Montana Department of
ENVIRONMENTAL QUALITY

FINAL DETERMINATION FOR REMEDY SELECTION

Introduction
The Department of Environmental Quality (DEQ) has made a final determination on remedy selection for the CHS Laurel Refinery. DEQ has selected the proposed remedy described in the Statement of Basis, dated July 9, 2014.

Public Participation Activities
The public was provided 45 days to review and comment on DEQ's proposed remedy selection as described in the Statement of Basis. The comment period extended from July 14 to August 27, 2014. No comments on the Statement of Basis were submitted to DEQ.

Selected Remedy
DEQ has determined that the remedy proposed in the Statement of Basis will meet cleanup objectives at the CHS Laurel Refinery. DEQ's decision is based on review of the Corrective Measures Study, extensive knowledge of the contamination present in environmental media and the remedial activities that have been conducted to date at the facility, and public input. The selected remedy combines remediation of contaminated soil and groundwater, institutional controls, and deferral of remedial action for areas of contamination currently inaccessible due to refinery infrastructure and operations. Remedies for contaminated soil are excavation combined with ex-situ treatment or disposal, and engineered controls. Remedies for contaminated groundwater include air sparging, oil skimming, groundwater recovery and treatment, and monitored natural attenuation. Implementation of land use controls and business safety practices are expected to prevent potential exposures of contaminants to current and future on-and off-site workers, and to current and future off-site residents.

The selected remedy is expected to provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through contaminant source reduction, engineering controls, and institutional controls. The selected remedy is expected to be reliable and effective over the long-term by reducing hazards posed by volatile and semi-volatile organic compounds and metals in contaminated soils and groundwater.

The administrative mechanism for implementation of the remedy will be the CHS Laurel Refinery hazardous waste permit and subsequent renewals, or other enforceable mechanisms which require implementation of facility-wide corrective action under the Montana Hazardous Waste Act.

Montana Department of
ENVIRONMENTAL QUALITY

STATEMENT OF BASIS

PROPOSED REMEDY SELECTION for SOIL AND GROUNDWATER

CHS Laurel Refinery
803 Highway 212 S.
Laurel, Montana 59044-0909
EPA ID Number MTD006238083

July 9, 2014

Public Comment Period: July 14 to August 27, 2014 (45 days)

Send Comments To:

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Contents

EXECUTIVE SUMMARY

The Montana Department of Environmental Quality (DEQ) has prepared this Statement of Basis to describe DEQ's recommended remedies for groundwater and soil contamination at the CHS Inc. (CHS) Laurel Refinery in Laurel, Montana. The Laurel Refinery is located at 803 Highway 212 S., Laurel, Montana (Figure 1). This Statement of Basis discusses the corrective actions which have been conducted to date, media-specific cleanup objectives, corrective measures alternatives evaluated, and the final corrective measures DEQ is proposing to ensure human health and the environment are protected at the Laurel Refinery.

The purpose of the corrective action process at the Laurel Refinery is to investigate releases or potential releases of hazardous waste or constituents to environmental media and assess potential risk of exposure to those hazardous constituents. Appropriate corrective action measures are then developed and implemented based on information gathered from the investigation and from the assessment of risk.

The Laurel Refinery has been in operation since the 1930's. The facility currently produces approximately 59,600 barrels per day of refined petroleum hydrocarbon products. A Montana hazardous waste permit has been issued to the facility for closure and post-closure of two land treatment units, and for facility-wide investigation and remediation of contaminated environmental media. Requirements of the permit, along with other relevant regulations and guidance, provided the basis for corrective action activities at the facility.

Releases of hazardous waste and hazardous constituents to environmental media have been found at the facility. Results of the remedial investigations indicate that volatile organic compounds, polycyclic aromatic hydrocarbons, and metals are the main constituents of concern. A human health and ecological risk assessment was conducted by CHS to evaluate potential health risks to humans or other ecological receptors if they were to be exposed to these constituents in soil, sediment, surface water, and/or groundwater. CHS then conducted a corrective measures study to evaluate corrective measure alternatives for cleanup of the releases. CHS submitted phased RCRA Facility Investigation Reports in 1997 and 2006; human health and ecological risk assessments in 2006, and a Corrective Measures Study Report in 2010.

CHS has implemented interim corrective measures to address contaminated groundwater within the refinery to prevent off-site migration. The interim measures include oil skimming, groundwater recovery and treatment, air sparging, chemical oxidation, and monitored natural attenuation.

DEQ is recommending a combination of corrective measures for the Laurel Refinery which includes remediation of contaminated soil and groundwater, institutional controls, and deferral of remedial action for areas of contamination currently inaccessible due to refinery infrastructure and operations. Excavation combined with ex-situ treatment or disposal, and engineered controls are proposed remedies for contaminated soil. Proposed remedies for contaminated groundwater include air sparging, oil skimming, groundwater recovery and treatment, and monitored natural attenuation. Implementation of land use controls and business safety practices are proposed to prevent potential exposures of contaminants to current and future on-and off-site workers, and to

current and future off-site residents.

DEQ is soliciting comment on the recommended corrective measures. The public comment period extends from July 14 to August 27, 2014. Instructions for submitting comments are in Section 9.

The Statement of Basis summarizes information that can be found in greater detail in reports developed for the Phase I and Phase II RCRA Facility Investigation, human health and ecological risk assessments, and the Corrective Measure Study. These reports are part of DEQ's public records. DEQ encourages the public to review these documents in order to gain a more comprehensive understanding of the Laurel Refinery and the corrective action activities that have been conducted there. These reports are available for review during the public comment period at the location provided in Section 9.

DEQ is issuing this Statement of Basis as a part of its public participation obligations under the Montana Hazardous Waste Act (MHWA) and the Laurel Refinery permit, MTHWP-02-02.

1.0 FACILITY AND REGULATORY BACKGROUND

Facility Description

The CHS Laurel Refinery is located at 803 Highway 212 S., Laurel, Montana (Figures 1). Refinery operations are conducted on approximately100 of 350 acres owned by CHS, all of which are currently zoned for heavy industrial use (Figure 2). The remaining acreage consists of administrative offices and green space. Adjacent property is residential, light industrial, and agricultural. The Yellowstone River borders a majority of the southern portion of the refinery property.

