,3,7,8-TCDD, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, total TCDD, and total PeCDF in sample KRY200SW001.

MS/MSD Recoveries

Aqueous MS/MSD analyses were performed using sample KRY200SW001. The recoveries of four analytes could not be reliably determined because the unspiked sample contained more than five times the concentration of the spikes. Nevertheless all recoveries (including for those four analytes) were within SAP-specified QC limits, and ranged from 87 to 112 percent. Also, all relative percent differences (RPD) were within their SAP-specified QC limits, and ranged from 0.9 to 8.9 percent.

No soil or sediment MS/MSD analyses were reported, but such analyses in other SDGs, plus the duplicate LCS analyses included here, provided adequate evidence of precision and accuracy.

LCS Recoveries

The laboratory analyzed one pair of duplicate aqueous LCS, one single aqueous LCS, and one soil LCS in this SDG. In the duplicate pair (LCS-10631 and LCS-10632), all recoveries, which ranged from 81 to 113 percent, and all RPDs, which ranged from 0.0 to 19.4 percent, were within the SAP-specified QC limits. The single aqueous LCS (LCS-10414) also had fully acceptable results, with recoveries ranging from 87 to 107 percent. The soil LCS (LCS-10419) also had fully acceptable QC limits, with recoveries ranging from 87 to 115 percent.

Field Duplicate Samples

This SDG included one field duplicate pair, samples KRY202SW001 and KRY202SW701. The analytical results are practically identical. The largest differences may be a result of different levels of blank contamination, because they were analyzed separately, with different method blanks.

Other Method-Specific QC Measures

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In many cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, and 1,2,3,7,8,9-HxCDD in sample KRY203SW001.
- 1,2,3,7,8,9-HxCDD in sample KRY203SE001.
- OCDF in sample KRY202SW001.
- 1,2,3,4,7,8-HxCDD and 1,2,3,4,7,8,9-HpCDF in sample KRY202SE001.
- 1,2,3,4,7,8-HxCDD in sample KRY200SE001.
- 1,2,3,7,8-Pentachlorodibenzo(p)dioxin (1,2,3,7,8-PeCDD) and 1,2,3,4,7,8,9-HpCDF in sample KRY560BKDSS001.
- 1,2,3,4,7,8,9-HpCDF in samples KRY561BKDSS001 and KRY562BKDSS001.

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-TCDD. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS

Samples	Total TEQ	
	Picograms per liter	Nanograms per kilogram
KRY203SW001	11.5	NA
KRY203SE001	NA	0.24
KRY202SW001	7.15	NA
KRY202SE001	NA	0.33
KRY202SW701	8.09	NA
KRY200SW001	5.83	NA
KRY200SE001	NA	0.69
KRY560BKDSS001	NA	1.08
KRY561BKDSS001	NA	1.35
KRY562BKDSS001	NA	4.83

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1035023
Sample Numbers:	KRY118AGW001, KRY118BGW001, KRY114BGW001, KRYGWY14GW701, KRYGWRR5GW001, KRYGWRR2GW001, KRYKPT2GW001, KRY114AGW001, KRYGWY10GW001, KRYPW1GW001, and KRYGWY10QE001
Matrix:	Ten groundwater samples and one equipment rinsate sample
QA Level:	Cursory validation on this SDG
Report Date:	17 August 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. As submitted, the EDD omitted results for two samples (KRYGWY14GW701 and KRYKPT2GW001); the essential information for these samples was transcribed from the analytical report into the EDD. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
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  Reported detection limits
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  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

With one exception, the samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days. Sample KRYGWY10GW001 arrived at the laboratory 35 days after collection. It was soon extracted and then analyzed well within the holding time limit. The principal reasons for the concern with these analytes are their toxic potency and high persistency. Because of this stability, no qualifications were applied for the delay in extraction.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. All calibration results were within QC limits.

Blanks

Method blanks were analyzed with the accompanying field samples on each day of analysis and yielded positive results for several analytes. When the sample had a concentration similar to that in the accompanying method blank, the sample result was considered to be a probable laboratory artifact. Therefore, the following results were flagged "U" to indicate the blank contamination:

- 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF), 1,2,3,4,6,7,8-heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD), octachlorodibenzo(p)dioxin (OCDD), total tetrachlorodibenzofurans (TCDF), total pentachlorodibenzofurans (PeCDF), total HxCDF, total heptachlorodibenzofurans (HpCDF), and total HpCDD in sample KRY118AGW001.
- 1,2,3,4,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, octachlorodibenzofuran (OCDF), OCDD, total HxCDF, total HpCDF, and total HpCDD in sample KRY118BGW001.
- 1,2,3,4,7,8-HxCDF, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, total PeCDF, total HpCDF, and total HpCDD in sample KRY114BGW001.
- 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,7,8-hexachlorodibenzo(p)dioxin (1,2,3,4,7,8-HxCDD), 1,2,3,6,7,8-HxCDD, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF, 1,2,3,4,6,7,8-

HpCDD, OCDF, OCDD, total pentachlorodibenzo(p)dioxins (PeCDD), total HxCDF, total HxCDD, total HpCDF, and total HpCDD in sample KRYGWY14GW701.

- 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, total HxCDF, total HpCDF, and total HpCDD in sample KRYGWRR5GW001.
- 1,2,3,4,6,7,8-HpCDD, OCDD, total HpCDF, and total HpCDD in sample KRYGWRR2GW001.
- 1,2,3,7,8-PeCDD, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDD, 1,2,3,4,7,8,9-HpCDF, and total PeCDD in sample KRYKPT2GW001.
- 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, and total HpCDD in sample KRYGWY10GW001.
- OCDD in samples KRYPW1GW001 and KRYGWY10QE001.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Almost all internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. The exceptions were 2,3,7,8-TCDF-^{13}C and 2,3,7,8-tetrachlorodibenzo(p)dioxin-^{13}C (2,3,7,8-TCDD-^{13}C) in sample KRYGWY14GW701, with recoveries of 28 and 31 percent, respectively, below the method-specified QC limits of 40 to 135 percent. Therefore, the following results were flagged "UJ" to indicate that the sample quantitation limits are considered estimated:

- 2,3,7,8-TCDF, 2,3,7,8-TCDD, total TCDF, and total TCDD in sample KRYGWY14GW701.

MS/MSD Recoveries

No MS/MSD analyses were performed with this SDG. Such analyses in other SDG, plus the duplicate LCS analyses included here, provided adequate evidence of precision and accuracy.

LCS Recoveries

The laboratory analyzed two pairs of duplicate LCS samples and one single LCS in this SDG. In the first duplicate pair (LCS-10181 and LCS-10182), recoveries of OCDD were 158 and 117 percent, respectively, versus SAP-specified QC limits of 78 to 144 percent. The average recovery was acceptable. Therefore, no qualifications were applied for this minor irregularity. All other recoveries, which ranged from 84 to 108 percent, and all relative percent duplicates (RPD), which ranged from 0.9 to 29.8 percent (for OCDD; the next highest was only 13.7 percent), were within the SAP-specified QC limits.

In the second duplicate pair (LCS-10346 and LCS-10347), recoveries ranged from 81 percent to 116 percent, well within SAP-specified QC limits for MS/MSD analysis, and RPDs ranged from 9.2 to 17.0 percent, again within the SAP-specified QC limits. In the single LCS (LCS-10414), recoveries ranged from 87 percent to 107 percent.

Field Duplicate Samples

This SDG was intended to include one field duplicate pair, samples KRYGWY14GW001 and KRYGWY14GW701. However, both containers for sample KRYGWY14GW001 were broken when the laboratory opened the cooler they were shipped in. The laboratory did not attempt to separate the spilled samples from the melted ice and packing materials in the cooler. Therefore, only the intended duplicate sample was analyzed. These results stand as the primary results for that location at the time of sampling.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. Therefore, the following positive result for 2,3,7,8-TCDF was flagged "J" to indicate that it may be biased high because of interference from other congeners:

- 2,3,7,8-TCDF in sample KRY114AGW001

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In many cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference (or "E" when the interference could be identified as polychlorinated diphenylethers) and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,7,8-PeCDF, 1,2,3,4,6,7,8-HpCDF, and OCDF in samples KRY118AGW001 and KRYGWRR2GW001.
- 1,2,3,7,8-PeCDF in samples KRY118BGW001, KRYGWRR5GW001, and KRYGWY10GW001.
- 2,3,4,6,7,8-HxCDF in sample KRY114BGW001.
- 1,2,3,7,8-PeCDF and 1,2,3,7,8-PeCDD in samples KRYGW14GW701 and KRY114AGW001.
- 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, and 2,3,4,7,8-PeCDF in sample KRYKPT2GW001.
- OCDF in sample KRYPW1GW001.
- 1,2,3,4,6,7,8-HpCDD and OCDF in sample KRYGWY10QE001.

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-TCDD. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS
(picograms/liter)

Samples	TEQ
KRY118AGW001	4.08
KRY118BGW001	4.60
KRY114BGW001	5.56
KRYGWY14GW701	11.1
KRYGWRR5GW001	4.84
KRYGWRR2GW001	5.25
KRYKPT2GW001	166
KRY114AGW001	925
KRYGWY10GW001	6.05
KRYPW1GW001	13.5
KRYGWY10QE001	12.2

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1034582
Sample Numbers:	KRYKPT1GW001, KRY129AGW001, KRYKPT15GW001, KRYKPT15GW701, and KRY121BGW001
Matrix:	Four groundwater samples and one field duplicate sample
QA Level:	Cursory validation on this SDG
Report Date:	10 August 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. All calibration results were within QC limits.

Blanks

Method blanks were analyzed with the field samples on each day of analysis and had positive results for several analytes. When the associated field sample had a concentration similar to that in the accompanying method blank, the sample result was considered to be a probable laboratory artifact. Therefore the following results were flagged "U" to indicate the blank contamination:

- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF), 1,2,3,4,6,7,8-heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD), octachlorodibenzofuran (OCDF), octachlorodibenzo(p)dioxin (OCDD), total HpCDF, and total HpCDD in sample KRYKPT1GW001
- 1,2,3,4,6,7,8-HpCDD, OCDF, and total HpCDD in sample KRY129AGW001
- 1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin (1,2,3,6,7,8-HxCDD), 1,2,3,4,6,7,8-HpCDD, and total HxCDD in sample KRYKPT15GW001
- 1,2,3,6,7,8-Hexachlorodibenzo(p)dioxin (1,2,3,6,7,8-HxCDD), 1,2,3,4,6,7,8-HpCDD, OCDF, and total HxCDD in sample KRYKPT15GW701
- OCDF, OCDD, total HpCDF, and total HpCDD in sample KRY121BGW001.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

All internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples.

MS/MSD Recoveries

No MS/MSD analyses were performed with this SDG. Such analyses in other SDGs, plus the duplicate LCS analyses included here, provided adequate evidence of precision and accuracy.

LCS Recoveries

The laboratory analyzed two pairs of duplicate LCS samples in this SDG. In the first duplicate pair (LCS-10090 and LCS-10091), recoveries of OCDD were 157 and 123 percent, respectively, versus SAP-specified QC limits of 70 to 140 percent for that congener in MS/MSD analyses. The average recovery was acceptable, and no OCDD was detected in the only sample associated with this LCS pair. Therefore, no qualifications were applied for this minor irregularity. All other recoveries, which ranged from 99 to 130 percent, and all relative percent duplicates (RPD), which ranged from 0.0 to 24.3 percent (for OCDD; the next highest was only 10.3 percent), were within the SAP-specified QC limits.

In the second duplicate pair (LCS-10141 and LCS-10142), recoveries ranged from 83 percent to 109 percent, well within SAP-specified QC limits, and RPDs ranged from 0.0 to 6.8 percent, again well within the SAP-specified QC limits.

Field Duplicate Samples

This SDG includes one field duplicate pair, samples KRYKPT15GW001 and KRYKPT15GW701. In both samples, most target congeners were not detected or were detected at such low concentrations that the results were considered estimated, as discussed below. The only congener detected at or above the reporting limit was OCDD. The RPD for OCDD was 42 percent, which exceeds the SAP-specified QC limit of 32 percent for OCDD in aqueous MS/MSD analyses. This field duplicate RPD is relatively high as compared with the RPDs of 24 and 1 percent for OCDD in the LCS duplicate samples in this SDG and the RPD of 8 percent for OCDD in the aqueous MS/MSD analyses in SDG 1034368, all of which were analyzed at about the same time as the field duplicate samples. While no qualification is required for field duplicate precision, the results may indicate heterogeneity of OCDD in the samples.

Other Method-Specific QC Measures

No 2,3,7,8-tetrachlorodibenzofuran (TCDF) was detected, so no second column confirmation was required. The laboratory flagged results below the calibration range

"J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,6,7,8-HxCDD and 1,2,3,4,6,7,8-HpCDF in sample KRY129AGW001
- 1,2,3,4,6,7,8-HpCDF and 1,2,3,4,6,7,8-HpCDD in sample KRY121BGW001

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan. Data users should be aware of the apparent heterogeneity in contaminant distribution at the site, as discussed for the field duplicate samples.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-TCDD. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS
(picograms/liter)

Samples	TEQ
KRYKPT1GW001	3.23
KRY129AGW001	4.25
KRYKPT15GW001	5.16
KRYKPT15GW701	4.16
KRY121BGW001	3.24

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1034368
Sample Numbers:	KRY121AGW001, KRY123AGW001, KRY127AGW001, KRY126AGW001, and KRY129BGW001
Matrix:	Five groundwater samples
QA Level:	Cursory validation on this SDG
Report Date:	10 August 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed (and, in some cases, re-analyzed) within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. In one closing continuing calibration, the internal standards 1,2,3,7,8-pentachlorodibenzofuran-^{13}C (1,2,3,7,8-PeCDF-^{13}C) and octachlorodibenzo(p)dioxin-^{13}C (OCDD-^{13}C) were outside the acceptable range. Therefore, the following results, which were associated with this irregular calibration, were flagged "UJ" to indicate that the quantitation limit is considered estimated:

- 1,2,3,7,8-PeCDF, OCDD and octachlorodibenzofuran (OCDF) in sample KRY129BGW001

All other results were within QC limits.

Blanks

Method blanks were analyzed with the field samples on each day of analysis and had positive results for several analytes. When the sample had a concentration similar to that in the accompanying method blank the sample result was considered to be a probable laboratory artifact. Therefore the following results were flagged "U" to indicate the blank contamination:

- 1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD), OCDF, OCDD, and total HpCDD in samples KRY121AGW001 and KRY126AGW001
- OCDD in sample KRY123AGW001
- OCDF and OCDD in sample KRY127AGW001

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

All internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples.

MS/MSD Recoveries

MS/MSD analyses were performed on sample KRY123AGW001. Recoveries ranged from 81 to 104 percent, well within the SAP-specified QC limits. The relative percent differences (RPD) between the two analyses ranged from 0.0 to 12.4 percent, again well within the SAP-specified QC limits.

LCS Recoveries

The laboratory analyzed three LCS samples for water, one singly and the other as a duplicate pair. In the first (LCS-10080) all recoveries were well within the SAP-specified limits for accuracy. Specifically, the LCS recoveries ranged from 82 to 104 percent.

In the duplicate pair (LCS-10090 and LCS-10091), recoveries of OCDD were 157 and 123 percent, respectively, versus SAP-specified QC limits of 70 to 140 percent for that congener in MS/MSD analyses. The average recovery was acceptable, and no OCDD was detected in the only sample associated with this LCS pair. Therefore, no qualifications were applied for this minor irregularity. All other recoveries, which ranged from 99 to 130 percent, and all RPD, which ranged from 0.0 to 24.3 percent (for OCDD; the next highest was only 10.3 percent), were within the SAP-specified QC limits.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. Therefore the following positive result for 2,3,7,8-TCDF was flagged "J" to indicate that it may be biased high due to interference from other congeners:

- 2,3,7,8-TCDF in sample KRY123AGW001

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory

identified these by the flag "I" for interference and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,4,6,7,8-HpCDF and OCDF in sample KRY123AGW001
- 1,2,3,4,6,7,8-HpCDF in sample KRY127AGW001

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-TCDD. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS
(picograms/liter)

Samples	TEQ
KRY121AGW001	3.23
KRY123AGW001	15.2
KRY127AGW001	5.06
KRY126AGW001	2.99
KRY129BGW001	6.91

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1034012
Sample Numbers:	KRY103BGW001, KRY101AGW001, KRY100AGW001, KRY103AGW001, KRY111BGW001, KRY111AGW001, KRY107BGW001, KRY107AGW001, and KRY111AQE001
Matrix:	Eight groundwater samples and one equipment rinsate (water) sample
QA Level:	Cursory validation on this SDG
Report Date:	10 August 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed (and, in some cases, re-analyzed) within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. In one closing continuing calibration, the internal standards 1,2,3,7,8-pentachlorodibenzofuran-^{13}C (1,2,3,7,8-PeCDF-^{13}C) and octachlorodibenzo(p)dioxin-^{13}C (OCDD-^{13}C) were outside the acceptable range. Therefore, the following results, which were quantitated in the same analytical run as this irregular calibration, were flagged "UJ" to indicate that the quantitation limit is considered estimated:

- 1,2,3,7,8-PeCDF, OCDD and octachlorodibenzofuran (OCDF) in sample KRY111AQE001

All other results were within QC limits.

Blanks

Method blanks were analyzed with the field samples on each day of analysis and had positive results for several analytes. When the sample had a concentration similar to that in the accompanying method blank the sample result was considered to be a probable laboratory artifact. Therefore the following results were flagged "U" to indicate the blank contamination:

- 1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD), OCDF, OCDD, and total HpCDD in sample KRY103BGW001
- 1,2,3,4,6,7,8-HpCDD, OCDF, and total hexachlorodibenzofurans (HxCDF) in sample KRY101AGW001
- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (12,3,4,6,7,8-HpCDF), OCDF, OCDD, and total HpCDF in sample KRY103AGW001
- 1,2,3,4,6,7,8-HpCDD, OCDF, and total HpCDD in sample KRY111BGW001
- 1,2,3,4,6,7,8-HpCDD, OCDD, and total HpCDD in sample KRY107BGW001
- 1,2,3,4,6,7,8-HpCDD, OCDF, OCDD, and total HpCDD in sample KRY111AQE001.

When the sample had a much higher concentration than the method blank (as with OCDD in sample KRY101AGW001), no qualifications were required.

The equipment rinsate sample (KRY111AQE001) contained a low concentration of some non-target (non-toxic) congeners. The source of these compounds is unknown. No qualifications were applied for this rinsate contamination, but data users should consider this contamination when evaluating low-concentration water samples.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Most internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. In sample KRY107BGW001, 2 of the 15 internal standards were slightly below the method limits of 40 to 135 percent recovery (at 36 and 32 percent recovery). Therefore, the following non-detected results were flagged "UJ" to indicate that they are considered estimated.

- 1,3,4,7,8,9-HpCDF, OCDD, and OCDF in sample KRY107BGW001

The probable errors in the concentrations of these analytes in the samples may be quite small, because the target compound results are quantitated against the internal standard recovery.

MS/MSD Recoveries

No MS/MSD analyses were performed in this SDG. Previous SDGs yielded acceptable results from MS/MSD and duplicate LCS analyses. No qualifications are warranted for this data gap.

LCS Recoveries

The laboratory analyzed two LCS samples for water. In the first (LCS-10014), 12 of the 15 internal standards had recoveries below the acceptable range. Therefore, the results of this LCS were not considered in the data validation. All recoveries from the second (LCS-10080) were well within the SAP-specified limits for accuracy. Specifically, the LCS recoveries ranged from 82 to 104 percent.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. Therefore, the following positive result for 2,3,7,8-TCDF was flagged "J" to indicate that it may be biased high due to interference from other congeners:

- 2,3,7,8-TCDF in sample KRY111AGW001

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference (or the flag "E" when the interference was identified as coming from a polychlorinated diphenylether) and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,7,8-PeCDF in sample KRY101AGW001
- OCDF in samples KRY100AGW001 and KRY107BGW001
- 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF) and 1,2,3,4,6,7,8-HpCDF in samples KRY111BGW001 and KRY111AQE001
- 1,2,3,7,8-PeCDF and 2,3,4,6,7,8-HxCDF in sample KRY111AGW001

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-TCDD. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS
(picograms/liter)

Samples	TEQ
KRY103BGW001	3.38
KRY101AGW001	5.62
KRY100AGW001	4.41
KRY103AGW001	5.26
KRY111BGW001	3.63
KRY111AGW001	968
KRY107BGW001	6.25
KRY107AGW001	7.29
KRY111AQE001	5.53

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1032459
Sample Numbers:	KRY628SS001, KRY628SS002, KRY628SS003, KRY628SB001, KRY628SB003, KRY628S004, KRY656SB001, KRY656SB002, KRY656SB003, KRY555SS001, KRY505SS001, KRY658SS001, KRY662SS001, and KRY554SS001
Matrix:	Fourteen soil samples
QA Level:	Cursory validation on this SDG
Report Date:	24 July 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed, including re-analyses at dilutions, within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. All calibration results were acceptable.