The refinery has been in operation since the 1930s. The original owner, Independent Refining Company, operated the refinery until Farmers Union Central Exchange, Inc. (CENEX, Inc.) purchased it in the 1940s. In 1998, CENEX Inc. merged with Harvest States Grain to form Cenex Harvest States Cooperatives and subsequently changed its name to CHS Inc.

Petroleum production has varied throughout the history of the Laurel Refinery. Currently, the refinery produces approximately 59,600 barrels per day of refined petroleum hydrocarbon products, including propane, gasoline, burner fuel, diesel fuel, asphalt, propane de-asphalted pitch, and road oil.

Regulatory Background

The Resource Conservation and Recovery Act (RCRA) is a federal law which governs proper management and disposal of hazardous waste, including requirements for issuance of permits to facilities for specific on-site treatment, storage, or disposal of hazardous waste. In addition to waste management, RCRA requires cleanup of hazardous waste and hazardous constituents in environmental media at permitted hazardous waste facilities. Any off-site contamination originating from the facility must also be addressed.

The Montana Hazardous Waste Act (MHWA) is the Montana equivalent of RCRA. DEQ is the

implementing state agency for MHWA.

A hazardous waste permit was initially issued to CHS for the Laurel Refinery in 1991, and reissued in 2002. The permit includes requirements for implementing facility-wide investigation and cleanup, and for closure and post-closure maintenance of two inactive land treatment units, named the New Landfarm and the Old Landfarm. CHS closed the New Landfarm in 2006 to cleanup standards which do not require post-closure care. The Old Landfarm was designated by DEQ as a Corrective Action Management Unit (CAMU) in the 2002 permit. The designation allows CHS use the CAMU to land treat remediation wastes that are generated during site-wide cleanup.

Hazardous waste permits are effective for ten years and may be reissued at the end of that time period. Concurrent with the remedy selection described in this Statement of Basis, DEQ is reissuing the Laurel Refinery hazardous waste permit. Final remedies selected by DEQ will be included in the reissued permit.

Site Geology and Hydrology

The refinery is underlain by alluvial terrace deposits from the Yellowstone River, which in turn are underlain by impermeable Colorado Shale bedrock. The upper surface of the bedrock is highly irregular and is present locally at approximately 14 to 21 feet below ground surface. An unconfined aquifer in the alluvial deposits above the bedrock flows generally southeast towards the Yellowstone River. Groundwater usage in the area is limited to residential wells upgradient and cross-gradient to the refinery.

2.0 SUMMARY OF SITE INVESTIGATION

In the facility-wide corrective action process, the owner/operator of a hazardous waste permitted facility must identify and characterize the nature and extent of all contamination present on-site and any contamination off-site that originated from the facility/ They also must evaluate potential risks of that contamination to human and ecological receptors. If characterization and assessment of risk indicate cleanup is necessary, remediation technologies and engineering and/or institutional controls are evaluated to determine the best approach to cleaning up the facility. A final cleanup remedy is chosen by DEQ and is then implemented by the permitted facility owner/operator.

Corrective action was initiated in 1989 at the Laurel Refinery when EPA conducted a facility assessment to identify areas of actual and potential releases. Thirty-eight areas, shown in Figure 5, were identified during that assessment. The areas are divided into solid waste management units (SWMUs) and areas of concern (AOCs). A SWMU is any unit used at any time to manage solid or hazardous waste, regardless of whether the unit was intended for that purpose. An AOC is any area where a release of a hazardous waste or hazardous constituent has occurred or potentially occurred. Contaminants in groundwater were also identified within the refinery and at the refinery boundaries.

In response to the potential for off-site migration of contaminated groundwater, CHS implemented several interim measures to prevent off-site migration of dissolved-phase

hydrocarbons in groundwater and to reduce the volume of light non-aqueous phase liquid (LNAPL) within the refinery proper. These interim measures were initiated in 1991 and have continued to present day. They include oil skimming and groundwater recovery, air sparging, and chemical oxidation. Monitored natural attenuation is also used to ensure dissolved-phase hydrocarbons in the groundwater are degrading.

CHS conducted two phases of field investigations between 1996 and 2004 to characterize soil, groundwater, and surface water conditions. Results of the field investigations are included in the following reports:

- Phase I Soil and Waste Investigation Report (ERM, 1997a), and
- Summary of Phase II RCRA Facility Investigation Results, Section 2 of the Baseline Risk Assessment Report (ERM, 2006)

These investigations included extensive sampling and analysis of soil, sediment, surface water, and groundwater. A system of groundwater monitoring wells was installed to support a groundwater monitoring program for both the field investigations and the interim measures. Results of groundwater monitoring for the interim measures were also used in the field investigations.

3.0 NATURE AND EXTENT OF CONTAMINATION

A brief summary of contamination found at the facility is presented below. Table 1 lists preliminary Constituents of Concern (COCs) identified during the field investigations that might be of concern to human and ecological receptors.

Soil and Sediment

Surface and subsurface soil samples were collected from each SWMU and AOC and analyzed to identify contaminants, concentration levels of contaminants, and the lateral and vertical extent of contamination. Concentrations of COCs were found above screening levels in both surface and subsurface soils. Sediment samples were collected in irrigation ditches located within and along the perimeter of the refinery, and along the Yellowstone River. Sediment samples with concentrations of nickel above ecological target levels were identified in one irrigation ditch. Contaminant levels in sediments along the Yellowstone River were below analytical detection limits.

Groundwater

COCs have been detected in groundwater at the site at concentrations above Montana water quality standards as presented in DEQ Circular-7 (DEQ, 2012). Data collected since 1991 indicates two phases of groundwater contamination are present: a dissolved phase plume and a light non-aqueous phase liquid (LNAPL) plume.

Five separate dissolved phase plumes are present at the refinery. COCs in the dissolved phase plumes include volatile organic compounds (benzene, toluene, ethylbenzene, and xylenes) and vinyl chloride. Concentrations vary within each dissolved phase plume and, due to interim corrective measures, have decreased over time. The dissolved-phase plume is shown in Figure 3.

The main LNAPL plume is restricted to the interior of the refinery. A smaller LNAPL plume is located beneath the inactive land treatment unit. Thickness of LNAPL ranges from 0.01 to 3.65 feet in the refinery interior. Thickness of LNAPL in the land treatment unit area ranges from a sheen to 0.01 feet. LNAPL thickness in each plume has decreased over time due to corrective measures taken by CHS. The refinery LNAPL plume is shown in Figure 4.

Surface Water
Surface water was sampled in the on-site portions of the Laurel Drain and the Italian Drain. Analytical results from the Italian Drain samples indicated selenium concentrations were above ecological target levels.

4.0 SUMMARY OF CONTAMINANT RISK

Risk assessments are used to characterize current and future potential risks to human and ecological receptors from exposure to chemical contaminants present in the environment. Results of the risk assessment contribute to the overall characterization of a contaminated site and assist in the development of appropriate cleanup actions. Risk is evaluated based on consideration of current and reasonably expected future uses of the facility and maximum beneficial use of groundwater.

CHS conducted risk assessments for both human health and ecological receptors. Results of the risk assessments are documented in the *Baseline Risk Assessment Report, CHS Inc., Laurel, Montana Refinery* (ERM, 2006).

Human Health Risk Assessment
CHS utilized an exposure area concept to evaluate potential risk to people from exposure to COCs in affected soil. Exposure areas were primarily determined by proximity of SWMUs and AOCs in the same geographical location, and the potential for people to reasonably spend time in or near those SWMUs and AOCs. Evaluation of groundwater was separated into on- and off-site exposure. CHS used a cumulative Hazard Index of 1.0 as a target level for non-carcinogenic COCs. Cumulative risk for carcinogenic COCs was evaluated using a target level of 1×10^{-5}.[1]

[1] Non-carcinogenic risk is characterized as being acceptable (no health hazard) or not acceptable (potential for a health hazard). Non-cancer effects are evaluated by comparing the estimated amount of exposure to a constituent of concern (dose) with a reference dose. This comparison is called the Hazard Quotient. Hazard quotients for all constituents of concern and exposure pathways are summed together to determine the Hazard Index. A hazard index of less than one indicates no potential for a health hazard. A hazard index greater than one indicates there is potential for a health hazard. The potential for hazard based on the summation of the hazard quotients for all COCs is conservative with the assumption that all COCs affect the same target organ.

Carcinogenic risks are defined as the incremental probability of an individual to develop cancer over a lifetime, as a result of exposure to the potential carcinogen. The carcinogenic risk determined in the risk assessment is a cancer caused by exposure to the impacted environmental media and would be above and beyond any general cancer risk in the population. EPA guidance suggested range for individual excess lifetime cancer risk is 1 in 1,000,000 (1 in one million or 1×10^{-6} to 1 in 100,000 (1 in one hundred thousand or 1×10^{-4}). DEQ uses a range of 1×10^{-6} to 1×10^{-5} for lifetime cancer risk.

Receptors: Based on current and future use of the facility and surrounding areas, the following receptors were chosen for evaluation of potential risk:

- Current and future on-site industrial workers,
- Current and future on-site construction workers,
- Current and future on-site trespassers,
- Current and future off-site residents, and
- Current and future off-site recreationalists.

Exposure Pathways: An exposure pathway refers to the way in which a person may come into contact with a contaminant. The following exposure pathways were used in the risk assessment:

- Direct contact to surface and sub-surface soil, sediment, surface water and groundwater,
- Inhalation of volatile emissions from subsurface soil and shallow groundwater,
- Vapor intrusion from contaminated soil into building indoor air,
- Surface runoff to surface water and sediment,
- Leaching of constituents from soil into groundwater, and
- Groundwater discharge to surface water and sediment.

Constituents of Concern: COCs, listed as *Preliminary Constituents of Concern* in the first column of Table 1, were evaluated in the human health and ecological risk assessments. Through the risk evaluation, a list of COCs which exceeded target carcinogenic and non-carcinogenic risk levels was developed. These final COCs, listed in Table 1, will be used as the basis for cleanup.

<u>Conclusions of the Human Health Risk Assessment</u>
Surface Soil (0 – 2 feet below ground surface): For on-site industrial workers, construction workers, and trespassers, COC concentration levels in multiple exposure areas exceed a cumulate cancer risk of 1×10^{-5}. Non-cancer risks do not exceed a Hazard Index of 1.0.

Subsurface Soil (2 – 5 feet below ground surface): For construction workers, COC concentration levels in subsurface soil did not exceed the target levels for cumulative cancer risk (1×10^{-5}) or a Hazard Index of 1.0.

Soil Leaching Potential: Concentrations of multiple COCs in soil at the Laurel Refinery are greater than soil screening levels for protection of groundwater; suggesting that COCs in soil could leach to groundwater in concentrations that would pose a risk to human health. However, an evaluation of groundwater data indicated there is no correlation between the COC concentrations found in soil to concentrations found in groundwater. CHS included data and an evaluation of the potential for the soil-to-groundwater leaching pathway in the Laurel Refinery Corrective Measures Study (ERM, 2010).

Indoor Air: The potential for indoor worker exposures to vapor intrusion into buildings was evaluated based on comparison of personnel air monitoring data with OSHA permissible exposure limits (PELs) and hypothetical risk evaluations using the Johnson and Ettinger Model. The modeling results indicate inhalation of indoor vapors may pose a potential risk to human

health in office buildings located near areas where maximum concentrations of sufficiently volatile and toxic COCs were reported. However, CHS collected personnel air measurement data and determined that COCs were below OSHA PELs. Therefore, unacceptable risk from actual exposure is not apparent at the facility.

Groundwater: The human health risk evaluation suggests COCs are present above cumulative cancer risk and non-cancer hazard quotient target levels for direct contact exposures (ingestion, dermal, and inhalation) for future potable groundwater use on-and off-site. Exposure scenarios evaluated for groundwater to ambient air and vapor intrusion into buildings indicate risks are less than target levels.

Sediment: The human health risk evaluation indicated risks are not expected for potential exposures to sediment in on-site ditches and ponds or off-site in the Yellowstone River.

Surface Water: The human health risk evaluation indicated risks are not expected for potential exposures to surface water in on-site ditches and ponds or off-site in the Yellowstone River.