Blanks

Method blanks were analyzed for each analytical run had positive results for a few analytes. When a sample had a concentration similar to that in the accompanying method blank, the sample result was considered to be a probable laboratory artifact. Therefore, the following results were flagged "U" to indicate the blank contamination:

- Octachlorodibenzofuran (OCDF) in sample KRY628SS002.
- 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF) in sample KRY555SS001.

When the field sample had a much higher concentration than the method blank (as was the case for most samples), no qualifications were applied.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Most internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. The exceptions were involved 1,2,3,7,8-pentachlorodibenzo(p)dioxin-^{13}C (1,2,3,7,8-PeCDD-^{13}C) and 1,2,3,4,6,7,8-heptachlorodibenzo(p)dioxin-^{13}C (1,2,3,4,6,7,8-HpCDD-^{13}C) in one sample, which had recoveries above the QC limit, possibly due to interference from non-target compounds. Therefore, the following results were flagged "J" to indicate that they are considered estimated and may be biased low:

- 1,2,3,7,8-PeCDD and 1,2,3,4,6,7,8-HpCDD in sample KRY658SS001

MS/MSD Recoveries

Soil MS/MSD analyses were performed using sample KRY628SS001. Recoveries could not be determined for 4 of the 17 analytes because the unspiked sample contained more than five times the concentrations of the spiked compounds. No qualifications are warranted for this data gap. All recoveries that could be determined, ranging from 93 to 119 percent, were well within QC limits. All relative percent difference (RPD) results, ranging from 1.8 to 24.4 percent, were also within QC limits.

LCS Recoveries

The laboratory analyzed two soil LCSs. Recoveries were well within the SAP-specified limits for accuracy. These recoveries ranged from 83 to 116 percent.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. As such, the following positive results for 2,3,7,8-TCDF were flagged "J" to indicate that they may be biased high because of interference from other congeners:

- 2,3,7,8-TCDF in samples KRY628SS001, KRY628SB003, KRY628SB004, KRY656SB002, KRY656SB003, KRY555SS001, KRY505SS001, KRY658SS001, and KRY662SS001.

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curves. The values should be considered estimated as flagged by the laboratory.

In one sample, a result saturated the detector on even the maximum practical (100-fold) dilution. Therefore the following result was flagged "J" to indicate that it is estimated and biased low:

- Octachlorodibenzo(p)dioxin (OCDD) in sample KRY628SB003.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference (or an "E" in the one case when the interference was identified as coming from polychlorinated diphenylethers) and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF) and 2,3,4,6,7,8-HxCDF in sample KRY628SS001
- 1,2,3,4,7,8-HxCDF, 1,2,3,4,7,8-hexachlorodibenzo(p)dioxin (1,2,3,4,7,8-HxCDD), and 1,2,3,7,8,9-HxCDD in sample KRY628SS003
- 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF in sample KRY628SB001
- 2,3,4,7,8-Pentaclorodibenzofuran (2,3,4,7,8-PeCDF) and 2,3,4,6,7,8-HxCDF in sample KRY628SB003
- 2,3,4,6,7,8-HxCDF in sample KRY628SB004
- 1,2,3,7,8-PeCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, and 1,2,3,4,7,8,9-HpCDF in sample KRY656SB001
- 1,2,3,7,8-PeCDF and 1,2,3,4,7,8-HxCDF in sample KRY656SB002
- 2,3,7,8-Tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD) in sample KRY656SB003
- 1,2,3,7,8,9-HxCDD and 1,2,3,4,7,8,9-HpCDF in sample KRY555SS001
- 1,2,3,6,7,8-HxCDF in sample KRY505SS001
- 1,2,3,4,7,8-HxCDF in sample KRY658SS001
- 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, and 1,2,3,7,8,9-HxCDD in sample KRY554SS001

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-tetrachlorodibenzo(p)dioxin. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS

Samples	TEQ	
	Nanograms/kilogram	Picograms/liter
KRY628SS001	2.93	NA
KRY628SS002	0.40	NA
KRY628SS003	0.61	NA
KRY628SB001	1.13	NA
KRY628SB003	4600	NA
KRY628SB004	977	NA
KRY656SB001	5.82	NA
KRY656SB002	14.9	NA
KRY656SB003	460	NA
KRY555SS001	1.43	NA
KRY505SS001	2220	NA
KRY658SS001	155	NA
KRY662SS001	2600	NA
KRY554SS001	2.21	NA

NA = Not applicable

Data users should note that the listed TEQ for sample KRY628SB003 is biased low due to saturation of the detector at the maximum practical dilution. The actual total TEQ for this sample is probably higher.

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1032190
Sample Numbers:	KRY482SS001, KRY482SS002, KRY482SS003, KRY549SS001, KRY550SS001, KRY551SS001, KRY552SS001, KRY553SS001, KRY556SS001, KRY557SS001, KRY429SS001, KRY429SS002, KRY429SS003, KRY430SS001, KRY430SS002, KRY430SS003, KRY902QS001, KRY636QE001, and KRY430QE001
Matrix:	Sixteen soil samples, one source water sample, and two equipment rinsate (water) samples
QA Level:	Cursory validation on this SDG
Report Date:	19 July 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed below, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. All calibration results were acceptable.

Blanks

Method blanks were analyzed for each medium and yielded positive results for a few analytes. When a sample had a concentration similar to that in the accompanying method blank, the sample result was considered to be a probable laboratory artifact. Therefore, the following results were flagged "U" to indicate the blank contamination:

- Octachlorodibenzo(p)dioxin (OCDD) in sample KRY902QS001.
- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF), total hexachlorodibenzofurans (HxCDF), and total HpCDF in sample KRY636QE001
- 1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD), octachlorodibenzofuran (OCDF), OCDD, total pentachlorodibenzo(p)dioxins (PeCDD), and total HpCDD in sample KRY430SS003
- 1,2,3,4,6,7,8-HpCDD and total HpCDD in sample KRY430QE001

When the field sample had a much higher concentration than the method blank (as for most analytes in the soil samples and OCDD in water sample KRY636QE001) or a nondetect result (as for most analytes in the water samples), no qualifications were applied.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

All internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples.

MS/MSD Recoveries

MS/MSD analyses were performed on sample KRY482SS001. Recoveries could not be determined for 10 of the 17 analytes because the unspiked sample contained more than five times the concentrations of the spiked compounds. No qualifications are warranted for this data gap. All recoveries that could be determined ranged from 88 to 111 percent, well within QC limits. All relative percent differences (RPD) ranged from 0.1 to 24.6 percent, also within QC limits.

No aqueous MS/MSD analyses were performed. No qualifications are warranted for this data gap.

LCS Recoveries

The laboratory analyzed LCS samples for each medium. Recoveries were well within the SAP-specified limits for accuracy, with aqueous recoveries ranging from 86 to 113 percent and soil recoveries ranging from 92 to 113 percent.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. As such, the following positive results for 2,3,7,8-TCDF were flagged "J" to indicate that they may be biased high because of interference from other congeners:

- 2,3,7,8-TCDF in samples KRY482SS001, KRY482SS003, KRY549SS001, KRY550SS001, KRY551SS001, KRY552SS001, KRY553SS001, KRY556SS001, KRY557SS001, KRY429SS001, KRY429SS002, KRY429SS003, KRY430SS001, and KRY430SS003.

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference (or an "E" in the few cases when the

interference was identified as coming from polychlorinated diphenylethers) and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 2,3,4,6,7,8-HxCDF and 1,2,3,6,7,8-hexachlorodibenzo(p)dioxin (1,2,3,6,7,8-HxCDD) in sample KRY636QE001
- 1,2,3,6,7,8-HxCDF in sample KRY482SS001
- 2,3,7,8-TCDF, 2,3,7,8-tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD), and 1,2,3,6,7,8-HxCDF in sample KRY482SS002
- 1,2,3,7,8-PeCDD, 1,2,3,6,7,8-HxCDF, and 1,2,3,4,7,8-HxCDD in sample KRY482SS003
- 1,2,3,6,7,8-HxCDF and 1,2,3,4,7,8,9-HpCDF in sample KRY549SS001
- 1,2,3,6,7,8-HxCDF in sample KRY550SS001
- 1,2,3,6,7,8-HxCDF in sample KRY551SS001
- 1,2,3,6,7,8-HxCDF in sample KRY552SS001
- 2,3,7,8-TCDD and 1,2,3,6,7,8-HxCDF in sample KRY553SS001
- 1,2,3,6,7,8-HxCDF in sample KRY556SS001
- 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF), 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, and 1,2,3,7,8,9-HxCDD in sample KRY557SS001
- 1,2,3,6,7,8-HxCDF in sample KRY429SS001
- 2,3,4,7,8-PeCDF, 1,2,3,7,8-PeCDD, and 1,2,3,6,7,8-HxCDF in sample KRY429SS002
- 2,3,7,8-TCDD and 1,2,3,6,7,8-HxCDF in sample KRY429SS003
- 2,3,7,8-TCDD and 1,2,3,6,7,8-HxCDF in sample KRY430SS001
- 2,3,7,8-TCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,7,8-HxCDD, and 1,2,3,4,7,8,9-HpCDF in sample KRY430SS002
- 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF in sample KRY430SS003
- OCDD in sample KRY430QE001

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-tetrachlorodibenzo(p)dioxin. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute

zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS

Samples	TEQ	
	Nanograms/kilogram	Picograms/liter
KRY482SS001	24.1	NA
KRY482SS002	6.03	NA
KRY482SS003	1.73	NA
KRY549SS001	0.64	NA
KRY550SS001	8.36	NA
KRY551SS001	6.17	NA
KRY552SS001	1.95	NA
KRY553SS001	2.75	NA
KRY556SS001	4.46	NA
KRY557SS001	0.39	NA
KRY429SS001	0.51	NA
KRY429SS002	0.99	NA
KRY429SS003	5.53	NA
KRY430SS001	5.19	NA
KRY430SS002	0.38	NA
KRY430SS003	0.10	NA
KRY902QS001	NA	5.47
KRY636QE001	NA	6.90
KRY430QE001	NA	4.61

NA = Not applicable

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1031716
Sample Numbers:	KRY111ASS001, KRY111ASS002, KRY111ASS003, KRY440SS001, KRY440SS002, KRY130QE001, and KRY440QE001
Matrix:	Five soil samples and two equipment rinsate (water) samples
QA Level:	Cursory validation on this SDG
Report Date:	19 July 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

<u>Organic Analyses</u>

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. Most calibration results were acceptable. The exceptions involved the octachlorodibenzo(p)dioxin-^{13}C (OCDD-^{13}C) responses in three continuing calibrations, which were outside of the target range. These included both of the soil analytical runs. Therefore, the following results, which were quantitated in the same analytical runs as one or more irregular calibrations, were flagged "J" to indicate that the quantitation is estimated.

- OCDD and octachlorodibenzofuran (OCDF) in all soil samples

Blanks

Method blanks were analyzed for each medium on each day of analysis and had positive results for a few analytes. When a sample had a concentration similar to that in the accompanying method blank, the sample result was considered to be a probable laboratory artifact. Therefore the following results were flagged "U" to indicate the blank contamination:

- 2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF) and OCDD in sample KRY130QE001
- OCDD in sample KRY440QE001

When the field sample had a much higher concentration than the method blank (as with all analytes in the soil samples) or a nondetect result (as for most analytes in the water samples), no qualifications were applied.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Almost all internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. The exceptions involved the internal standard OCDD-

^{13}C, with a recovery of 33 percent, below the method limits of 40 to 135 percent recovery, and the internal standard 1,2,3,4,7,8-hexachlorodibenzofuran-^{13}C (1,2,3,4,7,8-HxCDF-^{13}C), with a recovery of 141 percent. Therefore the following results were flagged "J to indicate that they are estimated:

- OCDD and OCDF in sample KRY111ASS001

No qualifications were required for 1,2,3,4,7,8-HxCDF because it was not detected in the sample. The probable errors in the concentrations of these analytes in the samples may be quite small, because the target compound results are quantitated against the internal standard recovery.

MS/MSD Recoveries

Two sets of soil MS/MSD analyses were performed in this SDG. The first used sample KRY111ASS001. Recoveries could not be determined for three analytes because the unspiked sample contained more than five times the concentrations of the spiked compounds. The second set used sample KRY440SS001 and recoveries for seven analytes could not be determined for the same reason. No qualifications are warranted for this data gap. All recoveries that could be determined and all relative percent differences (RPD) were well within QC limits.

No aqueous MS/MSD analyses were performed. No qualifications are warranted for this data gap.

LCS Recoveries

The laboratory analyzed LCS samples with each analytical run. Recoveries were well within the SAP-specified limits for accuracy, with aqueous recoveries ranging from 90 to 115 percent and soil recoveries ranging from 89 to 119 percent.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. As such, the following positive result for 2,3,7,8-TCDF was flagged "J" to indicate that it be biased high due to interference from other congeners.

- 2,3,7,8-TCDF in sample KRY440SS002

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations below the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference (or an "E" in the few cases when the interference was identified as coming from polychlorinated diphenylethers) and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF), 1,2,3,4,7,8-hexachlorodibenzofuran (HxCDF), 1,2,3,4,6,7,8-heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF), and 1,2,3,4,6,7,8-heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD) in sample KRY130QE001
- 1,2,3,4,6,7,8-HpCDF in sample KRY111ASS001; 1,2,3,7,8-pentachlorodibenzo(p)dioxin (PeCDD), 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,4,7,8-hexachlorodibenzo(p)dioxin (1,2,3,4,7,8-HxCDD), and 1,2,3,4,7,8,9-HpCDF in sample KRY111ASS002
- 2,3,7,8-TCDF in sample KRY111ASS003
- 2,3,7,8-TCDF, 1,2,3,7,8,9-HxCDF, 1,2,3,4,7,8-HxCDD, 1,2,3,6,7,8-HxCDD, and 1,2,3,4,7,8,9-HpCDF in sample KRY440SS001
- 1,2,3,6,7,8-HxCDF, 2,3,4,6,7,8-HxCDF, 1,2,3,6,7,8-HxCDD, and 1,2,3,4,7,8,9-HpCDF in sample KRY440SS002.

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for any purpose.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore, it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-tetrachlorodibenzo(p)dioxin. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS

Samples	TEQ	
	Nanograms/kilogram	Picograms/liter
KRY111ASS001	1.94	NA
KRY111ASS002	1.76	NA
KRY111ASS003	17.3	NA
KRY440SS001	13.6	NA
KRY440SS002	2.98	NA
KRY130QE001	NA	2.32
KRY403QE001	NA	13.6

NA = Not applicable

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1031364
Sample Numbers:	KRY603SB001, KRY603SB002, KRY603SB003, KRY605SS001, KRY605SS002, KRY605SS003, KRY666SB001, KRY666SB002, and KRY403QE001
Matrix:	Eight soil samples and one equipment rinsate (water) sample
QA Level:	Cursory validation on this SDG
Report Date:	18 July 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

Organic Analyses

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

No qualifier	=	Indicates the data are acceptable both qualitatively and quantitatively.
U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. All calibration results were acceptable.

Blanks

Method blanks were analyzed for each medium and had positive results for a few analytes. When a sample had a concentration similar to that in the accompanying method blank the sample result was considered to be a laboratory artifact. Therefore, the following results were flagged "U" to indicate the blank contamination:

- Octachlorodibenzo(p)dioxin (OCDD) in sample KRY603SB002
- 1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF) and total HpCDF in sample KRY603SB003
- 1,2,3,4,6,7,8-HpCDF and total HpCDF in sample KRY666SB002

When the sample had a much higher concentration than the method blank (as with OCDD in sample KRY603SB001), no qualifications were applied.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Almost all internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. In a single sample, one internal standard, OCDD-^{13}C, had a recovery of 29 percent, below the method limits of 40 to 135 percent recovery. Therefore, the following positive results were flagged "J" to indicate that they are estimated:

- OCDD and octachlorodibenzofuran (OCDF) in sample KRY605SS001

The probable errors in the concentrations of these analytes in the sample may be quite small, because the target compound results are quantitated against the internal standard recovery.

MS/MSD Recoveries

Soil MS/MSD analyses were performed in this SDG using sample KRY605SS001. Recoveries could be determined for only one analyte because the unspiked sample contained more than five times the concentrations of the spiked compounds for all of the other analytes. No qualifications are warranted for this data gap. That one pair of recoveries and the relative percent difference (RPD) were well within QC limits.

No aqueous MS/MSD analyses were performed. No qualifications are warranted for this data gap.

LCS Recoveries

The laboratory analyzed duplicate aqueous LCS samples and one soil LCS sample. Recoveries were well within the SAP-specified limits for accuracy. Aqueous recoveries ranging from 86 to 110 percent, with RPDs from 1.0 to 6.3 percent. Soil recoveries ranged from 90 to 114 percent.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. As such, the following positive results were flagged "J" to indicate that they may be biased high because of interference from the other congeners:

- 2,3,7,8-TCDF in samples KRY603SB001, KRY605SS001, KRY605SS002, and KRY605SS003

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF), 1,2,3,4,7,8-hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF), 1,2,3,6,7,8-HxCDF, and 1,2,3,4,7,8-hexachlorodibenzo(p)dioxin (HxCDD) in sample KRY603SB001
- OCDF in sample KRY603SB002
- 1,2,3,4,6,7,8-Heptachlorodibenzo(p)dioxin (1,2,3,4,6,7,8-HpCDD) and OCDF in sample KRY603SB003
- 2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF), 1,2,3,4,7,8-HxCDF, 1,2,3,7,8,9-HxCDF, 1,2,3,7,8,9-HxCDD, 1,2,3,4,6,7,8-HpCDF, and 1,2,3,4,7,8,9-HpCDF in sample KRY603QE001
- 1,2,3,4,7,8-HxCDF and 1,2,3,4,6,7,8-HpCDF in sample KRY666SB001; and 1,2,3,6,7,8-HxCDF in sample KRY666SB002.

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the workplan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-tetrachlorodibenzo(p)dioxin. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS

Samples	TEQ	
	Nanograms/kilogram	Picograms/liter
KRY603SB001	1.78	NA
KRY603SB002	0.31	NA
KRY603SB003	0.27	NA
KRY605SS001	67.7	NA
KRY605SS002	23.1	NA
KRY605SS003	11.8	NA
KRY666SB001	0.38	NA

KRY666SB002	0.38	NA
KRY403QE001	NA	2.78

NA = Not applicable

DATA VALIDATION REPORT

Site Name:	Kalispell Pole and Timber, Reliance Refinery, and Yale Oil Facilities (KRY—Kalispell), Kalispell, Montana
Laboratory:	Pace Analytical Services, Inc., Minneapolis, Minnesota
QA Reviewer:	Harry Ellis, Tetra Tech EM, Inc. (Tetra Tech)
SDG Number:	1031219
Sample Numbers:	KRY422SS001, KRY610SB001, KRY610SB002, KRY409SS001, KRY409SS002, KRY409SS003, KRY901QS001, and KRY410QE001
Matrix:	Six soil samples, one source water sample, and one equipment rinsate (water) sample
QA Level:	Cursory validation on this SDG
Report Date:	18 July 2006

1.0 INTRODUCTION

Analytical data were validated in accordance with the U.S Environmental Protection Agency (EPA) document "National Functional Guidelines for Chlorinated Dibenzo-p-Dioxins (CDDs) and Chlorinated Dibenzofurans (CDFs) Data Review" dated September 2005, the Montana Department of Environmental Quality (MDEQ) approved Sampling and Analysis Plan (SAP) dated March 2006, and the specific criteria in the EPA method used here, namely EPA SW-846 Method 8290. Section 2.0 of this data validation report lists the specific criteria reviewed. Section 3.0 is the glossary of qualifiers used in validating the data. Section 4.0 provides an assessment of the data. A separate spreadsheet, derived from the laboratory's electronic data deliverable (EDD), contains all validated analytical results. Validated results are imported into the KRY database and delivered as an appendix to the final remedial investigation report.