Ecological Risk Assessment

An ecological risk assessment is a qualitative and/or quantitative appraisal of actual or potential impacts of contaminants on plants and wildlife. CHS conducted a Preliminary Ecological Risk Assessment (PERA) in 1997 (ERM, 1997b). The data and information collected in the PERA was used to conduct a Screening Level Ecological Risk Assessment (SLERA). A screening level approach was determined to be an adequate and conservative evaluation to determine risk to ecological receptors at the refinery.

Areas of the refinery were grouped into three ecological zones, based on existing refinery infrastructure and operations. Zone 2 encompasses the refinery production area and does not provide suitable habitat for ecological receptors due to the presence of pavement and process equipment. Zones 1 and 3 are located west and east of Zone 2, respectively, and were identified by CHS as areas of potential ecological concern.

<u>Conclusions of the Ecological Risk Assessment</u>

Surface Soil (0 – 0.5 feet below ground surface): The ecological risk evaluation indicated that the highest potential risk is to omnivorous birds on the western and eastern portions of the refinery. Risk evaluation results indicated no potential risk to terrestrial plants and soil invertebrates.

Subsurface Soil (0.5 – 5 feet below ground surface): Risk evaluation results indicated that subsurface soil is not a significant exposure route for ecological receptors. Therefore, soil was not evaluated in the ecological risk assessment.

Groundwater: As with subsurface soil, risk evaluation results indicated groundwater is not a significant exposure route for ecological receptors and, therefore, groundwater was not evaluated in the ecological risk assessment.

Surface Water: Risk evaluation results indicated selenium concentrations in surface water from the Italian Drain in Zone 3 exceed the chronic surface water standards (Circular DEQ-7) for aquatic life. The risk evaluation indicated surface water poses no risk to birds or mammals.

Sediment: Nickel concentrations exceeded sediment community level benchmarks for community-level receptors (benthic invertebrates) in the Gravel Pit Pond in Zone 1. The gravel pit has been filled with clean material as a part of refinery construction activities, removing the sediment exposure pathway. Arsenic concentrations exceed benchmarks in Zone 3; however, concentrations are below DEQ's published generic background level (DEQ, 2012). The risk evaluation also indicated sediment posed no risk to birds or mammals. Therefore, no corrective measures will be required for sediment in Zones 1 and 3.

5.0 CLEANUP LEVELS

Based on results of the human health and ecological risk assessments, concentrations of COCs in surface soil in multiple SWMUs and AOCs, groundwater, and surface water in the Italian Drain are above risk-based target levels. The COCs which exceed cleanup levels for human and ecological receptors are listed in Table 1. Remediation of these areas will be required to reduce COC concentrations to the cleanup levels described below.

Surface Soil
Cleanup levels were developed for surface soil – 0 to 2 feet below ground surface for human health protection and 0 to 0.5 feet below ground surface for ecological receptors. If both human health and ecological receptors are at risk for a given COC, then the more conservative cleanup level will be used.

Human Health
Cleanup levels for protection of human health will be based on an industrial worker scenario and a cancer exposure pathway. To ensure a cumulative cancer risk of 1×10^{-5} is not exceeded, target cleanup goals for individual carcinogenic constituents will be based on an acceptable cancer risk of 1×10^{-6} for organic constituents and background concentrations for inorganic compounds.

The most current industrial risk-based values published in *EPA Regional Screening Levels for Superfund* will be used as cleanup target levels for organic compounds. Cleanup target levels for inorganic compounds will be background concentrations as determined by field investigation activities, or as published in *Background Concentrations of Inorganic Constituents in Montana Surface Soils* (DEQ, September 2013).

Non-carcinogenic constituents will not be included in the cleanup goals because risk for non-carcinogenic COCs is below the risk limit of a Hazard Quotient or Hazard Index of 1.0.

Ecological
CHS calculated Protective Concentration Levels (PCLs) for surface soil (ERM, 2010). The PCLs will be used as cleanup levels for ecological receptors.

Protection of Groundwater (Soil Leaching Potential)
As noted above, COC concentrations in soil are greater than soil screening levels for protection of groundwater; suggesting it is possible that COCs in soil could leach to groundwater. However, current groundwater data indicates there is not a correlation between COC concentrations in soil and in groundwater. As part of the proposed remedy, evaluation of groundwater sampling and analytical results will be used to monitor whether COCs in soil are leaching to groundwater.

Groundwater
Cleanup levels for groundwater will be the most current water quality standards found in Circular DEQ-7, Montana Numeric Water Quality Standards. If Montana water quality standards do not exist for specific COCs, the most current value in the following hierarchy will be used: Safe Drinking Water Act Maximum Contaminant Levels (MCLs); EPA Regional Screening Levels (RSLs) for Tap Water; and site-specific risk-based concentrations.

Sediment
As noted in the conclusions for the human health and ecological risk assessments, no corrective measures are required for sediment.

Surface Water (Italian Drain)
Contamination in surface water is limited to the Italian Drain. The driver for cleanup is ecological risk; therefore, cleanup levels will be the surface water standard from Circular DEQ-7 chronic aquatic life standard.

6.0 CORRECTIVE ACTION OBJECTIVES

Corrective action objectives form the basis for evaluating potential remedial technologies and actions. They are based on an evaluation of information presented in the Phases I and II RCRA Field Investigation Reports, human health and ecological risk assessments, the Corrective Measures Study, as well as the cleanup levels described in Section 5.0.

Objectives for Surface Soil
Human Receptors

- Prevent unacceptable exposures to human receptors from contaminated surface soil.
  - Prevent direct contact, ingestion, and inhalation of surface soil COCs, using industrial risk-based target levels.
- Prevent residential use of the facility property in areas where the excess lifetime risk from exposure to a carcinogenic constituent exceeds 1×10^{-5} or the Hazard Quotient/ Hazard Index exceeds 1.0.

Ecological Receptors

- Prevent unacceptable exposures to ecological receptors from contaminated soil.

Groundwater Protection

- Prevent leaching of contaminants in soil to groundwater at concentrations which would cause exceedances of Circular DEQ-7, Montana Numeric Water Quality Standards (DEQ, 2012); or if Montana water quality standards do not exist for specific COCs, the following hierarchy: Safe Drinking Water Act Maximum Contaminant Levels (MCLs); EPA Regional Screening Levels (RSLs) for Tap Water (EPA, 2013); and site-specific risk-based concentrations.

Objectives for Groundwater

- Reduce the amount of LNAPL in the aquifer to the extent practicable using available technologies;
- Prevent unacceptable exposures to human health and the environment from both LNAPL and dissolved-phase contaminants in groundwater.
  - Prevent direct contact with groundwater; and
  - Prevent direct contact, ingestion, and inhalation of groundwater COCs.

- Reduce groundwater contamination to levels that meet Circular DEQ-7, Montana Numeric Water Quality Standards (DEQ, 2012); or if Montana water quality standards do not exist for specific COCs, the following hierarchy: Safe Drinking Water Act Maximum Contaminant Levels (MCLs); EPA Regional Screening Levels (RSLs) for Tap Water (EPA, 2013); and site-specific risk-based concentrations.

Objectives for Surface Water

Ecological Receptors

- Prevent unacceptable exposures to ecological receptors from contaminated surface water.

7.0 SUMMARY OF CLEANUP OPTIONS

CHS evaluated multiple cleanup options for soil and groundwater in a Corrective Measures Study (CMS). CHS then recommended a combination of options they believed would meet the stated objectives for site-wide cleanup. The evaluation and recommended corrective measures were included in a CMS report (ERM, 2010). The CMS report documents the process for developing and evaluating corrective measures alternatives that would address contamination identified at the facility.

Identification and Evaluation of Corrective Measures Alternatives

CHS compiled a list of potentially applicable technologies based on a preliminary screening of a larger list of possible technologies, using the numeric screening matrix in the Federal Remediation Technologies Roundtable (FRTR); *Table 3-2: Treatment Technologies Screening Matrix*. Low scoring technologies, and technologies unsuitable to site geology or those presenting a high safety risk were dropped from consideration. The retained technologies and administrative approaches used in the evaluation of corrective measures alternatives are listed in Table 2.

The retained technologies were then carried forward into the evaluation of corrective measures alternatives. CHS developed a series of corrective measures alternatives which were

technologies and administrative approaches, or combinations of technologies and administrative approaches, designed to meet cleanup objectives. These alternatives were ranked using technical, human health, environmental, and institutional criteria. Cost of implementation was considered as well. The evaluation criteria are required by permit conditions and described in Appendix D of the CHS hazardous waste permit issued in 2002.

A detailed evaluation of the alternatives was conducted in two stages. Each alternative was first scored against the technical evaluation criteria of reliability, implementability, and safety. The scores of each alternative were then compared to each other. Alternatives with the highest technical scores were further evaluated against the human health, environmental, and institutional criterion. From the results of this evaluation process, corrective measures were developed for groundwater and for each SWMU and AOC. CHS then recommended these corrective measures to DEQ as the preferred cleanup options for the Laurel Refinery.

8.0 THE PROPOSED REMEDIES

DEQ selects corrective measures at permitted hazardous waste facilities in Montana. DEQ has concluded, based on the review of the Corrective Measures Study, as well as an extensive knowledge of the remedial activities that have been conducted and the contamination present at the facility, that the corrective measures recommended by CHS will meet the cleanup objectives for the Laurel Refinery. DEQ, therefore, proposes the following corrective measures for soil, surface water and groundwater. Maps of the recommended corrective measures for soil and groundwater are shown in Figures 5 and 6, respectively.

Proposed Remedies for Soil

No Action

No further action is proposed for areas where concentrations of constituents of concern (COCs) in the soil do not pose a risk to human or ecological health. In areas where no action is proposed, sampling results indicate that concentrations of COCs are below residential risk levels for soil and below risk action levels for ecological receptors.

Institutional Controls

Institutional controls are proposed both as a sole remedy and in combination with other proposed corrective measures. Institutional controls are proposed as the sole remedy for areas where concentrations of COCs are above residential risk-based values, and below industrial risk values. CHS would be required to restrict land use by establishing institutional controls which limit site zoning to long-term industrial use of the property, thus preventing use of the area for residential or recreational purposes. Institutional controls would include deed restrictions on SWMUs and AOCs, limiting use to commercial or industrial only, and access control in the form of gates, fencing, and security during the operating life of the refinery.

Deferred

Deferred would postpone corrective measures in areas where refinery practices prevent implementation of a remedy. These areas are currently being used for waste management, are beneath refinery structures such as tanks or process units, or are otherwise inaccessible. Corrective measures would be evaluated and implemented as necessary when deferred areas

become inactive, accessible, or at plant closure. When contaminated soil is accessible, CHS would be required to conduct an investigation and any necessary cleanup in accordance with requirements in the CHS hazardous waste permit. If contamination in a deferred area becomes an immediate threat to human health or the environment, the deferred status would be removed and CHS would be required to take immediate action to remove the threat.

Excavation and Removal with Institutional Controls

Excavation and removal of soil for ex-situ treatment or disposal is proposed for accessible surface soil contamination. Excavated soil would be placed on the CAMU, undergo further treatment, or be shipped off-site for disposal. Institutional controls would be combined with the excavation alternative to address any remaining contamination which is not accessible.

Engineering Controls (Capping) with Institutional Controls

Engineering controls with institutional controls is proposed for areas where infrastructure and refinery operations limit access. Engineering controls would include soil cover, capping with pavement or infrastructures such as tanks, and solidification/stabilization of soil. Engineering controls would limit human and ecological exposure to COCs and reduce infiltration and subsequent leaching of COCs to groundwater. Institutional controls are proposed in tandem with this alternative to ensure the engineering controls are maintained and inspected regularly, as well as ensuring current and future land use is limited to commercial or industrial purposes.

Because engineering controls do not reduce or remove hazardous constituents in soil, this remedy is proposed as a corrective measure until the land use changes. If land use changes in a way that causes exposure to hazardous constituents above acceptable risk levels, CHS will be required to evaluate and implement additional corrective measures.