2.0 DATA VALIDATION REQUIREMENTS

All items listed, if used in the analytical method, are evaluated for a full data review. Cursory review items are noted by an asterisk (*).

<u>Organic Analyses</u>

* Deliverables
* Holding times
* Calibration
* Blanks
* Surrogate recovery
* Internal standard performance
* Matrix spike/matrix spike duplicate (MS/MSD) recovery
* Laboratory control sample (LCS) recovery
* Field duplicate samples
* Other method-specific QC measures
  Analyte identification
  Analyte quantitation
  Reported detection limits
  Sample result verification
  System performance
* Overall assessment of the SDG.

3.0 GLOSSARY OF DATA QUALIFIERS

The following data qualifiers are the industry-standard qualifiers that may be applied during data validation. Note that all qualifiers are not necessarily applied in every SDG.

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U	=	The analyte was analyzed for but was not detected above the listed sample quantitation limit.
J	=	The analyte was detected, but the concentration is considered estimated for quality control reasons.
UJ	=	The analyte was not detected, and the sample quantitation limit is considered estimated for quality control reasons.
R	=	The data are unusable; the analyte may or may not be present. Resampling and reanalysis are necessary for verification.

4.0 DATA ASSESSMENT

Analytical results were reviewed by the criteria listed in Section 2.0.

Deliverables

The summary deliverable was complete for cursory validation.

Holding Times

The samples were extracted within the holding time limit of 30 days and the extracts were analyzed within the holding time limit of 45 days.

Calibration

Initial and continuing calibrations were analyzed at the proper frequencies and concentrations. Criteria include the window-defining mixture, gas chromatographic (GC) resolution, ion abundance ratios, sensitivity, linearity on initial calibration, and percent difference from initial calibration for continuing calibrations. In one closing continuing calibration, the internal standard octachlorodibenzo(p)dioxin-^{13}C (OCDD-^{13}C) was outside the acceptable range. Therefore, the following results, which were quantitated in the same analytical run as this irregular calibration, were flagged "J" to indicate that the result is considered estimated:

- OCDD and octachlorodibenzofuran (OCDF) in all soil samples

All other results were within QC limits.

Blanks

Method blanks were analyzed for each medium and had positive results for several analytes. When a sample had a concentration similar to that in the accompanying method blank, the sample result was considered to be a probable laboratory artifact. Therefore, the following results were flagged "U" to indicate the blank contamination:

- 1,2,3,4,7,8-Hexachlorodibenzo(p)dioxin (1,2,3,4,7,8-HxCDD) and total pentachlorodibenzo(p)dioxin (PeCDD) in sample KRY409SS002
- OCDF, total PeCDD, total hexachlorodibenzofuran (HpCDF), and total heptachlorodibenzofuran (HpCDF) in sample KRY409SS003
- OCDD in sample KRY410QE001.

When the sample had a much higher concentration than the method blank (as with 1,2,3,4,7,8-HxCDD in sample KRY409SS001), no qualifications were applied.

Surrogate Recovery

Recoveries of surrogates (called "recovery standards" in the analytical method) were within QC limits.

Internal Standard Performance

Almost all internal standard recoveries were within QC limits for the field samples, the LCS, and the other QC samples. The exception was sample KRY610SB001, in which two internal standards were below the method limits of 40 to 135 percent recovery. Therefore the following positive results were flagged "J" to indicate that they are estimated:

- 1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF), OCDF, and OCDD in sample KRY610SB001

The probable errors in the concentrations of these analytes in the samples may be quite small, because the target compound results are quantitated against the internal standard recovery.

MS/MSD Recoveries

Soil MS/MSD analyses were performed in this SDG, using sample KRY409SS001. Recoveries could not be determined for five analytes because the unspiked sample contained more than five times the concentrations of the spiked compounds. No qualifications are warranted for this data gap. All other recoveries and the relative percent differences (RPD) were well within QC limits.

No aqueous MS/MSD analyses were performed. No qualifications are warranted for this data gap.

LCS Recoveries

The laboratory analyzed LCS samples for both soil and water. Recoveries were well within the SAP-specified limits for accuracy, with aqueous recoveries ranging from 87 to 110 percent and soil recoveries ranging from 93 to 117 percent.

Field Duplicate Samples

No field duplicate samples were included in this SDG.

Other Method-Specific QC Measures

When 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF) was detected, Pace did not provide evidence that the required second column confirmation was performed. As such, the following positive results for 2,3,7,8-TCDF were flagged "J" to indicate that they may be biased high because of interference from other congeners:

- 2,3,7,8-TCDF in samples KRY422SS001, KRY610SB001, KRY610SB002, KRY409SS001, and KRY409SS002

The laboratory flagged results below the calibration range "J" to indicate that these results are extrapolations from the calibration curve. The values should be considered estimated as flagged by the laboratory.

In several cases, peaks were observed in the retention time windows for analytes but their ion abundance ratios were outside the method-specific limits. The laboratory identified these by the flag "I" for interference (or an "E" when the interference was identified as due to polychlorinated diphenylethers) and calculated the estimated maximum possible concentration (EMPC) of the analyte that could be present in the sample. As such, the following results were flagged "U" to indicate that the analyte was not detected:

- 2,3,7,8-Tetrachlorodibenzo(p)dioxin (2,3,7,8-TCDD) and 1,2,3,4,7,8-hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF) in sample KRY422SS001
- 1,2,3,7,8-Pentachlorodibenzofuran (PeCDF), 2,3,4,7,8-PeCDF, and 1,2,3,4,6,7,8-HpCDF in sample KRY610SB001
- 1,2,3,7,8-PeCDD, 1,2,3,6,7,8-HxCDF, and 2,3,4,6,7,8-HxCDF in sample KRY610SB002
- 2,3,4,7,8-PeCDF, 1,2,3,6,7,8-HxCDF, and 1,2,3,6,7,8-HxCDD in sample KRY409SS002
- 1,2,3,4,7,8-HxCDF and 1,2,3,7,8,9-HxCDD in sample KRY409SS003
- OCDF in sample KRY410QE001

Overall Assessment of the SDG

There were no major problems with the analysis of these samples. The analytical results may be used, as qualified, for the purposes stated in the work plan.

The 2,3,7,8-substituted analytes of this method vary in their toxic potency. Therefore it is customary to use "toxicity factors" (TEFs) to calculate the total toxicity equivalent (TEQ) of a sample. The TEQ standardizes the toxicity of all the carcinogenic dioxins in relationship to the toxicity of 2,3,7,8-tetrachlorodibenzo(p)dioxin. This standardized value allows risk assessors to evaluate the toxic effect of the entire mixture of dioxins in a given sample to an organism. Tetra Tech calculates TEQs using the most recently revised set of TEFs, published in 1998 by the World Health Organization. When an analyte is not detected in a sample, all that is known is that the analyte's true concentration is between the sample detection limit, as reported by the laboratory in these analyses, and absolute zero. Risk assessors account for this uncertainty by using one-half of the sample detection limit for each non-detected analyte (including the EMPC results) to calculate TEQs. Table 1 shows this calculated TEQ. This single result per sample should be used in all decision-making.

TABLE 1
TOTAL TOXICITY EQUIVALENTS

Samples	TEQ	
	Nanograms/kilogram	Picograms/liter
KRY422SS001	4.93	NA
KRY610SB001	9.99	NA
KRY610SB002	2.13	NA
KRY409SS001	6.79	NA
KRY409SS002	0.34	NA
KRY409SS003	0.15	NA
KRY901QS001	NA	3.22
KRY410QE001	NA	2.25

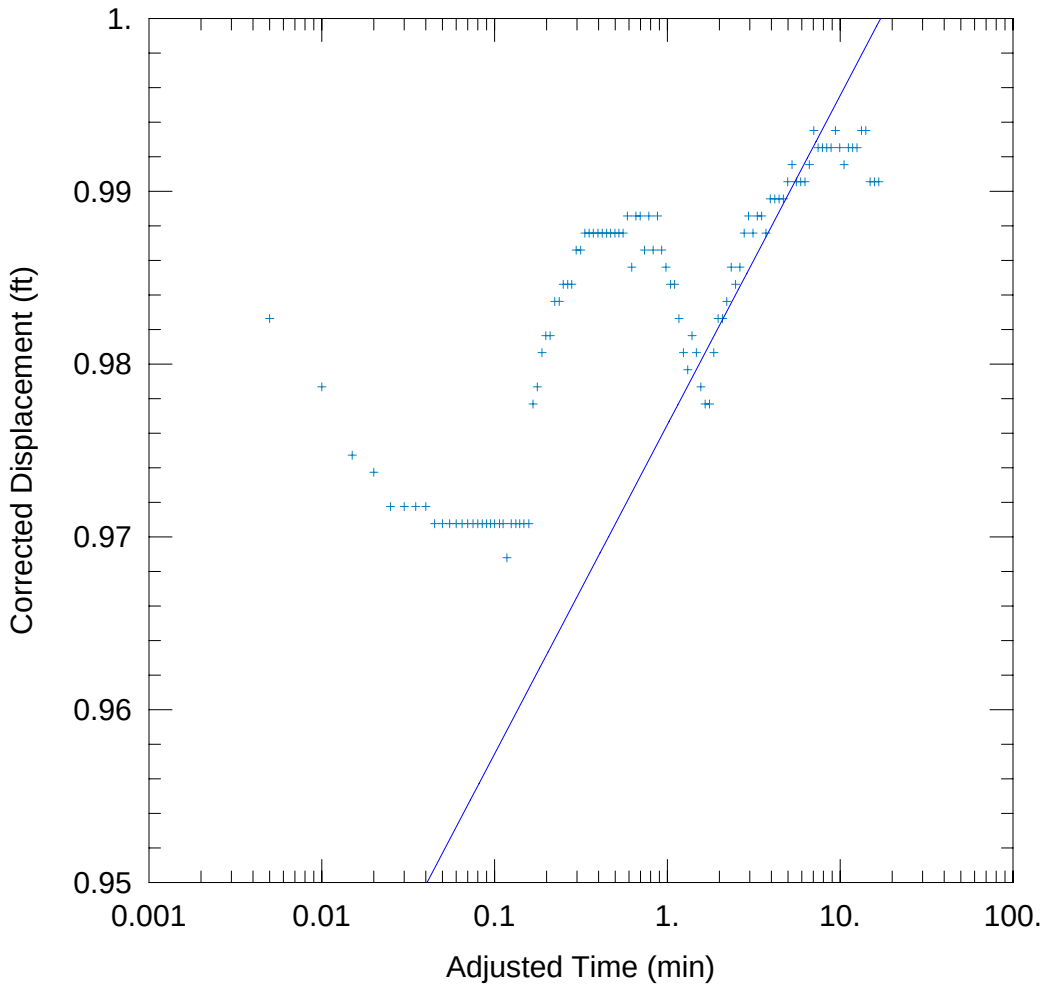
NA = Not applicable

APPENDIX I

AQUIFER TEST GRAPHICAL SOLUTIONS

KRY - Aquifer Test Analysis - Well KRY108A Drawdown

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT0405	Kalispell, Montana



SOLUTION

Aquifer Model: Unconfined
Solution Method: Cooper-Jacob

T = 1.129E+4 ft^2/day

AQUIFER DATA

Saturated Thickness: 91. fAnisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY108A	0	0

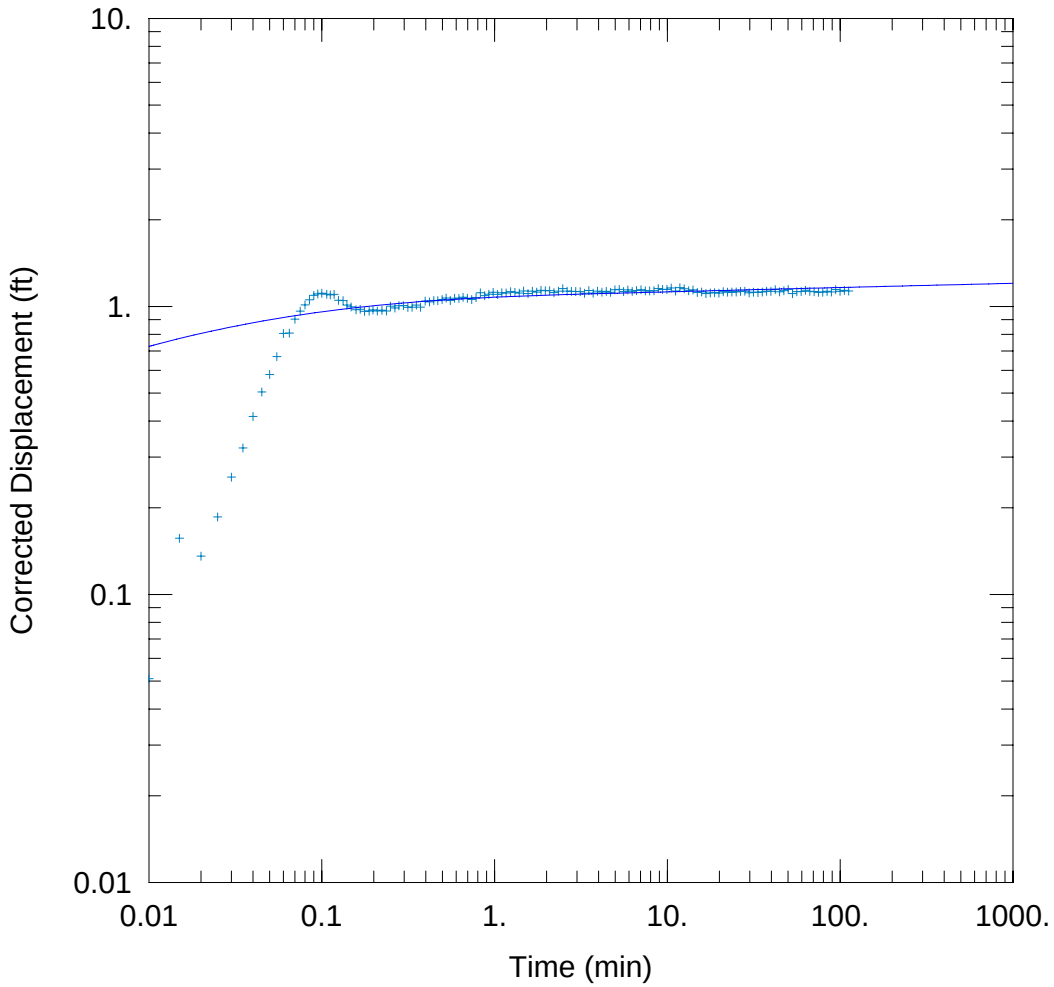
Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY108A	0	0

Tetra Tech EM Inc.

KRY - Aquifer Test Analysis - Well KRY 113B Drawdown

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT0405	Kalispell, Montana



SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 5552.6 ft^2/day

Kz/Kr = 1.
b = 91 ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY113B	0	0

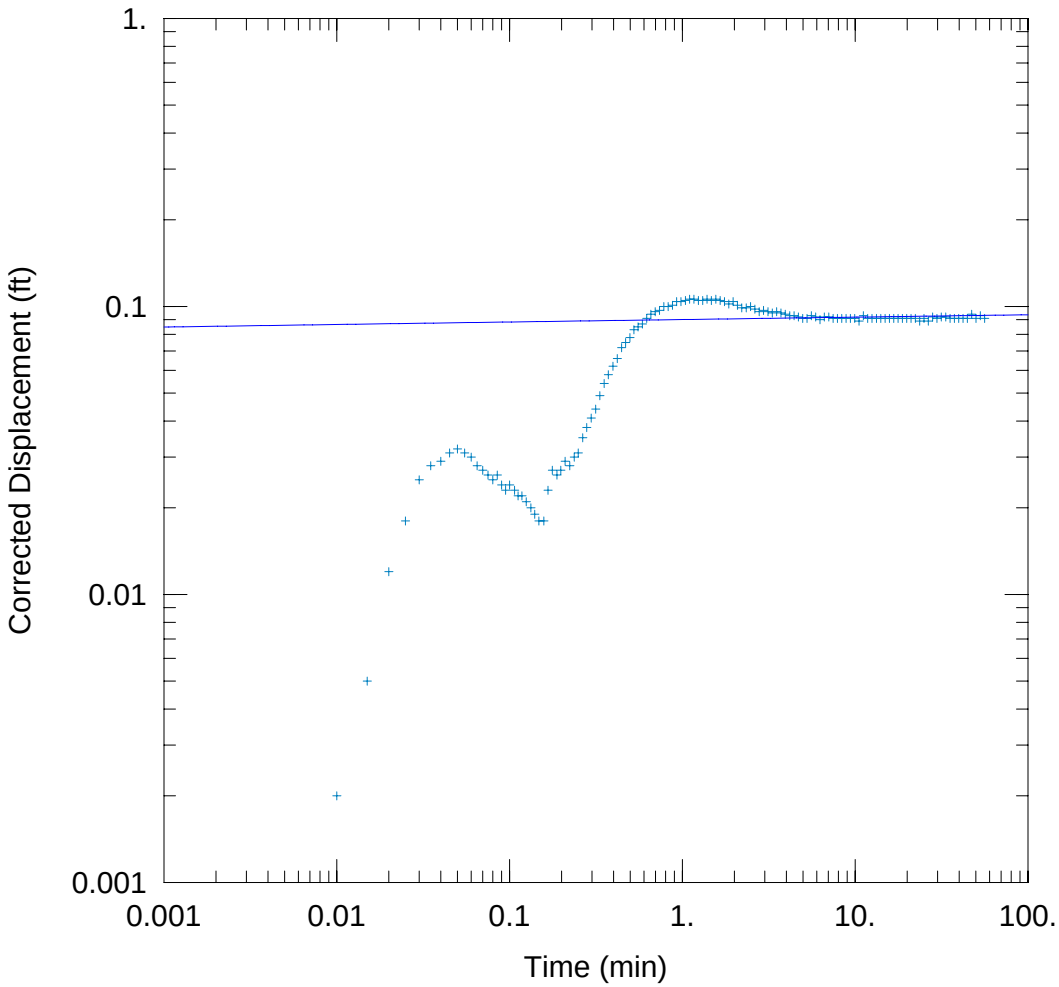
Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY113B	0	0

Tetra Tech EM Inc.