Excavation and Removal with Institutional Controls and Engineering Controls

Excavation and removal with institutional and engineering controls is proposed for areas where infrastructure and refinery operations allow partial access for excavation of contaminated soil. Because engineering controls do not reduce or remove COCs in soil, this remedy is proposed as a corrective measure until the land use changes. If land use changes in a way that causes exposure to COCs above acceptable risk levels, CHS will be required to evaluate and implement additional corrective measures.

Proposed Remedy for Surface Water

Deferred

Surface water sampling results from the Italian Drain have shown selenium exceeds the chronic surface water standards for ecological receptors. Additional assessment is necessary to confirm the initial sample results. Corrective measures will be deferred until further evaluation is completed. DEQ will require that a schedule for the evaluation be included in the Corrective Measures Implementation Work Plan. Should the evaluation indicate remediation is required, CHS will follow procedures outlined in the hazardous waste permit for developing and implementing corrective measures.

Proposed Remedies for Groundwater

The proposed remedy for groundwater contamination is the continuation of current interim measures (Figure 6). DEQ is proposing technologies used for the interim measures and bases its decision on their demonstrated long-term effectiveness in reducing LNAPL volume and COC concentrations in the dissolved phase plume. Please note the area named *RCRA LTU* in Figure 6 is the groundwater monitoring program for the closed land treatment unit and is not included in the facility groundwater remedy described in this Statement of Basis.

Air Sparging

Air sparging is proposed to remediate dissolved-phase contaminants in the groundwater at AOC-7 and the Southeast Area.

Pump and Treat

A groundwater treatment and LNAPL removal system is proposed to address dissolved-phase COCs in groundwater at AOC-1, AOC-17, and for the refinery LNAPL plume. Groundwater containing dissolved-phase COCs would be pumped from the ground and treated in the refinery wastewater treatment system. Belt skimmers would be used to remove LNAPL. In addition, a bail-down program would continue to be implemented annually where accumulated LNAPL in wells is removed by pumping or installation of a hydrophobic sock.

Monitored Natural Attenuation

Studies by CHS indicate that natural attenuation processes are reducing contaminant levels in the dissolved-phase plumes (ERM, 1998a). Monitored natural attenuation is proposed for the dissolved-phase plume at the Transportation Terminal Area. CHS would be required to monitor groundwater wells along the flow path of the plume. Monitoring parameters, such as pH, specific conductivity, dissolved oxygen and oxidation reduction potential, and concentrations of COCs would be used to evaluate degradation of organic COCs.

Groundwater Monitoring

Site-wide groundwater monitoring is proposed for evaluating and monitoring areas where COCs in soil have the potential to leach to groundwater.

9.0 OPPORTUNITY FOR PUBLIC COMMENT

DEQ is seeking comment from the public on the proposed corrective measures described in this Statement of Basis. Public input is an important contribution to the remedy selection process. The final remedies selected may be different from the one that has been proposed by DEQ, depending on the information received through the public participation process. DEQ will make a final determination on the remedies after all public comments have been considered. The CHS hazardous waste permit will be the administrative mechanism for implementing corrective measures at the Laurel Refinery.

DEQ is also proposing to re-issue a hazardous waste permit to CHS for closure and post-closure care of a regulated unit, and continued implementation of facility-wide cleanup. DEQ is required under the Montana Environmental Policy Act to conduct environmental assessments on the proposed corrective measures selection and the draft permit. Comments on the draft permit and

the environmental assessments will be accepted during the same comment period as for DEQ's proposed remedy selection. Information on where to find copies of the draft permit and environmental assessments can be found below.

Comment Period
The comment period extends from **July 14 to August 27, 2014**.

Document Location
The Statement of Basis, supporting project documents, draft permit, and environmental assessments for the Statement of Basis and the draft permit are available for review at the DEQ office in Helena and the Laurel Public Library. The supporting project documents include the human health and ecological risk assessment reports, and the Corrective Measures Study. All documents and correspondence related to facility cleanup at the Laurel Refinery are located in DEQ's public record and may be reviewed at the DEQ Helena office.

The Statement of Basis, draft permit, and environmental assessment are available on DEQ's website: http://deq.mt.gov/pubcom.mcpx and http://deq.mt.gov/ea/WasteMgt.mcpx.

Location Information	*Review Hours*
Laurel Public Library 720 West 3rd Street PO Box 68 Laurel, MT 59044 (406)682-4961	Monday through Thursday 9 A.M. to 7:30 P.M. Saturday 9 A.M. to 3 P.M. *Closed Friday and Sunday*
Montana Department of Environmental Quality Permitting and Compliance Division Waste and Underground Tank Management Bureau Metcalf Building 1520 E. 6th Ave. Helena, Montana (406) 444-5300	Monday through Friday 8:00 am – 5:00 pm Website: Statement of Basis and Draft Permit http://deq.mt.gov/pubcom.mcpx Draft Environmental Assessment http://deq.mt.gov/ea/WasteMgt.mcpx

Written Comments
The public has until close of business on August 27, 2014 to submit written comments. Comments should include all reasonably available references, factual grounds for comments, and supporting material. Please submit written comments to the following address or email:

U.S. Mail
Becky Holmes
DEQ Permitting and Compliance Division
Waste and Underground Tank Management Bureau
P.O. Box 200901
Helena, MT, 59620-0901

Email
DEQhazwaste@mt.gov
Subject Line – CHS Laurel Public Comment

A public hearing will be held if DEQ determines, based upon requests, there is a significant degree of public interest in the proposed permit reissuance and/or remedy selection. Requests for a public meeting may be submitted in writing to DEQ prior to the end of the comment period.

Procedures for Reaching a Final Decision on Remedy Selection

After reviewing all comments, DEQ will prepare a Response to Comments document. The Response to Comments will explain any changes to the proposed remedy and respond to all significant comments.

DEQ will then make a final decision on the remedy selection. After the final decision is made, notice will be given to CHS and each person who submitted written comments or requested a notice of the final decision. The final remedy decision becomes effective thirty (30) days after the service of notice of the decision, unless a later date is specified or a public hearing is requested under 40 CFR 124.11, as incorporated by ARM 17.53.1201. If no comments are received, the final remedy becomes effective immediately upon notice of DEQ's final decision.

For More Information

Please contact Becky Holmes at the address listed above, by phone 406-444-2876, or email rholmes@mt.gov.