KRY - Aquifer Test Analysis - Well KRY121A Drawdown

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT0405	Kalispell, Montana



SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 1.231E+5 ft^2/day
Kz/Kr = 1.

b = 106 ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY121A	0	0

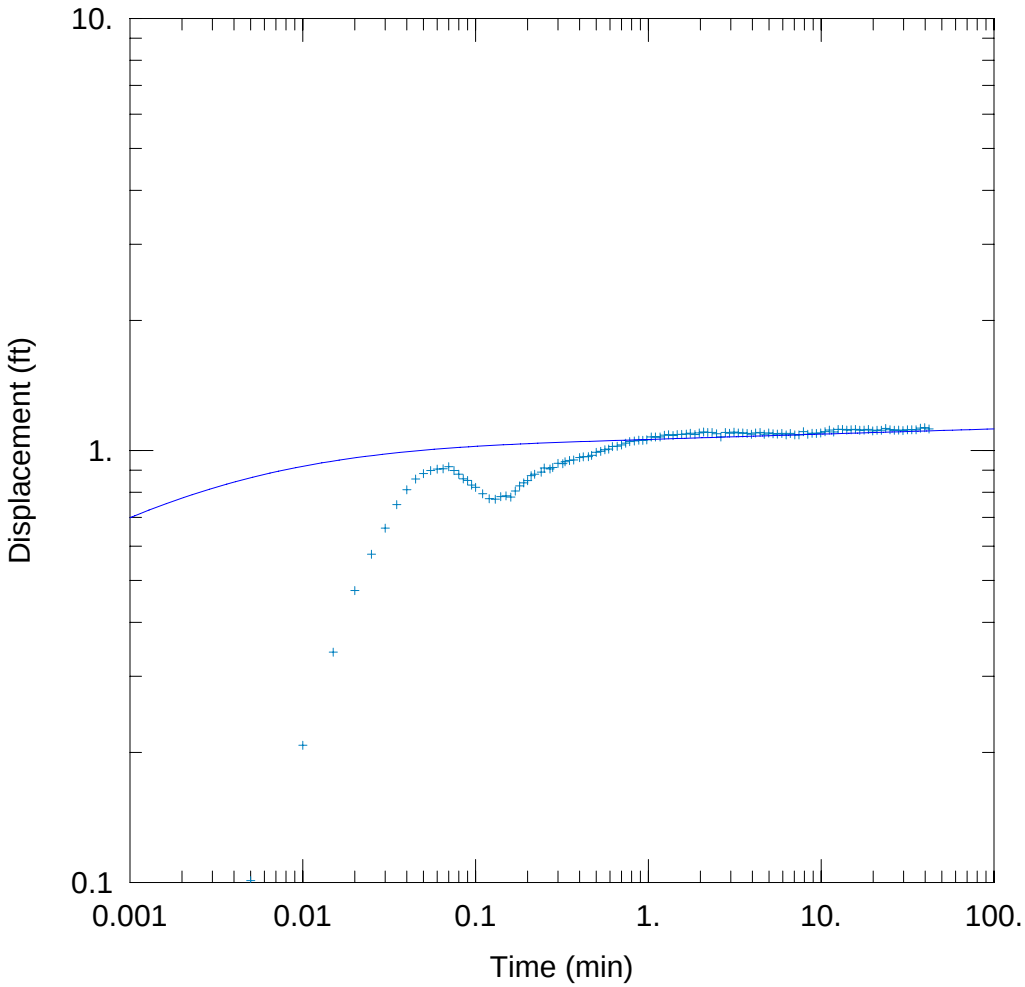
Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY121A	0	0

Tetra Tech EM Inc.

KRY - Aquifer Test Analysis - Well KRY121B Drawdown

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT004	Kalispell, Montana



SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 3.462E+4 ft^2/day
Kz/Kr = 1.

b = 106. ft/day

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY121B	0	0

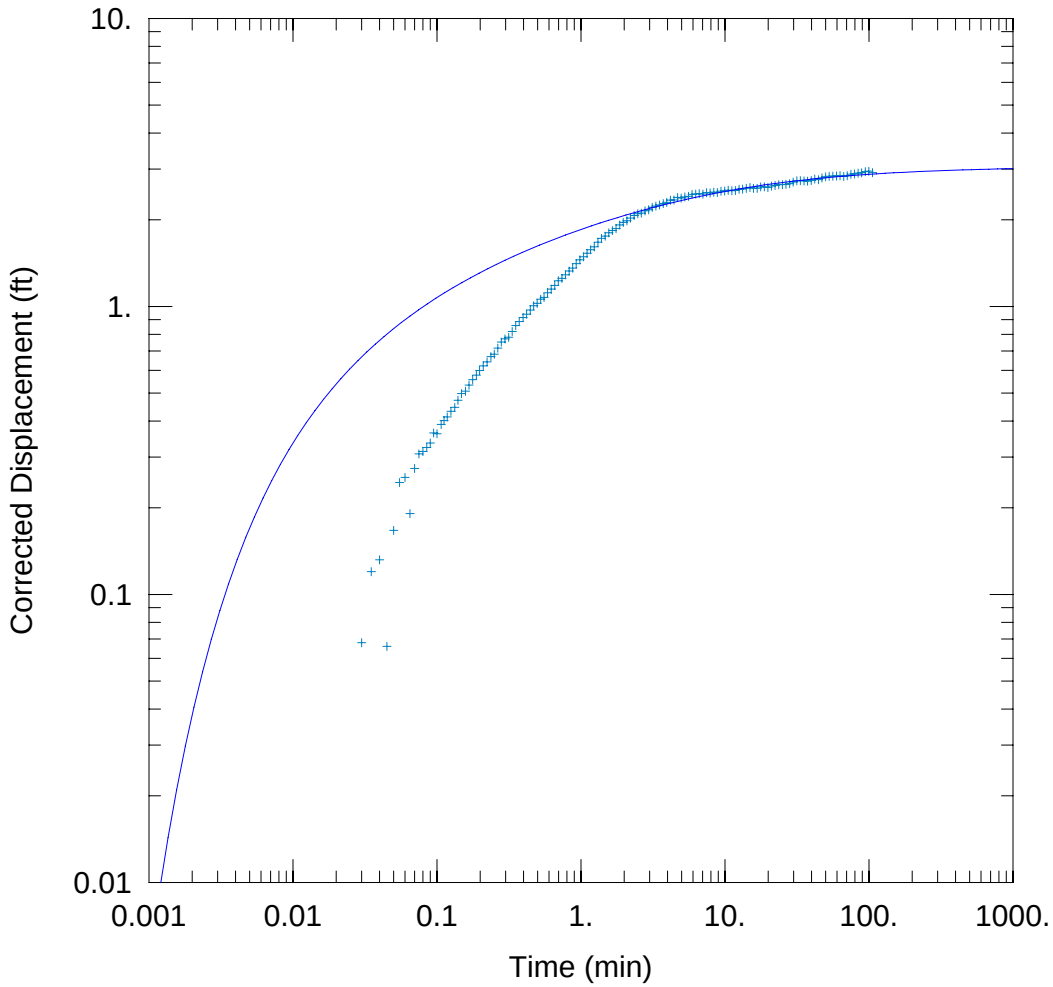
Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY121B	0	0

Tetra Tech EM Inc.

KRY - Aquifer Test Analysis - Well KRY139A Drawdown

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT004	Kalispell, Montana



SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 2814.5 ft^2/day
Kz/Kr = 1
b =164 ft/day

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY139A	0	0

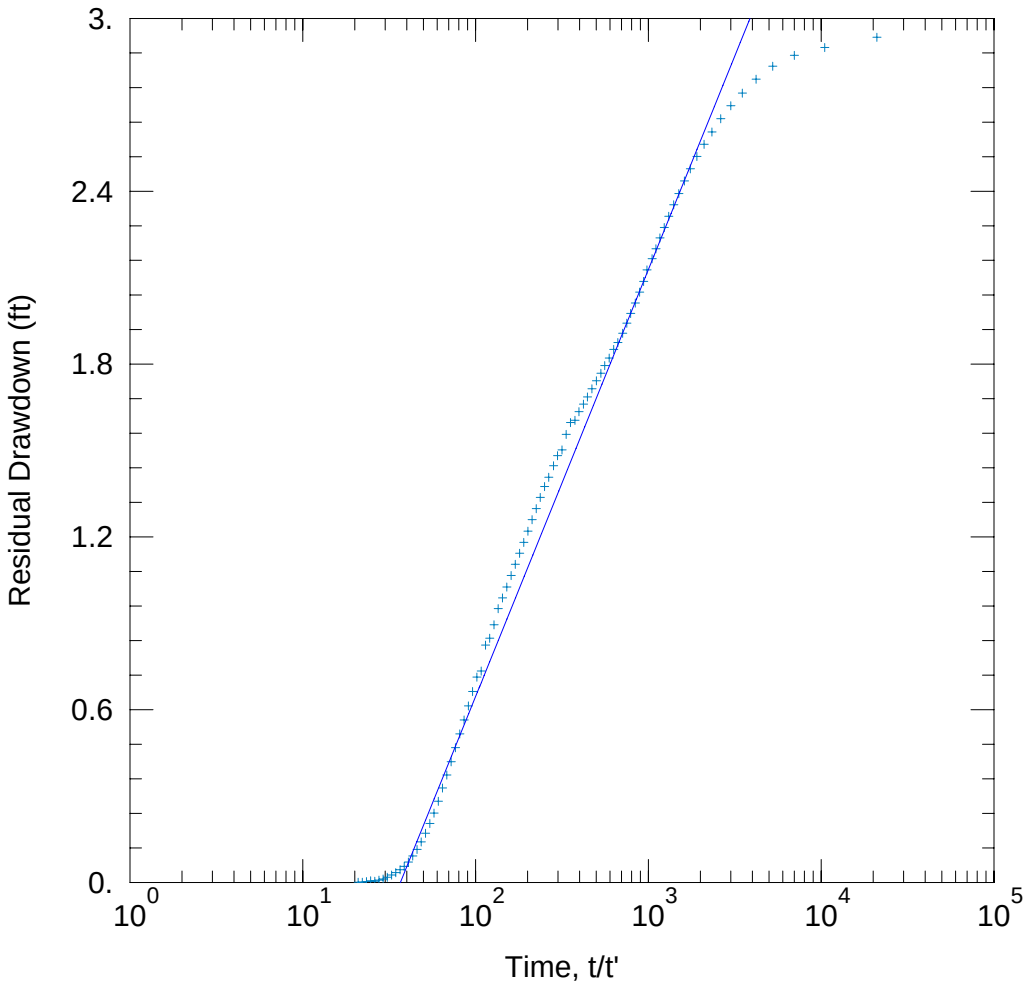
Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY139A	0	0

Tetra Tech EM Inc.

KRY - Aquifer Test Analysis - Well KRY139A Recovery

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT004	Kalispell, Montana



SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)

T = 138. ft^2/day S/S' = 36.77

AQUIFER DATA

Saturated Thickness: 14.6 Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY139A	0	0

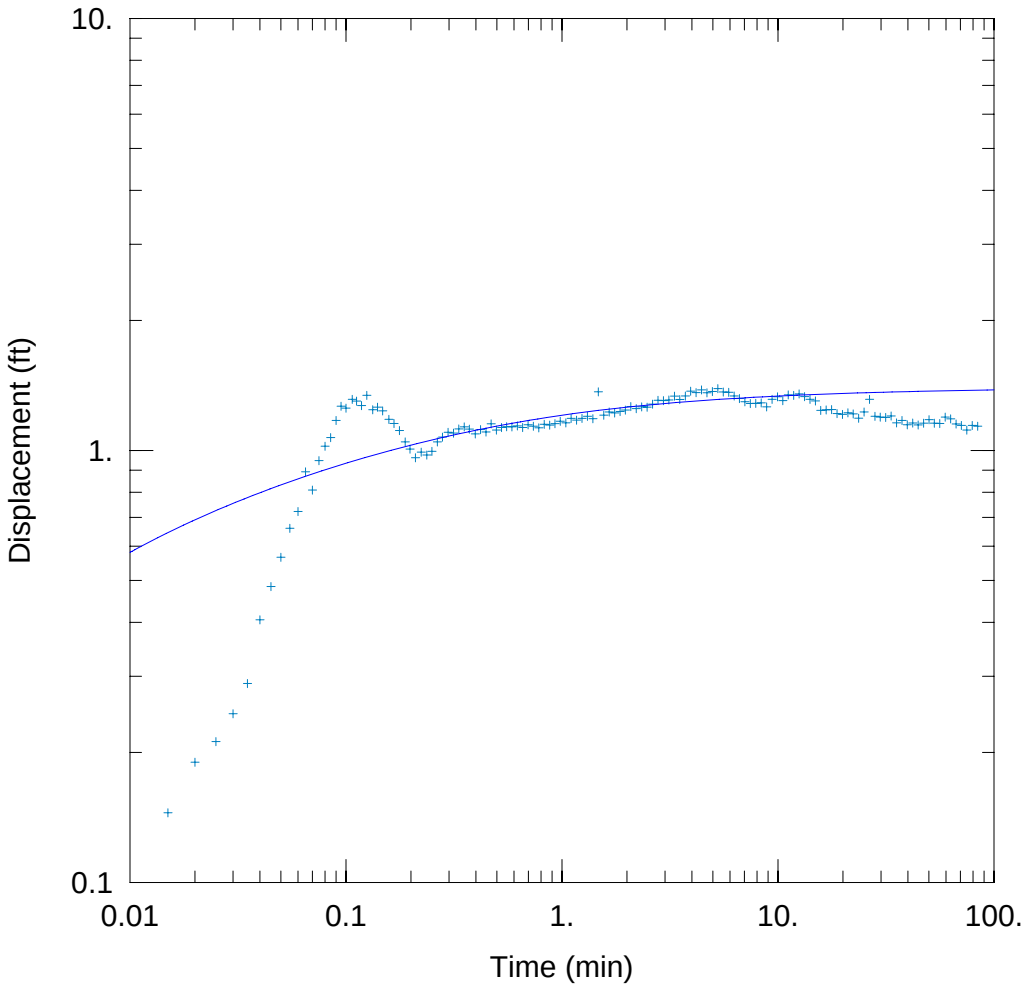
Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY139A	0	0

Tetra Tech EM Inc.

KRY - Aquifer Test Analysis - Well KRY 139B Drawdown

Prepared By:	Prepared For:
Tt EMI	MDEQ
Project:	Location:
S1176-37KPT004	Kalispell, Montana



SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 8941.3 ft^2/day

Kz/Kr = 1.

b = 164. ft

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
KRY139B	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
+ KRY139B	0	0

Tetra Tech EM Inc.

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/24/2006	14:38:11
Report from file:		...\SN07561 2006-08-17 165000 KRY121A .bin		
Win-Situ® Version		4.56.5.0		
Serial number:			7561	
Firmware Version			3.09	
Unit name:		KRY121A Obs		
Test name:				KRY121A
Test defined on:			8/17/2006	16:15:12
Test scheduled for:			8/17/2006	16:50:00
Test started on:			8/17/2006	16:50:00
Test stopped on:			8/18/2006	8:49:12
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			181	
TOTAL DATA SAMPLES			181	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			5.759	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/17/2006	16:50:00	0	49.23	0
8/17/2006	16:50:00	0.3	49.25	0.01
8/17/2006	16:50:00	0.6	49.25	0.012
8/17/2006	16:50:00	0.9	49.27	0.013
8/17/2006	16:50:01	1.2	49.27	0.015
8/17/2006	16:50:01	1.5	49.27	0.015
8/17/2006	16:50:01	1.8	49.27	0.015
8/17/2006	16:50:02	2.1	49.3	0.015
8/17/2006	16:50:02	2.4	49.3	0.015
8/17/2006	16:50:02	2.7	49.3	0.017
8/17/2006	16:50:03	3	49.3	0.015
8/17/2006	16:50:03	3.3	49.3	0.017
8/17/2006	16:50:03	3.6	49.3	0.017
8/17/2006	16:50:03	3.9	49.3	0.017
8/17/2006	16:50:04	4.2	49.3	0.017
8/17/2006	16:50:04	4.5	49.3	0.019
8/17/2006	16:50:04	4.8	49.3	0.017
8/17/2006	16:50:05	5.1	49.3	0.017
8/17/2006	16:50:05	5.4	49.3	0.017
8/17/2006	16:50:05	5.7	49.32	0.017
8/17/2006	16:50:06	6	49.3	0.017
8/17/2006	16:50:06	6.4	49.32	0.017
8/17/2006	16:50:06	6.7	49.32	0.017
8/17/2006	16:50:07	7.1	49.32	0.017
8/17/2006	16:50:07	7.5	49.32	0.019
8/17/2006	16:50:07	8	49.32	0.017
8/17/2006	16:50:08	8.4	49.32	0.017
8/17/2006	16:50:08	8.9	49.32	0.017
8/17/2006	16:50:09	9.5	49.32	0.017
8/17/2006	16:50:10	10	49.32	0.013
8/17/2006	16:50:10	10.6	49.3	0.009
8/17/2006	16:50:11	11.3	49.3	0.009
8/17/2006	16:50:11	11.9	49.3	0.009
8/17/2006	16:50:12	12.6	49.3	0.009

8/17/2006	16:50:13	13.4	49.3	0.007
8/17/2006	16:50:14	14.2	49.3	0.007
8/17/2006	16:50:15	15	49.3	0.007
8/17/2006	16:50:15	15.9	49.3	0.007
8/17/2006	16:50:16	16.8	49.27	0.005
8/17/2006	16:50:17	17.8	49.27	0.005
8/17/2006	16:50:18	18.9	49.3	0.005
8/17/2006	16:50:20	20	49.3	0.005
8/17/2006	16:50:21	21.2	49.27	0.003
8/17/2006	16:50:22	22.4	49.27	0.003
8/17/2006	16:50:23	23.8	49.27	0.005
8/17/2006	16:50:25	25.2	49.27	0.003
8/17/2006	16:50:26	26.7	49.27	0.003
8/17/2006	16:50:28	28.2	49.27	0.005
8/17/2006	16:50:29	29.8	49.27	0.003
8/17/2006	16:50:31	31.5	49.27	0.003
8/17/2006	16:50:33	33.3	49.27	0.003
8/17/2006	16:50:35	35.2	49.27	0.003
8/17/2006	16:50:37	37.3	49.27	0.003
8/17/2006	16:50:39	39.5	49.27	0.003
8/17/2006	16:50:41	41.8	49.27	0.003
8/17/2006	16:50:44	44.3	49.27	0.001
8/17/2006	16:50:46	46.9	49.27	0.003
8/17/2006	16:50:49	49.7	49.27	0.003
8/17/2006	16:50:52	52.6	49.27	0.003
8/17/2006	16:50:55	55.7	49.27	0.003
8/17/2006	16:50:58	59	49.25	0.002
8/17/2006	16:51:02	62.5	49.25	0.002
8/17/2006	16:51:06	66.2	49.25	0.002
8/17/2006	16:51:10	70.1	49.25	0.002
8/17/2006	16:51:14	74.3	49.25	0.002
8/17/2006	16:51:18	78.7	49.25	0.004
8/17/2006	16:51:23	83.4	49.25	0.002
8/17/2006	16:51:28	88.4	49.25	0.002
8/17/2006	16:51:33	93.7	49.25	0.002
8/17/2006	16:51:39	99.3	49.25	0.002
8/17/2006	16:51:45	105.2	49.25	0.002
8/17/2006	16:51:51	111.5	49.25	0.002
8/17/2006	16:51:58	118.1	49.25	0.002

8/17/2006	16:52:05	125.1	49.23	0.002
8/17/2006	16:52:12	132.6	49.23	0.002
8/17/2006	16:52:20	140.5	49.23	0
8/17/2006	16:52:28	148.9	49.23	0.002
8/17/2006	16:52:37	157.8	49.23	0.002
8/17/2006	16:52:47	167.2	49.23	0.002
8/17/2006	16:52:57	177.2	49.23	0.002
8/17/2006	16:53:07	187.8	49.23	0.002
8/17/2006	16:53:18	199	49.23	0.002
8/17/2006	16:53:30	210.9	49.23	0.002
8/17/2006	16:53:43	223.5	49.23	0.002
8/17/2006	16:53:56	236.8	49.23	0.002
8/17/2006	16:54:10	250.9	49.23	0.002
8/17/2006	16:54:25	265.8	49.23	0.002
8/17/2006	16:54:41	281.6	49.23	0
8/17/2006	16:54:58	298.4	49.23	0.002
8/17/2006	16:55:16	316.2	49.23	0
8/17/2006	16:55:34	335	49.23	0
8/17/2006	16:55:54	354.9	49.23	0
8/17/2006	16:56:15	376	49.23	0.002
8/17/2006	16:56:38	398.4	49.23	0.002
8/17/2006	16:57:02	422.1	49.21	0.002
8/17/2006	16:57:27	447.2	49.23	0.004
8/17/2006	16:57:53	473.8	49.21	0
8/17/2006	16:58:21	502	49.23	0
8/17/2006	16:58:51	531.9	49.23	0
8/17/2006	16:59:23	563.5	49.23	0
8/17/2006	16:59:56	597	49.21	0
8/17/2006	17:00:32	632.5	49.21	0
8/17/2006	17:01:10	670.1	49.21	0
8/17/2006	17:01:49	709.9	49.21	0
8/17/2006	17:02:32	752.1	49.21	0
8/17/2006	17:03:16	796.8	49.23	0
8/17/2006	17:04:04	844.2	49.21	0
8/17/2006	17:04:54	894.4	49.21	0
8/17/2006	17:05:47	947.5	49.21	0
8/17/2006	17:06:43	1003.8	49.21	-0.002
8/17/2006	17:07:43	1063.4	49.21	0
8/17/2006	17:08:46	1126.6	49.21	0

8/17/2006	17:09:53	1193.5	49.21	-0.002
8/17/2006	17:11:04	1264.4	49.21	-0.002
8/17/2006	17:12:19	1339.5	49.21	-0.002
8/17/2006	17:13:38	1419	49.21	-0.002
8/17/2006	17:15:03	1503.3	49.21	-0.002
8/17/2006	17:16:32	1592.6	49.21	-0.002
8/17/2006	17:18:07	1687.1	49.21	-0.004
8/17/2006	17:19:47	1787.2	49.21	-0.004
8/17/2006	17:21:33	1893.3	49.21	-0.004
8/17/2006	17:23:25	2005.7	49.21	-0.004
8/17/2006	17:25:24	2124.7	49.21	-0.004
8/17/2006	17:27:30	2250.8	49.21	-0.004
8/17/2006	17:29:44	2384.4	49.21	-0.006
8/17/2006	17:32:05	2525.9	49.23	-0.004
8/17/2006	17:34:35	2675.8	49.21	-0.006
8/17/2006	17:37:14	2834.6	49.21	-0.004
8/17/2006	17:40:02	3002.8	49.21	-0.004
8/17/2006	17:43:00	3180.9	49.23	-0.004
8/17/2006	17:46:09	3369.6	49.23	-0.004
8/17/2006	17:49:29	3569.5	49.23	-0.006
8/17/2006	17:53:01	3781.2	49.21	-0.006
8/17/2006	17:56:45	4005.5	49.23	-0.006
8/17/2006	18:00:43	4243.1	49.23	-0.008
8/17/2006	18:04:54	4494.7	49.21	-0.006
8/17/2006	18:09:21	4761.3	49.21	-0.008
8/17/2006	18:14:03	5043.7	49.21	-0.008
8/17/2006	18:19:02	5342.8	49.23	-0.006
8/17/2006	18:24:19	5659.6	49.21	-0.006
8/17/2006	18:29:55	5995.2	49.23	-0.008
8/17/2006	18:35:50	6350.7	49.21	-0.008
8/17/2006	18:42:07	6727.2	49.21	-0.008
8/17/2006	18:48:46	7126.1	49.21	-0.008
8/17/2006	18:55:48	7548.6	49.21	-0.008
8/17/2006	19:03:16	7996.1	49.23	-0.008
8/17/2006	19:11:10	8470.1	49.23	-0.008
8/17/2006	19:19:32	8972.2	49.21	-0.01
8/17/2006	19:28:24	9504.1	49.21	-0.008
8/17/2006	19:37:47	10067.5	49.23	-0.008
8/17/2006	19:47:44	10664.3	49.23	-0.008

8/17/2006	19:58:16	11296.5	49.23	-0.008
8/17/2006	20:09:26	11966.1	49.23	-0.008
8/17/2006	20:21:15	12675.4	49.23	-0.008
8/17/2006	20:33:46	13426.7	49.23	-0.008
8/17/2006	20:47:02	14222.6	49.23	-0.008
8/17/2006	21:01:05	15065.6	49.23	-0.008
8/17/2006	21:15:58	15958.6	49.23	-0.008
8/17/2006	21:31:44	16904.5	49.23	-0.008
8/17/2006	21:48:26	17906.4	49.23	-0.008
8/17/2006	22:06:07	18967.7	49.23	-0.008
8/17/2006	22:24:51	20091.9	49.23	-0.008
8/17/2006	22:44:42	21282.7	49.23	-0.008
8/17/2006	23:05:44	22544.1	49.23	-0.008
8/17/2006	23:28:00	23880.2	49.23	-0.008
8/17/2006	23:51:35	25295.5	49.23	-0.006
8/18/2006	0:16:34	26794.7	49.23	-0.006
8/18/2006	0:43:02	28382.7	49.23	-0.006
8/18/2006	1:11:04	30064.8	49.23	-0.004
8/18/2006	1:40:46	31846.6	49.23	-0.004
8/18/2006	2:12:13	33734	49.23	-0.004
8/18/2006	2:45:33	35733.2	49.23	-0.004
8/18/2006	3:20:50	37850.9	49.23	-0.002
8/18/2006	3:58:13	40094	49.23	0
8/18/2006	4:37:50	42470.1	49.23	0
8/18/2006	5:17:50	44870.1	49.23	0.002
8/18/2006	5:57:50	47270.1	49.23	0
8/18/2006	6:37:50	49670.1	49.23	0.002
8/18/2006	7:17:50	52070.1	49.23	0
8/18/2006	7:57:50	54470.1	49.23	0
8/18/2006	8:37:50	56870.1	49.23	-0.004

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/24/2006	13:48:25
Report from file:		...\SN17508 2006-08-17 165006 KRY121B DD.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			17508	
Firmware Version			3.09	
Unit name:				
Test name:				KRY121B DD
Test defined on:			8/17/2006	17:09:58
Test started on:			8/17/2006	16:50:06
Test stopped on:			8/17/2006	17:33:44
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			126	
TOTAL DATA SAMPLES			126	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			9.39	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/17/2006	16:50:06	0	49.12	0
8/17/2006	16:50:06	0.3	49.17	-0.101
8/17/2006	16:50:06	0.6	49.17	-0.208
8/17/2006	16:50:06	0.9	49.19	-0.342
8/17/2006	16:50:07	1.2	49.19	-0.475
8/17/2006	16:50:07	1.5	49.19	-0.577
8/17/2006	16:50:07	1.8	49.19	-0.663
8/17/2006	16:50:08	2.1	49.22	-0.752
8/17/2006	16:50:08	2.4	49.22	-0.814
8/17/2006	16:50:08	2.7	49.22	-0.862
8/17/2006	16:50:09	3	49.22	-0.888
8/17/2006	16:50:09	3.3	49.22	-0.902
8/17/2006	16:50:09	3.6	49.22	-0.909
8/17/2006	16:50:09	3.9	49.22	-0.911
8/17/2006	16:50:10	4.2	49.22	-0.921
8/17/2006	16:50:10	4.5	49.24	-0.902
8/17/2006	16:50:10	4.8	49.24	-0.885
8/17/2006	16:50:11	5.1	49.24	-0.863
8/17/2006	16:50:11	5.4	49.24	-0.856
8/17/2006	16:50:11	5.7	49.24	-0.835
8/17/2006	16:50:12	6	49.24	-0.825
8/17/2006	16:50:12	6.4	49.24	-0.809
8/17/2006	16:50:12	6.7	49.24	-0.797
8/17/2006	16:50:13	7.1	49.24	-0.776
8/17/2006	16:50:13	7.5	49.24	-0.778
8/17/2006	16:50:14	8	49.24	-0.774
8/17/2006	16:50:14	8.4	49.24	-0.785
8/17/2006	16:50:15	8.9	49.24	-0.788
8/17/2006	16:50:15	9.5	49.24	-0.783
8/17/2006	16:50:16	10	49.22	-0.809
8/17/2006	16:50:16	10.6	49.22	-0.831
8/17/2006	16:50:17	11.3	49.22	-0.845
8/17/2006	16:50:17	11.9	49.22	-0.855
8/17/2006	16:50:18	12.6	49.22	-0.878
8/17/2006	16:50:19	13.4	49.22	-0.885

8/17/2006	16:50:20	14.2	49.19	-0.895
8/17/2006	16:50:21	15	49.19	-0.915
8/17/2006	16:50:21	15.9	49.19	-0.91
8/17/2006	16:50:22	16.8	49.19	-0.917
8/17/2006	16:50:23	17.8	49.19	-0.938
8/17/2006	16:50:24	18.9	49.19	-0.936
8/17/2006	16:50:26	20	49.19	-0.946
8/17/2006	16:50:27	21.2	49.19	-0.952
8/17/2006	16:50:28	22.4	49.19	-0.955
8/17/2006	16:50:29	23.8	49.19	-0.967
8/17/2006	16:50:31	25.2	49.19	-0.971
8/17/2006	16:50:32	26.7	49.19	-0.972
8/17/2006	16:50:34	28.2	49.19	-0.979
8/17/2006	16:50:35	29.8	49.19	-0.995
8/17/2006	16:50:37	31.5	49.22	-1
8/17/2006	16:50:39	33.3	49.22	-1.009
8/17/2006	16:50:41	35.2	49.19	-1.012
8/17/2006	16:50:43	37.3	49.19	-1.026
8/17/2006	16:50:45	39.5	49.19	-1.028
8/17/2006	16:50:47	41.8	49.19	-1.035
8/17/2006	16:50:50	44.3	49.22	-1.045
8/17/2006	16:50:52	46.9	49.22	-1.054
8/17/2006	16:50:55	49.7	49.19	-1.057
8/17/2006	16:50:58	52.6	49.19	-1.062
8/17/2006	16:51:01	55.7	49.22	-1.061
8/17/2006	16:51:05	59	49.22	-1.064
8/17/2006	16:51:08	62.5	49.22	-1.08
8/17/2006	16:51:12	66.2	49.22	-1.08
8/17/2006	16:51:16	70.1	49.22	-1.08
8/17/2006	16:51:20	74.3	49.22	-1.09
8/17/2006	16:51:24	78.7	49.19	-1.093
8/17/2006	16:51:29	83.4	49.22	-1.089
8/17/2006	16:51:34	88.4	49.22	-1.094
8/17/2006	16:51:39	93.7	49.19	-1.095
8/17/2006	16:51:45	99.3	49.19	-1.097
8/17/2006	16:51:51	105.2	49.22	-1.102
8/17/2006	16:51:57	111.5	49.22	-1.094
8/17/2006	16:52:04	118.1	49.19	-1.104
8/17/2006	16:52:11	125.1	49.22	-1.109

8/17/2006	16:52:18	132.6	49.22	-1.106
8/17/2006	16:52:26	140.5	49.22	-1.106
8/17/2006	16:52:34	148.9	49.22	-1.099
8/17/2006	16:52:43	157.8	49.22	-1.08
8/17/2006	16:52:53	167.2	49.22	-1.106
8/17/2006	16:53:03	177.2	49.22	-1.102
8/17/2006	16:53:13	187.8	49.22	-1.108
8/17/2006	16:53:25	199	49.22	-1.104
8/17/2006	16:53:36	210.9	49.22	-1.104
8/17/2006	16:53:49	223.5	49.22	-1.101
8/17/2006	16:54:02	236.8	49.22	-1.096
8/17/2006	16:54:16	250.9	49.22	-1.104
8/17/2006	16:54:31	265.8	49.22	-1.106
8/17/2006	16:54:47	281.6	49.22	-1.096
8/17/2006	16:55:04	298.4	49.22	-1.104
8/17/2006	16:55:22	316.2	49.22	-1.099
8/17/2006	16:55:41	335	49.22	-1.097
8/17/2006	16:56:00	354.9	49.22	-1.101
8/17/2006	16:56:22	376	49.22	-1.092
8/17/2006	16:56:44	398.4	49.22	-1.101
8/17/2006	16:57:08	422.1	49.22	-1.092
8/17/2006	16:57:33	447.2	49.22	-1.092
8/17/2006	16:57:59	473.8	49.22	-1.111
8/17/2006	16:58:28	502	49.22	-1.096
8/17/2006	16:58:57	531.9	49.22	-1.102
8/17/2006	16:59:29	563.5	49.22	-1.101
8/17/2006	17:00:03	597	49.22	-1.104
8/17/2006	17:00:38	632.5	49.22	-1.111
8/17/2006	17:01:16	670.1	49.22	-1.121
8/17/2006	17:01:55	709.9	49.22	-1.109
8/17/2006	17:02:38	752.1	49.22	-1.125
8/17/2006	17:03:22	796.8	49.22	-1.125
8/17/2006	17:04:10	844.2	49.22	-1.121
8/17/2006	17:05:00	894.4	49.22	-1.123
8/17/2006	17:05:53	947.5	49.22	-1.125
8/17/2006	17:06:49	1003.8	49.22	-1.12
8/17/2006	17:07:49	1063.4	49.22	-1.121
8/17/2006	17:08:52	1126.6	49.22	-1.125
8/17/2006	17:09:59	1193.5	49.22	-1.116

8/17/2006	17:11:10	1264.4	49.22	-1.12
8/17/2006	17:12:25	1339.5	49.22	-1.12
8/17/2006	17:13:45	1419	49.22	-1.13
8/17/2006	17:15:09	1503.3	49.22	-1.123
8/17/2006	17:16:38	1592.6	49.22	-1.12
8/17/2006	17:18:13	1687.1	49.22	-1.121
8/17/2006	17:19:53	1787.2	49.22	-1.118
8/17/2006	17:21:39	1893.3	49.22	-1.123
8/17/2006	17:23:31	2005.7	49.22	-1.123
8/17/2006	17:25:30	2124.7	49.22	-1.123
8/17/2006	17:27:36	2250.8	49.22	-1.132
8/17/2006	17:29:50	2384.4	49.22	-1.135
8/17/2006	17:32:11	2525.9	49.22	-1.128

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/23/2006	11:11:45
Report from file:		...\SN07561 2006-08-18 152000 KRY121A#2Rec.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			7561	
Firmware Version			3.09	
Unit name:		KRY121A Obs		
Test name:			KRY121A#2Rec	
Test defined on:			8/18/2006	15:14:42
Test scheduled for:			8/18/2006	15:20:00
Test started on:			8/18/2006	15:20:00
Test stopped on:			8/18/2006	15:36:02
Data gathered using Logarithmic testing				
Maximum time between data points:	600.0	Seconds.		
Number of data samples:			109	
TOTAL DATA SAMPLES			109	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			4.866	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/18/2006	15:20:00	0	49.82	0
8/18/2006	15:20:00	0.3	49.84	0.008
8/18/2006	15:20:00	0.6	49.84	0.01
8/18/2006	15:20:00	0.9	49.86	0.011
8/18/2006	15:20:01	1.2	49.86	0.011
8/18/2006	15:20:01	1.5	49.86	0.017
8/18/2006	15:20:01	1.8	49.86	0.023
8/18/2006	15:20:02	2.1	49.89	0.029
8/18/2006	15:20:02	2.4	49.89	0.035
8/18/2006	15:20:02	2.7	49.89	0.041
8/18/2006	15:20:03	3	49.89	0.047
8/18/2006	15:20:03	3.3	49.89	0.051
8/18/2006	15:20:03	3.6	49.89	0.062
8/18/2006	15:20:03	3.9	49.89	0.068
8/18/2006	15:20:04	4.2	49.89	0.072
8/18/2006	15:20:04	4.5	49.89	0.076
8/18/2006	15:20:04	4.8	49.89	0.074
8/18/2006	15:20:05	5.1	49.91	0.07
8/18/2006	15:20:05	5.4	49.91	0.068
8/18/2006	15:20:05	5.7	49.91	0.068
8/18/2006	15:20:06	6	49.91	0.066
8/18/2006	15:20:06	6.4	49.91	0.066
8/18/2006	15:20:06	6.7	49.91	0.064
8/18/2006	15:20:07	7.1	49.91	0.064
8/18/2006	15:20:07	7.5	49.91	0.064
8/18/2006	15:20:07	8	49.91	0.064
8/18/2006	15:20:08	8.4	49.91	0.064
8/18/2006	15:20:08	8.9	49.91	0.062
8/18/2006	15:20:09	9.5	49.91	0.062
8/18/2006	15:20:10	10	49.91	0.058
8/18/2006	15:20:10	10.6	49.89	0.059
8/18/2006	15:20:11	11.3	49.89	0.059
8/18/2006	15:20:11	11.9	49.89	0.057
8/18/2006	15:20:12	12.6	49.89	0.057

8/18/2006	15:20:13	13.4	49.89	0.057
8/18/2006	15:20:14	14.2	49.89	0.055
8/18/2006	15:20:15	15	49.86	0.055
8/18/2006	15:20:15	15.9	49.86	0.055
8/18/2006	15:20:16	16.8	49.86	0.055
8/18/2006	15:20:17	17.8	49.86	0.055
8/18/2006	15:20:18	18.9	49.86	0.055
8/18/2006	15:20:20	20	49.86	0.053
8/18/2006	15:20:21	21.2	49.86	0.053
8/18/2006	15:20:22	22.4	49.86	0.053
8/18/2006	15:20:23	23.8	49.84	0.053
8/18/2006	15:20:25	25.2	49.84	0.051
8/18/2006	15:20:26	26.7	49.84	0.051
8/18/2006	15:20:28	28.2	49.84	0.049
8/18/2006	15:20:29	29.8	49.84	0.049
8/18/2006	15:20:31	31.5	49.84	0.049
8/18/2006	15:20:33	33.3	49.84	0.047
8/18/2006	15:20:35	35.2	49.84	0.047
8/18/2006	15:20:37	37.3	49.84	0.045
8/18/2006	15:20:39	39.5	49.86	0.045
8/18/2006	15:20:41	41.8	49.86	0.043
8/18/2006	15:20:44	44.3	49.86	0.041
8/18/2006	15:20:46	46.9	49.86	0.041
8/18/2006	15:20:49	49.7	49.89	0.041
8/18/2006	15:20:52	52.6	49.89	0.041
8/18/2006	15:20:55	55.7	49.91	0.04
8/18/2006	15:20:58	59	49.91	0.04
8/18/2006	15:21:02	62.5	49.91	0.04
8/18/2006	15:21:06	66.2	49.93	0.04
8/18/2006	15:21:10	70.1	49.93	0.04
8/18/2006	15:21:14	74.3	49.93	0.04
8/18/2006	15:21:18	78.7	49.96	0.04
8/18/2006	15:21:23	83.4	49.96	0.04
8/18/2006	15:21:28	88.4	49.98	0.039
8/18/2006	15:21:33	93.7	49.98	0.041
8/18/2006	15:21:39	99.3	49.98	0.039
8/18/2006	15:21:45	105.2	49.98	0.039
8/18/2006	15:21:51	111.5	50	0.041
8/18/2006	15:21:58	118.1	50	0.041

8/18/2006	15:22:05	125.1	50.02	0.041
8/18/2006	15:22:12	132.6	50.02	0.041
8/18/2006	15:22:20	140.5	50.02	0.041
8/18/2006	15:22:28	148.9	50.02	0.039
8/18/2006	15:22:37	157.8	50.05	0.04
8/18/2006	15:22:47	167.2	50.05	0.04
8/18/2006	15:22:57	177.2	50.05	0.04
8/18/2006	15:23:07	187.8	50.05	0.04
8/18/2006	15:23:18	199	50.07	0.04
8/18/2006	15:23:30	210.9	50.07	0.04
8/18/2006	15:23:43	223.5	50.07	0.04
8/18/2006	15:23:56	236.8	50.07	0.04
8/18/2006	15:24:10	250.9	50.07	0.042
8/18/2006	15:24:25	265.8	50.07	0.042
8/18/2006	15:24:41	281.6	50.07	0.04
8/18/2006	15:24:58	298.4	50.07	0.038
8/18/2006	15:25:16	316.2	50.07	0.04
8/18/2006	15:25:34	335	50.07	0.04
8/18/2006	15:25:54	354.9	50.07	0.04
8/18/2006	15:26:15	376	50.09	0.04
8/18/2006	15:26:38	398.4	50.14	0.041
8/18/2006	15:27:02	422.1	50.16	0.041
8/18/2006	15:27:27	447.2	50.18	0.04
8/18/2006	15:27:53	473.8	50.21	0.04
8/18/2006	15:28:21	502	50.25	0.041
8/18/2006	15:28:51	531.9	50.25	0.041
8/18/2006	15:29:23	563.5	50.25	0.04
8/18/2006	15:29:56	597	50.25	0.04
8/18/2006	15:30:32	632.5	50.27	0.039
8/18/2006	15:31:10	670.1	50.3	0.041
8/18/2006	15:31:49	709.9	50.3	0.039
8/18/2006	15:32:32	752.1	50.3	0.039
8/18/2006	15:33:16	796.8	50.27	0.041
8/18/2006	15:34:04	844.2	50.25	0.041
8/18/2006	15:34:54	894.4	50.23	0.042
8/18/2006	15:35:47	947.5	50.23	0.04