References

DEQ, 2012. *Circular DEQ-7, Montana Numeric Water Quality Standards, October 2012*.

EPA, 2014. *Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites, EPA May 2014.*

ERM, 1997a. *RCRA Facility Investigation: Phase I Soil and Waste Investigation at Solid Waste Management Units and Areas of Concern, May 30, 1997*.

ERM, 1997b. *RCRA Facility Investigation: Phase I Preliminary Ecological Risk Assessment. ERM-Southwest, July 31, 1997*.

ERM, 1998. *An Intrinsic Remediation Demonstration Report – Transportation Terminal Interim Measures Area, June 3, 1998.*

ERM, 1998. *Summary of ISM LNAPL Plume Investigation; LNAPL Interim Stabilization Measures, November 17, 1998*.

ERM, 2006. *Baseline Risk Assessment Report, CHS Inc., Laurel, Montana Refinery, April 3, 2006.*

ERM, 2010. *Final Corrective Measures Study, CHS Refinery, Laurel Montana, March 3, 2010*.

Table 1
Summary of Constituents of Concern for the Laurel Refinery

Table 1a – Human Health			
Preliminary COCs	**Final COCs for Cleanup**		
	Groundwater		Surface Soil
	On-site	Off-site	
Organic Compounds			
Benzene	X	X	
Ethylbenzene			
Vinyl Chloride	X	X	
Xylenes, total			
1,2-Dichloroethylene (cis)			
1,4-Dichlorobenzene			
1-Methylnaphthalene			
2-Methylnapthalene			
Benz(a)anthracene			X
Benzo(b)flouranthene			X
Benzo(a)pyrene			X
Bis(2-ethylhexyl)phthalate			
Chrysene			
7,12-Dimethylbenz(a)anthracene			X
Dibenz(a,h)anthracene			X
Indeno(1,2,3-cd)pyrene			
Naphthalene			
Trichloroethylene	X		
Inorganic Compounds			
Antimony			
Arsenic	X	X	X
Chromium, total			
Lead			
Manganese	X		
Mercury			
Vanadium			

Notes:
COC – Constituents of Concern

Table 1b – Ecological		
Preliminary COC	**Final COCs for Cleanup**	
	Surface Water	Surface Soil
Organic Compounds		
Benzene		
Bis(2-ethylhexyl)phthalate		X[b]
Dibenzofuran		
Dibutyl phthalate		
di-n-Octyl phthalate		
Ethylbenzene		
Fluoranthene		
Polycyclic aromatic hydrocarbons (PAHs)[a]		X[b]
Toluene		
Xylenes		
Inorganic Compounds		
Antimony		
Arsenic		
Barium		X[c]
Cadmium		
Chromium, Total		X[c]
Cyanide		X[b,c]
Lead		
Mercury		
Nickel		
Selenium	X[c]	X[c]
Silver		
Vanadium		X[b]
Zinc		

Notes:
COC – Constituent of Concern

[a] In the ecological risk assessment, polycyclic aromatic hydrocarbons (PAHs) were evaluated as one constituent due to limited toxicity information for individual PAHs.

[b] COC is found in ecological Zone 1 (east of the refinery operations area)

[c] COC is found in ecological Zone 3 (west of the refinery operations area)

Table 2
Applicable Technologies and Administrative Approaches Evaluated in the Corrective Measures Study

Soil
In Situ Biological Treatment
• Phytoremediation
In Situ Physical/Chemical Treatment
• Soil Flushing
Engineering Controls
• Capping
• Cap Enhancement/Alternatives
• Solidification/Stabilization
Other
•Excavation and Treatment or Disposal
- Land treatment of excavated material on the refinery CAMU is considered part of the Excavation and Removal alternative.
•Evaluate and Upgrade (specifically for the refinery wastewater sewer system)
Groundwater, Surface Water, and Leachate Media
In Situ Biological Treatment
• Enhanced Bioremediation
• Monitored Natural Attenuation
• Phytoremediation
In Situ Physical/Chemical Treatment
• Air Sparging
• Bioslurping
• Chemical Oxidation
• Dual Phase Extraction
• In-Well Air Stripping
• Passive/Reactive Treatment Walls
Ex Situ Physical Treatment of Pumped Fluids
• Pump & Treat
Containment
• Physical Barriers
• Deep Well Injection
Administrative Controls
• Institutional and Land Use Controls
• Deferred
• No Action (COC concentration levels pose no risk to human or ecological receptors)