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/24/2006	15:24:11
Report from file:		...\SN07561 2006-08-18 140201 KRY121A DD#2.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			7561	
Firmware Version			3.09	
Unit name:		KRY121A Obs		
Test name:				KRY121A DD#2
Test defined on:			8/18/2006	14:01:36
Test started on:			8/18/2006	14:02:01
Test stopped on:			8/18/2006	15:00:00
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			131	
TOTAL DATA SAMPLES			131	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			4.956	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/18/2006	14:02:01	0	53.31	0
8/18/2006	14:02:02	0.3	53.41	0.003
8/18/2006	14:02:02	0.6	53.47	-0.002
8/18/2006	14:02:02	0.9	53.52	-0.005
8/18/2006	14:02:03	1.2	53.59	-0.012
8/18/2006	14:02:03	1.5	53.63	-0.018
8/18/2006	14:02:03	1.8	53.7	-0.025
8/18/2006	14:02:03	2.1	53.75	-0.028
8/18/2006	14:02:04	2.4	53.79	-0.029
8/18/2006	14:02:04	2.7	53.86	-0.031
8/18/2006	14:02:04	3	53.9	-0.032
8/18/2006	14:02:05	3.3	53.95	-0.031
8/18/2006	14:02:05	3.6	54.02	-0.03
8/18/2006	14:02:05	3.9	54.06	-0.028
8/18/2006	14:02:06	4.2	54.11	-0.027
8/18/2006	14:02:06	4.5	54.18	-0.026
8/18/2006	14:02:06	4.8	54.22	-0.025
8/18/2006	14:02:06	5.1	54.29	-0.026
8/18/2006	14:02:07	5.4	54.34	-0.024
8/18/2006	14:02:07	5.7	54.38	-0.023
8/18/2006	14:02:07	6	54.45	-0.024
8/18/2006	14:02:08	6.4	54.49	-0.023
8/18/2006	14:02:08	6.7	54.56	-0.022
8/18/2006	14:02:08	7.1	54.61	-0.022
8/18/2006	14:02:09	7.5	54.68	-0.021
8/18/2006	14:02:09	8	54.77	-0.02
8/18/2006	14:02:10	8.4	54.83	-0.019
8/18/2006	14:02:10	8.9	54.9	-0.018
8/18/2006	14:02:11	9.5	54.99	-0.018
8/18/2006	14:02:11	10	55.11	-0.023
8/18/2006	14:02:12	10.6	55.2	-0.027
8/18/2006	14:02:13	11.3	55.29	-0.026
8/18/2006	14:02:13	11.9	55.38	-0.027
8/18/2006	14:02:14	12.6	55.49	-0.029
8/18/2006	14:02:15	13.4	55.58	-0.028

8/18/2006	14:02:16	14.2	55.7	-0.03
8/18/2006	14:02:16	15	55.81	-0.031
8/18/2006	14:02:17	15.9	55.9	-0.035
8/18/2006	14:02:18	16.8	55.99	-0.038
8/18/2006	14:02:19	17.8	56.08	-0.041
8/18/2006	14:02:20	18.9	56.17	-0.044
8/18/2006	14:02:21	20	56.22	-0.049
8/18/2006	14:02:23	21.2	56.29	-0.054
8/18/2006	14:02:24	22.4	56.31	-0.058
8/18/2006	14:02:25	23.8	56.33	-0.062
8/18/2006	14:02:27	25.2	56.33	-0.066
8/18/2006	14:02:28	26.7	56.29	-0.072
8/18/2006	14:02:30	28.2	56.24	-0.075
8/18/2006	14:02:31	29.8	56.17	-0.078
8/18/2006	14:02:33	31.5	56.08	-0.083
8/18/2006	14:02:35	33.3	55.97	-0.085
8/18/2006	14:02:37	35.2	55.83	-0.087
8/18/2006	14:02:39	37.3	55.67	-0.091
8/18/2006	14:02:41	39.5	55.51	-0.094
8/18/2006	14:02:43	41.8	55.31	-0.096
8/18/2006	14:02:46	44.3	55.13	-0.097
8/18/2006	14:02:48	46.9	54.9	-0.1
8/18/2006	14:02:51	49.7	54.68	-0.1
8/18/2006	14:02:54	52.6	54.45	-0.101
8/18/2006	14:02:57	55.7	54.22	-0.104
8/18/2006	14:03:00	59	53.97	-0.104
8/18/2006	14:03:04	62.5	53.72	-0.105
8/18/2006	14:03:08	66.2	53.5	-0.106
8/18/2006	14:03:11	70.1	53.25	-0.106
8/18/2006	14:03:16	74.3	53.02	-0.105
8/18/2006	14:03:20	78.7	52.77	-0.105
8/18/2006	14:03:25	83.4	52.54	-0.106
8/18/2006	14:03:30	88.4	52.34	-0.105
8/18/2006	14:03:35	93.7	52.11	-0.106
8/18/2006	14:03:41	99.3	51.93	-0.105
8/18/2006	14:03:47	105.2	51.73	-0.104
8/18/2006	14:03:53	111.5	51.54	-0.102
8/18/2006	14:03:59	118.1	51.39	-0.104
8/18/2006	14:04:06	125.1	51.23	-0.101

8/18/2006	14:04:14	132.6	51.07	-0.099
8/18/2006	14:04:22	140.5	50.93	-0.099
8/18/2006	14:04:30	148.9	50.82	-0.1
8/18/2006	14:04:39	157.8	50.68	-0.098
8/18/2006	14:04:49	167.2	50.59	-0.096
8/18/2006	14:04:59	177.2	50.5	-0.097
8/18/2006	14:05:09	187.8	50.41	-0.096
8/18/2006	14:05:20	199	50.32	-0.095
8/18/2006	14:05:32	210.9	50.25	-0.096
8/18/2006	14:05:45	223.5	50.18	-0.095
8/18/2006	14:05:58	236.8	50.14	-0.094
8/18/2006	14:06:12	250.9	50.09	-0.093
8/18/2006	14:06:27	265.8	50.05	-0.093
8/18/2006	14:06:43	281.6	50	-0.092
8/18/2006	14:07:00	298.4	49.96	-0.091
8/18/2006	14:07:18	316.2	49.93	-0.091
8/18/2006	14:07:36	335	49.91	-0.093
8/18/2006	14:07:56	354.9	49.89	-0.092
8/18/2006	14:08:17	376	49.86	-0.09
8/18/2006	14:08:40	398.4	49.84	-0.092
8/18/2006	14:09:03	422.1	49.84	-0.092
8/18/2006	14:09:29	447.2	49.82	-0.091
8/18/2006	14:09:55	473.8	49.82	-0.091
8/18/2006	14:10:23	502	49.82	-0.091
8/18/2006	14:10:53	531.9	49.82	-0.091
8/18/2006	14:11:25	563.5	49.8	-0.091
8/18/2006	14:11:58	597	49.8	-0.091
8/18/2006	14:12:34	632.5	49.82	-0.089
8/18/2006	14:13:11	670.1	49.8	-0.093
8/18/2006	14:13:51	709.9	49.8	-0.091
8/18/2006	14:14:33	752.1	49.8	-0.091
8/18/2006	14:15:18	796.8	49.82	-0.091
8/18/2006	14:16:06	844.2	49.82	-0.091
8/18/2006	14:16:56	894.4	49.82	-0.091
8/18/2006	14:17:49	947.5	49.82	-0.091
8/18/2006	14:18:45	1003.8	49.82	-0.091
8/18/2006	14:19:45	1063.4	49.82	-0.091
8/18/2006	14:20:48	1126.6	49.82	-0.091
8/18/2006	14:21:55	1193.5	49.82	-0.091

8/18/2006	14:23:06	1264.4	49.82	-0.091
8/18/2006	14:24:21	1339.5	49.82	-0.091
8/18/2006	14:25:40	1419	49.82	-0.089
8/18/2006	14:27:05	1503.3	49.82	-0.091
8/18/2006	14:28:34	1592.6	49.82	-0.089
8/18/2006	14:30:08	1687.1	49.84	-0.092
8/18/2006	14:31:49	1787.2	49.82	-0.091
8/18/2006	14:33:35	1893.3	49.84	-0.092
8/18/2006	14:35:27	2005.7	49.84	-0.092
8/18/2006	14:37:26	2124.7	49.82	-0.091
8/18/2006	14:39:32	2250.8	49.82	-0.091
8/18/2006	14:41:46	2384.4	49.82	-0.091
8/18/2006	14:44:07	2525.9	49.82	-0.091
8/18/2006	14:46:37	2675.8	49.82	-0.091
8/18/2006	14:49:16	2834.6	49.84	-0.094
8/18/2006	14:52:04	3002.8	49.82	-0.091
8/18/2006	14:55:02	3180.9	49.82	-0.093
8/18/2006	14:58:11	3369.6	49.82	-0.091

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/23/2006	11:31:57
Report from file:		...\SN07561 2006-08-22 190114 139APumpRec.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			7561	
Firmware Version			3.09	
Unit name:		KRY108A		
Test name:				139APumpRec
Test defined on:			8/22/2006	16:22:07
Test started on:			8/22/2006	19:01:14
Test stopped on:		N/A		N/A
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			108	
TOTAL DATA SAMPLES			108	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			6.689	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O	Residual DD
8/22/2006	19:01:14	0	51.7	0	
8/22/2006	19:01:15	0.3	51.73	0.035	2.935
8/22/2006	19:01:15	0.6	51.75	0.071	2.899
8/22/2006	19:01:15	0.9	51.75	0.098	2.872
8/22/2006	19:01:15	1.2	51.77	0.136	2.834
8/22/2006	19:01:16	1.5	51.77	0.181	2.789
8/22/2006	19:01:16	1.8	51.77	0.229	2.741
8/22/2006	19:01:16	2.1	51.77	0.273	2.697
8/22/2006	19:01:17	2.4	51.77	0.318	2.652
8/22/2006	19:01:17	2.7	51.77	0.364	2.606
8/22/2006	19:01:17	3	51.77	0.407	2.563
8/22/2006	19:01:18	3.3	51.77	0.449	2.521
8/22/2006	19:01:18	3.6	51.79	0.492	2.478
8/22/2006	19:01:18	3.9	51.79	0.534	2.436
8/22/2006	19:01:18	4.2	51.79	0.578	2.392
8/22/2006	19:01:19	4.5	51.79	0.617	2.353
8/22/2006	19:01:19	4.8	51.79	0.657	2.313
8/22/2006	19:01:19	5.1	51.79	0.696	2.274
8/22/2006	19:01:20	5.4	51.79	0.732	2.238
8/22/2006	19:01:20	5.7	51.79	0.77	2.2
8/22/2006	19:01:20	6	51.79	0.804	2.166
8/22/2006	19:01:21	6.4	51.79	0.843	2.127
8/22/2006	19:01:21	6.7	51.79	0.883	2.087
8/22/2006	19:01:21	7.1	51.79	0.92	2.05
8/22/2006	19:01:22	7.5	51.79	0.958	2.012
8/22/2006	19:01:22	8	51.79	0.994	1.976
8/22/2006	19:01:23	8.4	51.79	1.028	1.942
8/22/2006	19:01:23	8.9	51.79	1.063	1.907
8/22/2006	19:01:24	9.5	51.79	1.095	1.875
8/22/2006	19:01:24	10	51.79	1.119	1.851
8/22/2006	19:01:25	10.6	51.77	1.149	1.821
8/22/2006	19:01:25	11.3	51.77	1.175	1.795
8/22/2006	19:01:26	11.9	51.77	1.202	1.768
8/22/2006	19:01:27	12.6	51.77	1.228	1.742
8/22/2006	19:01:28	13.4	51.77	1.256	1.714
8/22/2006	19:01:28	14.2	51.77	1.284	1.686
8/22/2006	19:01:29	15	51.77	1.309	1.661
8/22/2006	19:01:30	15.9	51.77	1.335	1.635
8/22/2006	19:01:31	16.8	51.77	1.365	1.605
8/22/2006	19:01:32	17.8	51.77	1.373	1.597
8/22/2006	19:01:33	18.9	51.77	1.414	1.556
8/22/2006	19:01:34	20	51.77	1.468	1.502

8/22/2006	19:01:35	21.2	51.77	1.488	1.482
8/22/2006	19:01:37	22.4	51.77	1.523	1.447
8/22/2006	19:01:38	23.8	51.77	1.563	1.407
8/22/2006	19:01:39	25.2	51.77	1.595	1.375
8/22/2006	19:01:41	26.7	51.75	1.633	1.337
8/22/2006	19:01:42	28.2	51.75	1.672	1.298
8/22/2006	19:01:44	29.8	51.75	1.71	1.26
8/22/2006	19:01:46	31.5	51.75	1.75	1.22
8/22/2006	19:01:47	33.3	51.75	1.789	1.181
8/22/2006	19:01:49	35.2	51.75	1.827	1.143
8/22/2006	19:01:51	37.3	51.75	1.865	1.105
8/22/2006	19:01:54	39.5	51.75	1.904	1.066
8/22/2006	19:01:56	41.8	51.75	1.944	1.026
8/22/2006	19:01:58	44.3	51.75	1.982	0.988
8/22/2006	19:02:01	46.9	51.75	2.019	0.951
8/22/2006	19:02:04	49.7	51.75	2.075	0.895
8/22/2006	19:02:07	52.6	51.75	2.122	0.848
8/22/2006	19:02:10	55.7	51.73	2.146	0.824
8/22/2006	19:02:13	59	51.73	2.236	0.734
8/22/2006	19:02:17	62.5	51.73	2.257	0.713
8/22/2006	19:02:20	66.2	51.73	2.307	0.663
8/22/2006	19:02:24	70.1	51.73	2.357	0.613
8/22/2006	19:02:28	74.3	51.73	2.406	0.564
8/22/2006	19:02:33	78.7	51.73	2.454	0.516
8/22/2006	19:02:38	83.4	51.7	2.502	0.468
8/22/2006	19:02:43	88.4	51.7	2.551	0.419
8/22/2006	19:02:48	93.7	51.7	2.597	0.373
8/22/2006	19:02:53	99.3	51.7	2.642	0.328
8/22/2006	19:02:59	105.2	51.7	2.688	0.282
8/22/2006	19:03:06	111.5	51.7	2.729	0.241
8/22/2006	19:03:12	118.1	51.68	2.765	0.205
8/22/2006	19:03:19	125.1	51.68	2.799	0.171
8/22/2006	19:03:27	132.6	51.68	2.829	0.141
8/22/2006	19:03:35	140.5	51.68	2.855	0.115
8/22/2006	19:03:43	148.9	51.68	2.878	0.092
8/22/2006	19:03:52	157.8	51.66	2.899	0.071
8/22/2006	19:04:01	167.2	51.66	2.914	0.056
8/22/2006	19:04:11	177.2	51.66	2.926	0.044
8/22/2006	19:04:22	187.8	51.66	2.936	0.034
8/22/2006	19:04:33	199	51.64	2.944	0.026
8/22/2006	19:04:45	210.9	51.64	2.952	0.018
8/22/2006	19:04:58	223.5	51.64	2.958	0.012
8/22/2006	19:05:11	236.8	51.64	2.962	0.008
8/22/2006	19:05:25	250.9	51.64	2.966	0.004
8/22/2006	19:05:40	265.8	51.64	2.964	0.006
8/22/2006	19:05:56	281.6	51.61	2.967	0.003

8/22/2006	19:06:13	298.4	51.61	2.969	0.001
8/22/2006	19:06:30	316.2	51.61	2.969	0.001
8/22/2006	19:06:49	335	51.61	2.971	-0.001
8/22/2006	19:07:09	354.9	51.59	2.971	-0.001
8/22/2006	19:07:30	376	51.59	2.971	-0.001
8/22/2006	19:07:53	398.4	51.59	2.971	-0.001
8/22/2006	19:08:16	422.1	51.59	2.973	-0.003
8/22/2006	19:08:41	447.2	51.57	2.973	-0.003
8/22/2006	19:09:08	473.8	51.57	2.973	-0.003
8/22/2006	19:09:36	502	51.59	2.975	-0.005
8/22/2006	19:10:06	531.9	51.64	2.974	-0.004
8/22/2006	19:10:38	563.5	51.68	2.976	-0.006
8/22/2006	19:11:11	597	51.75	2.975	-0.005
8/22/2006	19:11:47	632.5	51.77	2.976	-0.006
8/22/2006	19:12:24	670.1	51.77	2.976	-0.006
8/22/2006	19:13:04	709.9	51.79	2.974	-0.004
8/22/2006	19:13:46	752.1	51.79	2.974	-0.004
8/22/2006	19:14:31	796.8	51.82	2.974	-0.004
8/22/2006	19:15:18	844.2	51.79	2.974	-0.004
8/22/2006	19:16:09	894.4	51.79	2.974	-0.004

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/23/2006	11:30:42
Report from file:		...\SN07561 2006-08-22 171502 139APumpDD2.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			7561	
Firmware Version			3.09	
Unit name:		KRY108A		
Test name:				139APumpDD2
Test defined on:			8/22/2006	17:04:22
Test started on:			8/22/2006	17:15:02
Test stopped on:			8/22/2006	19:00:57
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			142	
TOTAL DATA SAMPLES			142	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			9.65	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/22/2006	17:15:02	0	52.7	0
8/22/2006	17:15:02	0.3	52.72	0.01
8/22/2006	17:15:02	0.6	52.75	0.013
8/22/2006	17:15:03	0.9	52.75	0.015
8/22/2006	17:15:03	1.2	52.75	0.015
8/22/2006	17:15:03	1.5	52.77	0.013
8/22/2006	17:15:04	1.8	52.77	-0.068
8/22/2006	17:15:04	2.1	52.77	-0.12
8/22/2006	17:15:04	2.4	52.77	-0.132
8/22/2006	17:15:05	2.7	52.77	-0.066
8/22/2006	17:15:05	3	52.77	-0.167
8/22/2006	17:15:05	3.3	52.77	-0.245
8/22/2006	17:15:05	3.6	52.77	-0.255
8/22/2006	17:15:06	3.9	52.77	-0.191
8/22/2006	17:15:06	4.2	52.77	-0.274
8/22/2006	17:15:06	4.5	52.77	-0.308
8/22/2006	17:15:07	4.8	52.79	-0.314
8/22/2006	17:15:07	5.1	52.79	-0.324
8/22/2006	17:15:07	5.4	52.79	-0.336
8/22/2006	17:15:08	5.7	52.77	-0.364
8/22/2006	17:15:08	6	52.79	-0.362
8/22/2006	17:15:08	6.4	52.79	-0.39
8/22/2006	17:15:09	6.7	52.79	-0.402
8/22/2006	17:15:09	7.1	52.79	-0.414
8/22/2006	17:15:09	7.5	52.79	-0.433
8/22/2006	17:15:10	8	52.79	-0.447
8/22/2006	17:15:10	8.4	52.79	-0.473
8/22/2006	17:15:11	8.9	52.79	-0.499
8/22/2006	17:15:11	9.5	52.79	-0.509
8/22/2006	17:15:12	10	52.77	-0.534
8/22/2006	17:15:12	10.6	52.77	-0.558
8/22/2006	17:15:13	11.3	52.77	-0.578
8/22/2006	17:15:14	11.9	52.77	-0.6
8/22/2006	17:15:14	12.6	52.77	-0.623
8/22/2006	17:15:15	13.4	52.77	-0.643

8/22/2006	17:15:16	14.2	52.77	-0.671
8/22/2006	17:15:17	15	52.75	-0.684
8/22/2006	17:15:18	15.9	52.75	-0.718
8/22/2006	17:15:19	16.8	52.75	-0.754
8/22/2006	17:15:20	17.8	52.75	-0.774
8/22/2006	17:15:21	18.9	52.75	-0.784
8/22/2006	17:15:22	20	52.75	-0.821
8/22/2006	17:15:23	21.2	52.75	-0.861
8/22/2006	17:15:24	22.4	52.72	-0.888
8/22/2006	17:15:26	23.8	52.75	-0.918
8/22/2006	17:15:27	25.2	52.72	-0.942
8/22/2006	17:15:29	26.7	52.72	-0.975
8/22/2006	17:15:30	28.2	52.72	-1.009
8/22/2006	17:15:32	29.8	52.72	-1.029
8/22/2006	17:15:33	31.5	52.7	-1.064
8/22/2006	17:15:35	33.3	52.7	-1.078
8/22/2006	17:15:37	35.2	52.68	-1.12
8/22/2006	17:15:39	37.3	52.68	-1.153
8/22/2006	17:15:41	39.5	52.66	-1.187
8/22/2006	17:15:44	41.8	52.66	-1.232
8/22/2006	17:15:46	44.3	52.66	-1.256
8/22/2006	17:15:49	46.9	52.63	-1.293
8/22/2006	17:15:52	49.7	52.61	-1.333
8/22/2006	17:15:54	52.6	52.61	-1.364
8/22/2006	17:15:58	55.7	52.59	-1.414
8/22/2006	17:16:01	59	52.59	-1.459
8/22/2006	17:16:04	62.5	52.59	-1.495
8/22/2006	17:16:08	66.2	52.59	-1.538
8/22/2006	17:16:12	70.1	52.59	-1.582
8/22/2006	17:16:16	74.3	52.61	-1.618
8/22/2006	17:16:21	78.7	52.61	-1.679
8/22/2006	17:16:25	83.4	52.63	-1.733
8/22/2006	17:16:30	88.4	52.66	-1.763
8/22/2006	17:16:36	93.7	52.68	-1.813
8/22/2006	17:16:41	99.3	52.7	-1.845
8/22/2006	17:16:47	105.2	52.72	-1.875
8/22/2006	17:16:53	111.5	52.72	-1.931
8/22/2006	17:17:00	118.1	52.75	-1.971
8/22/2006	17:17:07	125.1	52.75	-1.995

8/22/2006	17:17:14	132.6	52.75	-2.04
8/22/2006	17:17:22	140.5	52.72	-2.083
8/22/2006	17:17:31	148.9	52.7	-2.113
8/22/2006	17:17:40	157.8	52.66	-2.124
8/22/2006	17:17:49	167.2	52.61	-2.161
8/22/2006	17:17:59	177.2	52.57	-2.18
8/22/2006	17:18:10	187.8	52.52	-2.225
8/22/2006	17:18:21	199	52.48	-2.246
8/22/2006	17:18:33	210.9	52.45	-2.268
8/22/2006	17:18:45	223.5	52.41	-2.293
8/22/2006	17:18:59	236.8	52.36	-2.314
8/22/2006	17:19:13	250.9	52.32	-2.357
8/22/2006	17:19:28	265.8	52.29	-2.359
8/22/2006	17:19:43	281.6	52.27	-2.408
8/22/2006	17:20:00	298.4	52.25	-2.398
8/22/2006	17:20:18	316.2	52.23	-2.417
8/22/2006	17:20:37	335	52.18	-2.431
8/22/2006	17:20:57	354.9	52.16	-2.47
8/22/2006	17:21:18	376	52.13	-2.474
8/22/2006	17:21:40	398.4	52.13	-2.483
8/22/2006	17:22:04	422.1	52.11	-2.475
8/22/2006	17:22:29	447.2	52.09	-2.503
8/22/2006	17:22:56	473.8	52.07	-2.496
8/22/2006	17:23:24	502	52.07	-2.512
8/22/2006	17:23:54	531.9	52.04	-2.508
8/22/2006	17:24:25	563.5	52.04	-2.532
8/22/2006	17:24:59	597	52.02	-2.535
8/22/2006	17:25:34	632.5	52.02	-2.553
8/22/2006	17:26:12	670.1	52.02	-2.543
8/22/2006	17:26:52	709.9	52	-2.545
8/22/2006	17:27:34	752.1	52	-2.573
8/22/2006	17:28:19	796.8	52	-2.577
8/22/2006	17:29:06	844.2	51.98	-2.592
8/22/2006	17:29:56	894.4	51.98	-2.61
8/22/2006	17:30:49	947.5	51.98	-2.592
8/22/2006	17:31:46	1003.8	51.95	-2.592
8/22/2006	17:32:45	1063.4	51.95	-2.624
8/22/2006	17:33:48	1126.6	51.95	-2.624
8/22/2006	17:34:55	1193.5	51.93	-2.609

8/22/2006	17:36:06	1264.4	51.93	-2.639
8/22/2006	17:37:21	1339.5	51.93	-2.655
8/22/2006	17:38:41	1419	51.91	-2.672
8/22/2006	17:40:05	1503.3	51.91	-2.669
8/22/2006	17:41:34	1592.6	51.91	-2.676
8/22/2006	17:43:09	1687.1	51.89	-2.692
8/22/2006	17:44:49	1787.2	51.89	-2.726
8/22/2006	17:46:35	1893.3	51.89	-2.755
8/22/2006	17:48:28	2005.7	51.86	-2.757
8/22/2006	17:50:27	2124.7	51.86	-2.751
8/22/2006	17:52:33	2250.8	51.84	-2.749
8/22/2006	17:54:46	2384.4	51.84	-2.761
8/22/2006	17:57:08	2525.9	51.84	-2.794
8/22/2006	17:59:38	2675.8	51.82	-2.778
8/22/2006	18:02:16	2834.6	51.82	-2.818
8/22/2006	18:05:05	3002.8	51.79	-2.845
8/22/2006	18:08:03	3180.9	51.79	-2.855
8/22/2006	18:11:11	3369.6	51.77	-2.859
8/22/2006	18:14:31	3569.5	51.77	-2.865
8/22/2006	18:18:03	3781.2	51.75	-2.87
8/22/2006	18:21:47	4005.5	51.75	-2.853
8/22/2006	18:25:45	4243.1	51.75	-2.87
8/22/2006	18:29:57	4494.7	51.73	-2.906
8/22/2006	18:34:23	4761.3	51.75	-2.912
8/22/2006	18:39:06	5043.7	51.73	-2.932
8/22/2006	18:44:05	5342.8	51.73	-2.938
8/22/2006	18:49:21	5659.6	51.73	-2.965
8/22/2006	18:54:57	5995.2	51.7	-2.975
8/22/2006	19:00:53	6350.7	51.7	-2.941

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/23/2006	11:26:55
Report from file:		...\SN07561 2006-08-22 152000 139A139BRecObs.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			7561	
Firmware Version			3.09	
Unit name:		KRY108A		
Test name:			139A139BRecObs	
Test defined on:			8/22/2006	15:14:02
Test scheduled for:			8/22/2006	15:20:00
Test started on:			8/22/2006	15:20:00
Test stopped on:		N/A	N/A	
Data gathered using Logarithmic testing				
Maximum time between data points:	600.0	Seconds.		
Number of data samples:			127	
TOTAL DATA SAMPLES			127	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			15.178	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/22/2006	15:20:00	0	49.25	0
8/22/2006	15:20:00	0.3	49.3	0.011
8/22/2006	15:20:00	0.6	49.3	0.017
8/22/2006	15:20:00	0.9	49.32	0.019
8/22/2006	15:20:01	1.2	49.32	0.021
8/22/2006	15:20:01	1.5	49.34	0.022
8/22/2006	15:20:01	1.8	49.34	0.022
8/22/2006	15:20:02	2.1	49.34	0.022
8/22/2006	15:20:02	2.4	49.34	0.022
8/22/2006	15:20:02	2.7	49.34	0.024
8/22/2006	15:20:03	3	49.34	0.024
8/22/2006	15:20:03	3.3	49.34	0.022
8/22/2006	15:20:03	3.6	49.34	0.024
8/22/2006	15:20:03	3.9	49.34	0.024
8/22/2006	15:20:04	4.2	49.36	0.026
8/22/2006	15:20:04	4.5	49.36	0.024
8/22/2006	15:20:04	4.8	49.36	0.024
8/22/2006	15:20:05	5.1	49.36	0.024
8/22/2006	15:20:05	5.4	49.36	0.024
8/22/2006	15:20:05	5.7	49.36	0.024
8/22/2006	15:20:06	6	49.36	0.026
8/22/2006	15:20:06	6.4	49.36	0.026
8/22/2006	15:20:06	6.7	49.36	0.024
8/22/2006	15:20:07	7.1	49.36	0.026
8/22/2006	15:20:07	7.5	49.36	0.026
8/22/2006	15:20:07	8	49.36	0.026
8/22/2006	15:20:08	8.4	49.36	0.026
8/22/2006	15:20:08	8.9	49.36	0.026
8/22/2006	15:20:09	9.5	49.36	0.026
8/22/2006	15:20:10	10	49.34	0.019
8/22/2006	15:20:10	10.6	49.34	0.015
8/22/2006	15:20:11	11.3	49.34	0.015
8/22/2006	15:20:11	11.9	49.34	0.011
8/22/2006	15:20:12	12.6	49.34	0.011

8/22/2006	15:20:13	13.4	49.34	0.013
8/22/2006	15:20:14	14.2	49.34	0.011
8/22/2006	15:20:15	15	49.34	0.011
8/22/2006	15:20:15	15.9	49.34	0.011
8/22/2006	15:20:16	16.8	49.32	0.011
8/22/2006	15:20:17	17.8	49.32	0.009
8/22/2006	15:20:18	18.9	49.32	0.007
8/22/2006	15:20:20	20	49.32	0.009
8/22/2006	15:20:21	21.2	49.32	0.007
8/22/2006	15:20:22	22.4	49.32	0.009
8/22/2006	15:20:23	23.8	49.32	0.007
8/22/2006	15:20:25	25.2	49.32	0.007
8/22/2006	15:20:26	26.7	49.32	0.007
8/22/2006	15:20:28	28.2	49.32	0.007
8/22/2006	15:20:29	29.8	49.32	0.009
8/22/2006	15:20:31	31.5	49.32	0.009
8/22/2006	15:20:33	33.3	49.32	0.009
8/22/2006	15:20:35	35.2	49.32	0.009
8/22/2006	15:20:37	37.3	49.32	0.007
8/22/2006	15:20:39	39.5	49.32	0.007
8/22/2006	15:20:41	41.8	49.32	0.007
8/22/2006	15:20:44	44.3	49.32	0.007
8/22/2006	15:20:46	46.9	49.32	0.007
8/22/2006	15:20:49	49.7	49.32	0.007
8/22/2006	15:20:52	52.6	49.32	0.005
8/22/2006	15:20:55	55.7	49.32	0.005
8/22/2006	15:20:58	59	49.3	0.005
8/22/2006	15:21:02	62.5	49.3	0.007
8/22/2006	15:21:06	66.2	49.3	0.005
8/22/2006	15:21:10	70.1	49.3	0.005
8/22/2006	15:21:14	74.3	49.3	0.007
8/22/2006	15:21:18	78.7	49.3	0.005
8/22/2006	15:21:23	83.4	49.3	0.005
8/22/2006	15:21:28	88.4	49.3	0.005
8/22/2006	15:21:33	93.7	49.3	0.005
8/22/2006	15:21:39	99.3	49.3	0.005
8/22/2006	15:21:45	105.2	49.3	0.005
8/22/2006	15:21:51	111.5	49.27	0.004
8/22/2006	15:21:58	118.1	49.27	0.006

8/22/2006	15:22:05	125.1	49.3	0.007
8/22/2006	15:22:12	132.6	49.27	0.008
8/22/2006	15:22:20	140.5	49.27	0.008
8/22/2006	15:22:28	148.9	49.27	0.008
8/22/2006	15:22:37	157.8	49.27	0.008
8/22/2006	15:22:47	167.2	49.27	0.006
8/22/2006	15:22:57	177.2	49.27	0.012
8/22/2006	15:23:07	187.8	49.27	0.014
8/22/2006	15:23:18	199	49.27	0.014
8/22/2006	15:23:30	210.9	49.27	0.014
8/22/2006	15:23:43	223.5	49.27	0.012
8/22/2006	15:23:56	236.8	49.27	0.012
8/22/2006	15:24:10	250.9	49.27	0.012
8/22/2006	15:24:25	265.8	49.27	0.008
8/22/2006	15:24:41	281.6	49.27	0.014
8/22/2006	15:24:58	298.4	49.27	0.01
8/22/2006	15:25:16	316.2	49.27	-0.002
8/22/2006	15:25:34	335	49.27	-0.006
8/22/2006	15:25:54	354.9	49.27	-0.004
8/22/2006	15:26:15	376	49.27	-0.004
8/22/2006	15:26:38	398.4	49.25	-0.004
8/22/2006	15:27:02	422.1	49.25	-0.006
8/22/2006	15:27:27	447.2	49.27	-0.004
8/22/2006	15:27:53	473.8	49.27	-0.004
8/22/2006	15:28:21	502	49.27	-0.004
8/22/2006	15:28:51	531.9	49.27	-0.004
8/22/2006	15:29:23	563.5	49.27	-0.004
8/22/2006	15:29:56	597	49.27	-0.004
8/22/2006	15:30:32	632.5	49.27	-0.008
8/22/2006	15:31:10	670.1	49.27	-0.008
8/22/2006	15:31:49	709.9	49.27	-0.006
8/22/2006	15:32:32	752.1	49.27	-0.006
8/22/2006	15:33:16	796.8	49.27	-0.006
8/22/2006	15:34:04	844.2	49.27	-0.006
8/22/2006	15:34:54	894.4	49.27	-0.006
8/22/2006	15:35:47	947.5	49.27	-0.004
8/22/2006	15:36:43	1003.8	49.25	-0.004
8/22/2006	15:37:43	1063.4	49.27	-0.004
8/22/2006	15:38:46	1126.6	49.25	-0.004

8/22/2006	15:39:53	1193.5	49.25	-0.004
8/22/2006	15:41:04	1264.4	49.25	-0.004
8/22/2006	15:42:19	1339.5	49.25	-0.006
8/22/2006	15:43:38	1419	49.25	-0.004
8/22/2006	15:45:03	1503.3	49.25	-0.004
8/22/2006	15:46:32	1592.6	49.25	-0.002
8/22/2006	15:48:07	1687.1	49.25	-0.002
8/22/2006	15:49:47	1787.2	49.25	-0.002
8/22/2006	15:51:33	1893.3	49.27	-0.002
8/22/2006	15:53:25	2005.7	49.25	-0.002
8/22/2006	15:55:24	2124.7	49.25	-0.002
8/22/2006	15:57:30	2250.8	49.25	0
8/22/2006	15:59:44	2384.4	49.25	0.002
8/22/2006	16:02:05	2525.9	49.25	0
8/22/2006	16:04:35	2675.8	49.25	0.01

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/24/2006	13:53:06
Report from file:		...\SN17508 2006-08-22 135001 139BPumpDD.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			17508	
Firmware Version			3.09	
Unit name:				
Test name:				139BPumpDD
Test defined on:			8/22/2006	13:37:14
Test started on:			8/22/2006	13:50:01
Test stopped on:			8/22/2006	15:18:14
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			138	
TOTAL DATA SAMPLES			138	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			23.864	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/22/2006	13:50:01	0	49.56	0
8/22/2006	13:50:02	0.3	49.63	0.03
8/22/2006	13:50:02	0.6	49.63	0.042
8/22/2006	13:50:02	0.9	49.65	-0.145
8/22/2006	13:50:03	1.2	49.65	-0.19
8/22/2006	13:50:03	1.5	49.65	-0.212
8/22/2006	13:50:03	1.8	49.67	-0.246
8/22/2006	13:50:04	2.1	49.67	-0.289
8/22/2006	13:50:04	2.4	49.67	-0.406
8/22/2006	13:50:04	2.7	49.67	-0.485
8/22/2006	13:50:04	3	49.67	-0.567
8/22/2006	13:50:05	3.3	49.67	-0.662
8/22/2006	13:50:05	3.6	49.67	-0.724
8/22/2006	13:50:05	3.9	49.67	-0.895
8/22/2006	13:50:06	4.2	49.67	-0.812
8/22/2006	13:50:06	4.5	49.69	-0.95
8/22/2006	13:50:06	4.8	49.69	-1.026
8/22/2006	13:50:07	5.1	49.69	-1.075
8/22/2006	13:50:07	5.4	49.69	-1.178
8/22/2006	13:50:07	5.7	49.69	-1.271
8/22/2006	13:50:07	6	49.69	-1.258
8/22/2006	13:50:08	6.4	49.69	-1.318
8/22/2006	13:50:08	6.7	49.69	-1.306
8/22/2006	13:50:09	7.1	49.69	-1.275
8/22/2006	13:50:09	7.5	49.69	-1.347
8/22/2006	13:50:09	8	49.69	-1.247
8/22/2006	13:50:10	8.4	49.69	-1.264
8/22/2006	13:50:10	8.9	49.69	-1.24
8/22/2006	13:50:11	9.5	49.69	-1.185
8/22/2006	13:50:11	10	49.67	-1.159
8/22/2006	13:50:12	10.6	49.67	-1.116

8/22/2006	13:50:13	11.3	49.65	-1.05
8/22/2006	13:50:13	11.9	49.65	-1.01
8/22/2006	13:50:14	12.6	49.65	-0.965
8/22/2006	13:50:15	13.4	49.65	-0.994
8/22/2006	13:50:16	14.2	49.65	-0.979
8/22/2006	13:50:16	15	49.65	-0.998
8/22/2006	13:50:17	15.9	49.65	-1.05
8/22/2006	13:50:18	16.8	49.65	-1.077
8/22/2006	13:50:19	17.8	49.65	-1.105
8/22/2006	13:50:20	18.9	49.65	-1.101
8/22/2006	13:50:21	20	49.65	-1.125
8/22/2006	13:50:23	21.2	49.65	-1.138
8/22/2006	13:50:24	22.4	49.65	-1.124
8/22/2006	13:50:25	23.8	49.65	-1.096
8/22/2006	13:50:27	25.2	49.65	-1.122
8/22/2006	13:50:28	26.7	49.65	-1.107
8/22/2006	13:50:30	28.2	49.65	-1.157
8/22/2006	13:50:31	29.8	49.65	-1.119
8/22/2006	13:50:33	31.5	49.65	-1.134
8/22/2006	13:50:35	33.3	49.65	-1.139
8/22/2006	13:50:37	35.2	49.65	-1.138
8/22/2006	13:50:39	37.3	49.65	-1.144
8/22/2006	13:50:41	39.5	49.65	-1.134
8/22/2006	13:50:43	41.8	49.65	-1.151
8/22/2006	13:50:46	44.3	49.63	-1.142
8/22/2006	13:50:48	46.9	49.63	-1.132
8/22/2006	13:50:51	49.7	49.63	-1.154
8/22/2006	13:50:54	52.6	49.63	-1.149
8/22/2006	13:50:57	55.7	49.63	-1.158
8/22/2006	13:51:00	59	49.63	-1.173
8/22/2006	13:51:04	62.5	49.63	-1.163
8/22/2006	13:51:08	66.2	49.63	-1.191
8/22/2006	13:51:11	70.1	49.63	-1.18
8/22/2006	13:51:16	74.3	49.63	-1.191
8/22/2006	13:51:20	78.7	49.63	-1.204
8/22/2006	13:51:25	83.4	49.63	-1.189
8/22/2006	13:51:30	88.4	49.6	-1.373

8/22/2006	13:51:35	93.7	49.6	-1.211
8/22/2006	13:51:41	99.3	49.6	-1.232
8/22/2006	13:51:47	105.2	49.6	-1.226
8/22/2006	13:51:53	111.5	49.6	-1.235
8/22/2006	13:51:59	118.1	49.58	-1.245
8/22/2006	13:52:06	125.1	49.58	-1.269
8/22/2006	13:52:14	132.6	49.58	-1.255
8/22/2006	13:52:22	140.5	49.58	-1.267
8/22/2006	13:52:30	148.9	49.58	-1.264
8/22/2006	13:52:39	157.8	49.58	-1.285
8/22/2006	13:52:49	167.2	49.56	-1.312
8/22/2006	13:52:59	177.2	49.56	-1.309
8/22/2006	13:53:09	187.8	49.56	-1.314
8/22/2006	13:53:20	199	49.56	-1.341
8/22/2006	13:53:32	210.9	49.56	-1.317
8/22/2006	13:53:45	223.5	49.53	-1.343
8/22/2006	13:53:58	236.8	49.53	-1.377
8/22/2006	13:54:12	250.9	49.53	-1.367
8/22/2006	13:54:27	265.8	49.53	-1.387
8/22/2006	13:54:43	281.6	49.51	-1.366
8/22/2006	13:55:00	298.4	49.51	-1.375
8/22/2006	13:55:18	316.2	49.51	-1.396
8/22/2006	13:55:36	335	49.49	-1.371
8/22/2006	13:55:56	354.9	49.49	-1.369
8/22/2006	13:56:17	376	49.49	-1.343
8/22/2006	13:56:40	398.4	49.49	-1.324
8/22/2006	13:57:03	422.1	49.47	-1.302
8/22/2006	13:57:29	447.2	49.47	-1.29
8/22/2006	13:57:55	473.8	49.47	-1.291
8/22/2006	13:58:23	502	49.44	-1.294
8/22/2006	13:58:53	531.9	49.44	-1.267
8/22/2006	13:59:25	563.5	49.44	-1.318
8/22/2006	13:59:58	597	49.42	-1.337
8/22/2006	14:00:34	632.5	49.42	-1.309
8/22/2006	14:01:11	670.1	49.42	-1.351
8/22/2006	14:01:51	709.9	49.42	-1.347
8/22/2006	14:02:33	752.1	49.4	-1.357

8/22/2006	14:03:18	796.8	49.4	-1.338
8/22/2006	14:04:06	844.2	49.4	-1.319
8/22/2006	14:04:56	894.4	49.4	-1.307
8/22/2006	14:05:49	947.5	49.38	-1.243
8/22/2006	14:06:45	1003.8	49.38	-1.246
8/22/2006	14:07:45	1063.4	49.38	-1.248
8/22/2006	14:08:48	1126.6	49.38	-1.222
8/22/2006	14:09:55	1193.5	49.35	-1.217
8/22/2006	14:11:06	1264.4	49.35	-1.227
8/22/2006	14:12:21	1339.5	49.35	-1.22
8/22/2006	14:13:40	1419	49.33	-1.192
8/22/2006	14:15:05	1503.3	49.33	-1.232
8/22/2006	14:16:34	1592.6	49.33	-1.318
8/22/2006	14:18:08	1687.1	49.33	-1.204
8/22/2006	14:19:49	1787.2	49.33	-1.199
8/22/2006	14:21:35	1893.3	49.33	-1.197
8/22/2006	14:23:27	2005.7	49.33	-1.206
8/22/2006	14:25:26	2124.7	49.33	-1.163
8/22/2006	14:27:32	2250.8	49.33	-1.178
8/22/2006	14:29:46	2384.4	49.33	-1.151
8/22/2006	14:32:07	2525.9	49.31	-1.162
8/22/2006	14:34:37	2675.8	49.31	-1.15
8/22/2006	14:37:16	2834.6	49.31	-1.161
8/22/2006	14:40:04	3002.8	49.31	-1.183
8/22/2006	14:43:02	3180.9	49.31	-1.161
8/22/2006	14:46:11	3369.6	49.31	-1.159
8/22/2006	14:49:31	3569.5	49.31	-1.199
8/22/2006	14:53:03	3781.2	49.31	-1.188
8/22/2006	14:56:47	4005.5	49.33	-1.156
8/22/2006	15:00:44	4243.1	49.33	-1.147
8/22/2006	15:04:56	4494.7	49.31	-1.119
8/22/2006	15:09:23	4761.3	49.31	-1.147
8/22/2006	15:14:05	5043.7	49.31	-1.142

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/24/2006	13:57:10
Report from file:		...\SN17508 2006-08-23 113501 108APumpRec.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			17508	
Firmware Version			3.09	
Unit name:				
Test name:				108APumpRec
Test defined on:			8/23/2006	9:28:21
Test started on:			8/23/2006	11:35:01
Test stopped on:		N/A		N/A
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			110	
TOTAL DATA SAMPLES			110	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			8.132	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/23/2006	11:35:01	0	49.69	0
8/23/2006	11:35:01	0.3	49.72	0.012
8/23/2006	11:35:01	0.6	49.74	0.016
8/23/2006	11:35:02	0.9	49.74	0.02
8/23/2006	11:35:02	1.2	49.76	0.021
8/23/2006	11:35:02	1.5	49.76	0.023
8/23/2006	11:35:03	1.8	49.76	0.023
8/23/2006	11:35:03	2.1	49.76	0.023
8/23/2006	11:35:03	2.4	49.79	0.023
8/23/2006	11:35:03	2.7	49.79	0.024
8/23/2006	11:35:04	3	49.79	0.024
8/23/2006	11:35:04	3.3	49.79	0.024
8/23/2006	11:35:04	3.6	49.79	0.024
8/23/2006	11:35:05	3.9	49.79	0.024
8/23/2006	11:35:05	4.2	49.79	0.024
8/23/2006	11:35:05	4.5	49.79	0.024
8/23/2006	11:35:06	4.8	49.79	0.024
8/23/2006	11:35:06	5.1	49.79	0.024
8/23/2006	11:35:06	5.4	49.79	0.024
8/23/2006	11:35:06	5.7	49.79	0.024
8/23/2006	11:35:07	6	49.79	0.024
8/23/2006	11:35:07	6.4	49.79	0.024
8/23/2006	11:35:07	6.7	49.81	0.024
8/23/2006	11:35:08	7.1	49.81	0.026
8/23/2006	11:35:08	7.5	49.81	0.024
8/23/2006	11:35:09	8	49.81	0.024
8/23/2006	11:35:09	8.4	49.81	0.024
8/23/2006	11:35:10	8.9	49.81	0.024
8/23/2006	11:35:10	9.5	49.81	0.024
8/23/2006	11:35:11	10	49.79	0.017
8/23/2006	11:35:11	10.6	49.76	0.016
8/23/2006	11:35:12	11.3	49.76	0.014
8/23/2006	11:35:13	11.9	49.76	0.013
8/23/2006	11:35:13	12.6	49.76	0.013
8/23/2006	11:35:14	13.4	49.76	0.011

8/23/2006	11:35:15	14.2	49.74	0.011
8/23/2006	11:35:16	15	49.74	0.01
8/23/2006	11:35:17	15.9	49.74	0.01
8/23/2006	11:35:18	16.8	49.74	0.01
8/23/2006	11:35:19	17.8	49.74	0.008
8/23/2006	11:35:20	18.9	49.72	0.008
8/23/2006	11:35:21	20	49.72	0.007
8/23/2006	11:35:22	21.2	49.72	0.007
8/23/2006	11:35:23	22.4	49.69	0.007
8/23/2006	11:35:25	23.8	49.69	0.007
8/23/2006	11:35:26	25.2	49.69	0.007
8/23/2006	11:35:27	26.7	49.69	0.007
8/23/2006	11:35:29	28.2	49.67	0.007
8/23/2006	11:35:31	29.8	49.67	0.007
8/23/2006	11:35:32	31.5	49.67	0.007
8/23/2006	11:35:34	33.3	49.67	0.007
8/23/2006	11:35:36	35.2	49.65	0.006
8/23/2006	11:35:38	37.3	49.65	0.009
8/23/2006	11:35:40	39.5	49.65	0.006
8/23/2006	11:35:43	41.8	49.65	0.006
8/23/2006	11:35:45	44.3	49.63	0.008
8/23/2006	11:35:48	46.9	49.63	0.006
8/23/2006	11:35:50	49.7	49.65	0.008
8/23/2006	11:35:53	52.6	49.65	0.006
8/23/2006	11:35:56	55.7	49.65	0.008
8/23/2006	11:36:00	59	49.67	0.009
8/23/2006	11:36:03	62.5	49.69	0.01
8/23/2006	11:36:07	66.2	49.74	0.01
8/23/2006	11:36:11	70.1	49.81	0.012
8/23/2006	11:36:15	74.3	49.88	0.014
8/23/2006	11:36:19	78.7	49.99	0.015
8/23/2006	11:36:24	83.4	50.13	0.013
8/23/2006	11:36:29	88.4	50.29	0.014
8/23/2006	11:36:34	93.7	50.47	0.016
8/23/2006	11:36:40	99.3	50.67	0.017
8/23/2006	11:36:46	105.2	50.85	0.017
8/23/2006	11:36:52	111.5	51.01	0.014
8/23/2006	11:36:59	118.1	51.15	0.012
8/23/2006	11:37:06	125.1	51.26	0.012

8/23/2006	11:37:13	132.6	51.33	0.011
8/23/2006	11:37:21	140.5	51.4	0.009
8/23/2006	11:37:30	148.9	51.47	0.01
8/23/2006	11:37:39	157.8	51.54	0.009
8/23/2006	11:37:48	167.2	51.61	0.007
8/23/2006	11:37:58	177.2	51.67	0.006
8/23/2006	11:38:09	187.8	51.74	0.007
8/23/2006	11:38:20	199	51.81	0.006
8/23/2006	11:38:32	210.9	51.88	0.006
8/23/2006	11:38:44	223.5	51.95	0.007
8/23/2006	11:38:58	236.8	52.02	0.005
8/23/2006	11:39:12	250.9	52.06	0.005
8/23/2006	11:39:27	265.8	52.11	0.005
8/23/2006	11:39:42	281.6	52.15	0.005
8/23/2006	11:39:59	298.4	52.2	0.004
8/23/2006	11:40:17	316.2	52.24	0.003
8/23/2006	11:40:36	335	52.27	0.004
8/23/2006	11:40:56	354.9	52.29	0.004
8/23/2006	11:41:17	376	52.31	0.004
8/23/2006	11:41:39	398.4	52.33	0.003
8/23/2006	11:42:03	422.1	52.36	0.001
8/23/2006	11:42:28	447.2	52.38	0.002
8/23/2006	11:42:55	473.8	52.38	0.002
8/23/2006	11:43:23	502	52.38	0.002
8/23/2006	11:43:53	531.9	52.38	0.002
8/23/2006	11:44:24	563.5	52.33	0.001
8/23/2006	11:44:58	597	52.31	0.002
8/23/2006	11:45:33	632.5	52.27	0.003
8/23/2006	11:46:11	670.1	52.2	0.002
8/23/2006	11:46:51	709.9	52.13	0.002
8/23/2006	11:47:33	752.1	51.99	0.002
8/23/2006	11:48:18	796.8	51.86	0.001
8/23/2006	11:49:05	844.2	51.7	0.001
8/23/2006	11:49:55	894.4	51.7	0.004
8/23/2006	11:50:48	947.5	51.7	0.004
8/23/2006	11:51:45	1003.8	51.58	0.004

In-Situ Inc.		MiniTroll Pro		
Report generated:			8/24/2006	13:55:19
Report from file:		...\SN17508 2006-08-23 095502 108APumpDD.bin		
Win-Situ® Version		4.56.5.0		
Serial number:			17508	
Firmware Version			3.09	
Unit name:				
Test name:				108APumpDD
Test defined on:			8/23/2006	9:42:44
Test started on:			8/23/2006	9:55:02
Test stopped on:			8/23/2006	11:33:43
Data gathered using Logarithmic testing				
Maximum time between data points:	2400.0	Seconds.		
Number of data samples:			140	
TOTAL DATA SAMPLES			140	
Channel number [1]				
Measurement type:		Temperature		
Channel name:				
Channel number [2]				
Measurement type:		Pressure		
Channel name:				
Sensor Range:		30 PSIG.		
Sensor Offset:		0.000 psi		
Specific gravity:			1	
Mode:		Surface		
User-defined reference:			0	Feet H2O
Referenced on:		test start		
Pressure head at reference:			8.148	Feet H2O

Date	Time	ET (sec)	Chan[1] Temperature Fahrenheit	Chan[2] Pressure Feet H2O
8/23/2006	9:55:02	0	49.94	0
8/23/2006	9:55:02	0.3	49.99	0.008
8/23/2006	9:55:02	0.6	49.99	0.01
8/23/2006	9:55:03	0.9	50.01	0.011
8/23/2006	9:55:03	1.2	50.01	0.011
8/23/2006	9:55:03	1.5	50.04	0.01
8/23/2006	9:55:04	1.8	50.04	0.01
8/23/2006	9:55:04	2.1	50.04	0.009
8/23/2006	9:55:04	2.4	50.04	0.009
8/23/2006	9:55:05	2.7	50.04	0.007
8/23/2006	9:55:05	3	50.06	0.007
8/23/2006	9:55:05	3.3	50.06	0.007
8/23/2006	9:55:05	3.6	50.06	0.007
8/23/2006	9:55:06	3.9	50.06	0.007
8/23/2006	9:55:06	4.2	50.06	0.008
8/23/2006	9:55:06	4.5	50.06	0.007
8/23/2006	9:55:07	4.8	50.06	0.008
8/23/2006	9:55:07	5.1	50.06	0.01
8/23/2006	9:55:07	5.4	50.06	0.008
8/23/2006	9:55:08	5.7	50.06	0.01
8/23/2006	9:55:08	6	50.06	0.008
8/23/2006	9:55:08	6.4	50.06	0.01
8/23/2006	9:55:09	6.7	50.06	0.01
8/23/2006	9:55:09	7.1	50.06	0.01
8/23/2006	9:55:09	7.5	50.06	0.01
8/23/2006	9:55:10	8	50.06	0.008
8/23/2006	9:55:10	8.4	50.06	0.01
8/23/2006	9:55:11	8.9	50.08	0.01
8/23/2006	9:55:11	9.5	50.08	0.01
8/23/2006	9:55:12	10	50.06	0.001
8/23/2006	9:55:12	10.6	50.04	-0.002

8/23/2006	9:55:13	11.3	50.04	-0.002
8/23/2006	9:55:14	11.9	50.04	-0.002
8/23/2006	9:55:14	12.6	50.04	-0.003
8/23/2006	9:55:15	13.4	50.04	-0.003
8/23/2006	9:55:16	14.2	50.04	-0.005
8/23/2006	9:55:17	15	50.04	-0.005
8/23/2006	9:55:18	15.9	50.01	-0.006
8/23/2006	9:55:19	16.8	50.01	-0.006
8/23/2006	9:55:20	17.8	50.01	-0.006
8/23/2006	9:55:21	18.9	50.01	-0.008
8/23/2006	9:55:22	20	50.01	-0.008
8/23/2006	9:55:23	21.2	50.01	-0.01
8/23/2006	9:55:24	22.4	50.01	-0.01
8/23/2006	9:55:26	23.8	50.01	-0.01
8/23/2006	9:55:27	25.2	50.01	-0.012
8/23/2006	9:55:29	26.7	50.01	-0.012
8/23/2006	9:55:30	28.2	50.01	-0.012
8/23/2006	9:55:32	29.8	50.01	-0.012
8/23/2006	9:55:33	31.5	50.01	-0.012
8/23/2006	9:55:35	33.3	49.99	-0.011
8/23/2006	9:55:37	35.2	49.99	-0.013
8/23/2006	9:55:39	37.3	49.99	-0.013
8/23/2006	9:55:41	39.5	49.99	-0.013
8/23/2006	9:55:44	41.8	49.99	-0.013
8/23/2006	9:55:46	44.3	49.99	-0.013
8/23/2006	9:55:49	46.9	49.97	-0.014
8/23/2006	9:55:52	49.7	49.97	-0.013
8/23/2006	9:55:54	52.6	49.97	-0.014
8/23/2006	9:55:58	55.7	49.97	-0.014
8/23/2006	9:56:01	59	49.94	-0.014
8/23/2006	9:56:04	62.5	49.94	-0.014
8/23/2006	9:56:08	66.2	49.94	-0.014
8/23/2006	9:56:12	70.1	49.94	-0.016
8/23/2006	9:56:16	74.3	49.92	-0.013
8/23/2006	9:56:21	78.7	49.92	-0.013
8/23/2006	9:56:25	83.4	49.92	-0.015
8/23/2006	9:56:30	88.4	49.9	-0.015

8/23/2006	9:56:36	93.7	49.9	-0.015
8/23/2006	9:56:41	99.3	49.88	-0.014
8/23/2006	9:56:47	105.2	49.88	-0.014
8/23/2006	9:56:53	111.5	49.88	-0.018
8/23/2006	9:57:00	118.1	49.85	-0.016
8/23/2006	9:57:07	125.1	49.85	-0.017
8/23/2006	9:57:14	132.6	49.83	-0.015
8/23/2006	9:57:22	140.5	49.83	-0.015
8/23/2006	9:57:31	148.9	49.83	-0.017
8/23/2006	9:57:40	157.8	49.81	-0.017
8/23/2006	9:57:49	167.2	49.81	-0.015
8/23/2006	9:57:59	177.2	49.81	-0.017
8/23/2006	9:58:10	187.8	49.79	-0.016
8/23/2006	9:58:21	199	49.79	-0.016
8/23/2006	9:58:33	210.9	49.79	-0.016
8/23/2006	9:58:45	223.5	49.79	-0.016
8/23/2006	9:58:59	236.8	49.76	-0.016
8/23/2006	9:59:13	250.9	49.76	-0.016
8/23/2006	9:59:28	265.8	49.76	-0.016
8/23/2006	9:59:43	281.6	49.76	-0.017
8/23/2006	10:00:00	298.4	49.76	-0.016
8/23/2006	10:00:18	316.2	49.76	-0.016
8/23/2006	10:00:37	335	49.74	-0.017
8/23/2006	10:00:57	354.9	49.74	-0.017
8/23/2006	10:01:18	376	49.74	-0.017
8/23/2006	10:01:40	398.4	49.74	-0.017
8/23/2006	10:02:04	422.1	49.74	-0.017
8/23/2006	10:02:29	447.2	49.74	-0.017
8/23/2006	10:02:56	473.8	49.74	-0.017
8/23/2006	10:03:24	502	49.74	-0.019
8/23/2006	10:03:54	531.9	49.74	-0.017
8/23/2006	10:04:25	563.5	49.74	-0.019
8/23/2006	10:04:59	597	49.74	-0.019
8/23/2006	10:05:34	632.5	49.74	-0.017
8/23/2006	10:06:12	670.1	49.74	-0.019
8/23/2006	10:06:52	709.9	49.72	-0.018
8/23/2006	10:07:34	752.1	49.74	-0.021

8/23/2006	10:08:19	796.8	49.72	-0.018
8/23/2006	10:09:06	844.2	49.74	-0.019
8/23/2006	10:09:56	894.4	49.72	-0.02
8/23/2006	10:10:49	947.5	49.72	-0.018
8/23/2006	10:11:46	1003.8	49.72	-0.02
8/23/2006	10:12:45	1063.4	49.72	-0.02
8/23/2006	10:13:48	1126.6	49.72	-0.02
8/23/2006	10:14:55	1193.5	49.72	-0.02
8/23/2006	10:16:06	1264.4	49.72	-0.02
8/23/2006	10:17:21	1339.5	49.72	-0.02
8/23/2006	10:18:41	1419	49.72	-0.022
8/23/2006	10:20:05	1503.3	49.72	-0.022
8/23/2006	10:21:34	1592.6	49.72	-0.022
8/23/2006	10:23:09	1687.1	49.72	-0.022
8/23/2006	10:24:49	1787.2	49.72	-0.022
8/23/2006	10:26:35	1893.3	49.69	-0.023
8/23/2006	10:28:28	2005.7	49.69	-0.021
8/23/2006	10:30:27	2124.7	49.69	-0.021
8/23/2006	10:32:33	2250.8	49.69	-0.023
8/23/2006	10:34:46	2384.4	49.69	-0.023
8/23/2006	10:37:08	2525.9	49.69	-0.023
8/23/2006	10:39:38	2675.8	49.69	-0.023
8/23/2006	10:42:16	2834.6	49.69	-0.023
8/23/2006	10:45:05	3002.8	49.69	-0.025
8/23/2006	10:48:03	3180.9	49.69	-0.025
8/23/2006	10:51:11	3369.6	49.67	-0.025
8/23/2006	10:54:31	3569.5	49.69	-0.025
8/23/2006	10:58:03	3781.2	49.69	-0.027
8/23/2006	11:01:47	4005.5	49.69	-0.027
8/23/2006	11:05:45	4243.1	49.67	-0.026
8/23/2006	11:09:57	4494.7	49.67	-0.026
8/23/2006	11:14:23	4761.3	49.67	-0.026
8/23/2006	11:19:06	5043.7	49.69	-0.027
8/23/2006	11:24:05	5342.8	49.69	-0.028
8/23/2006	11:29:21	5659.6	49.67	-0.028