Figure 1
Site Location Map

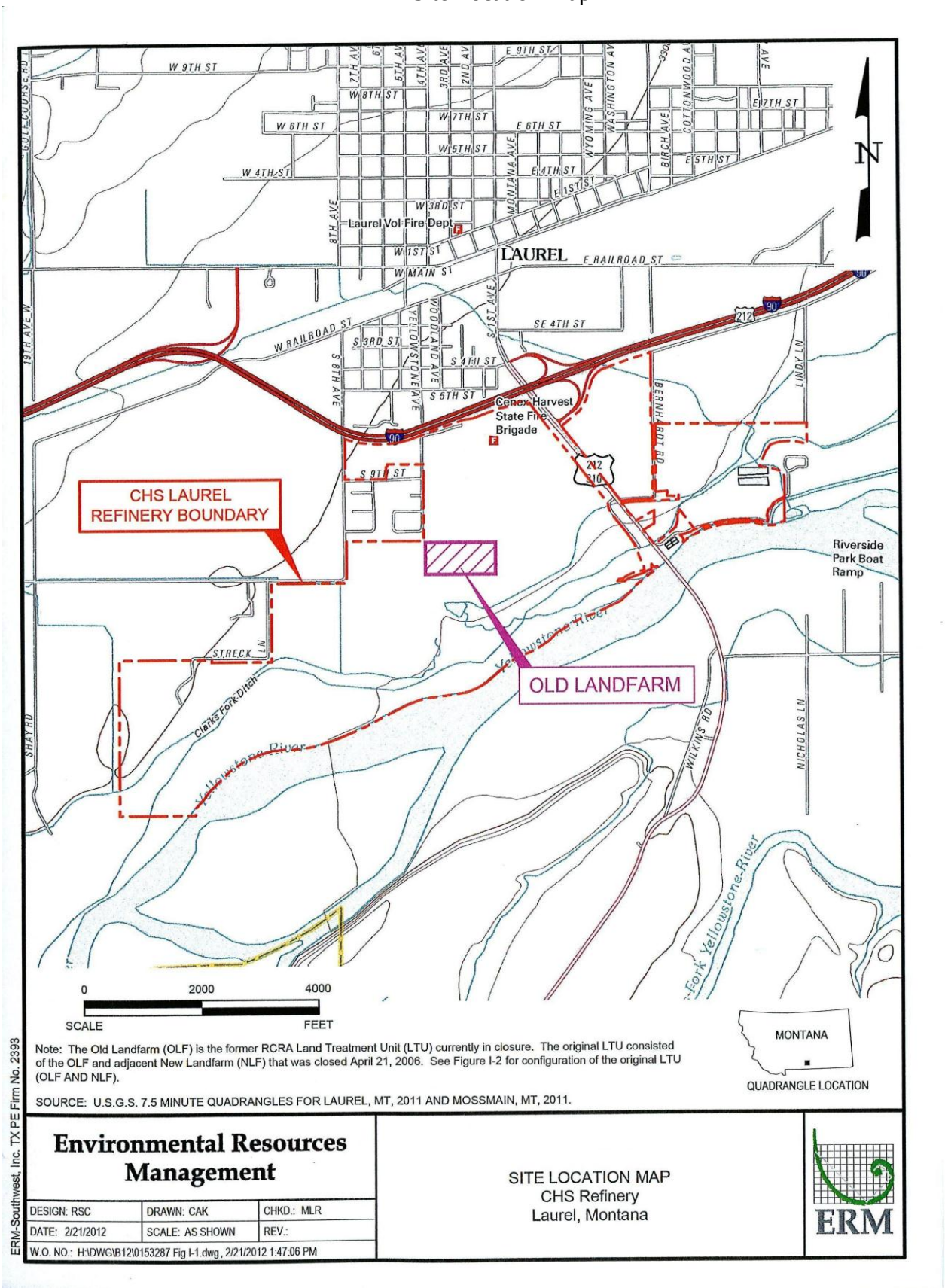


Figure 2
CHS Laurel Refinery Site Map

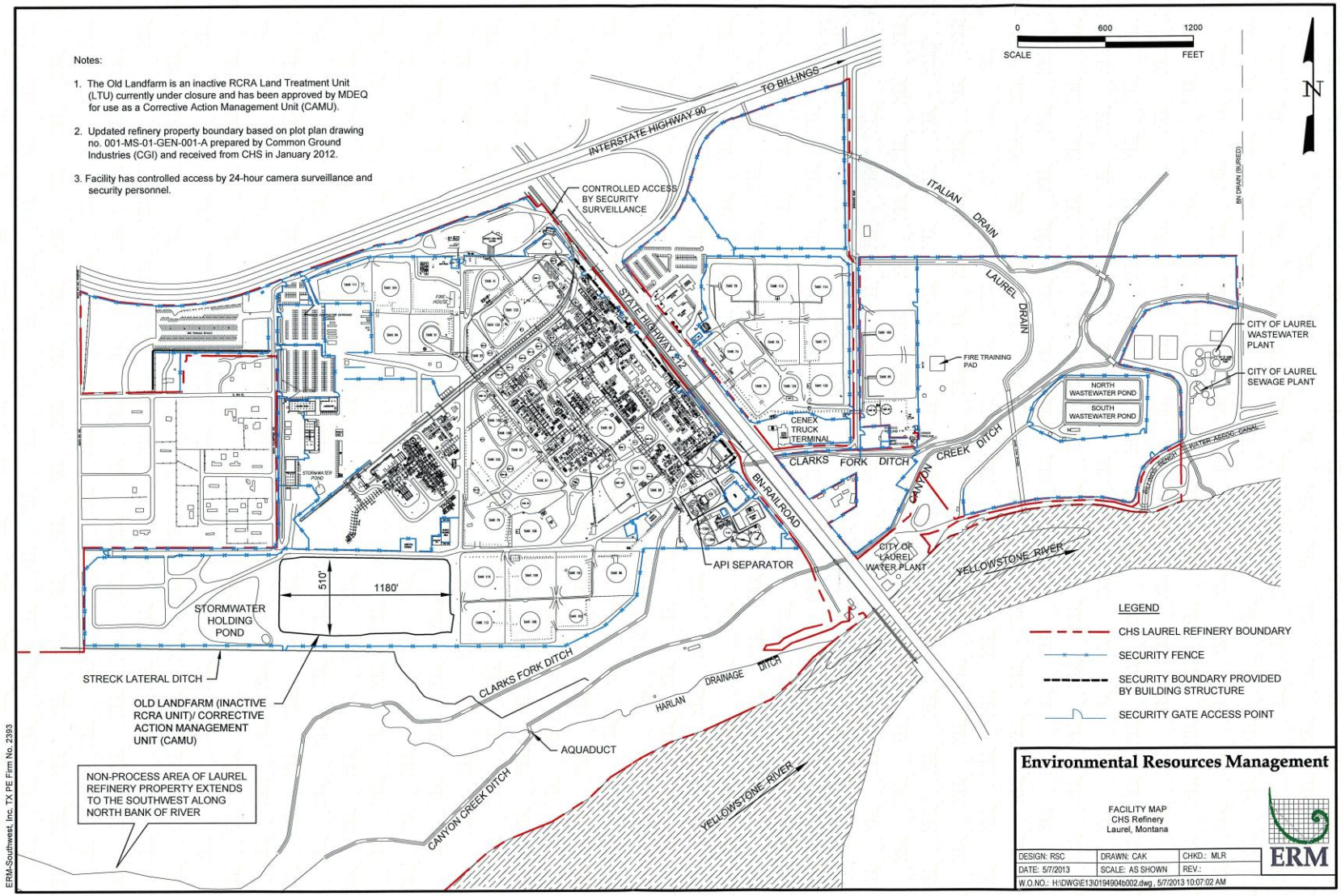


Figure 3
Dissolved-Phase Groundwater Plume

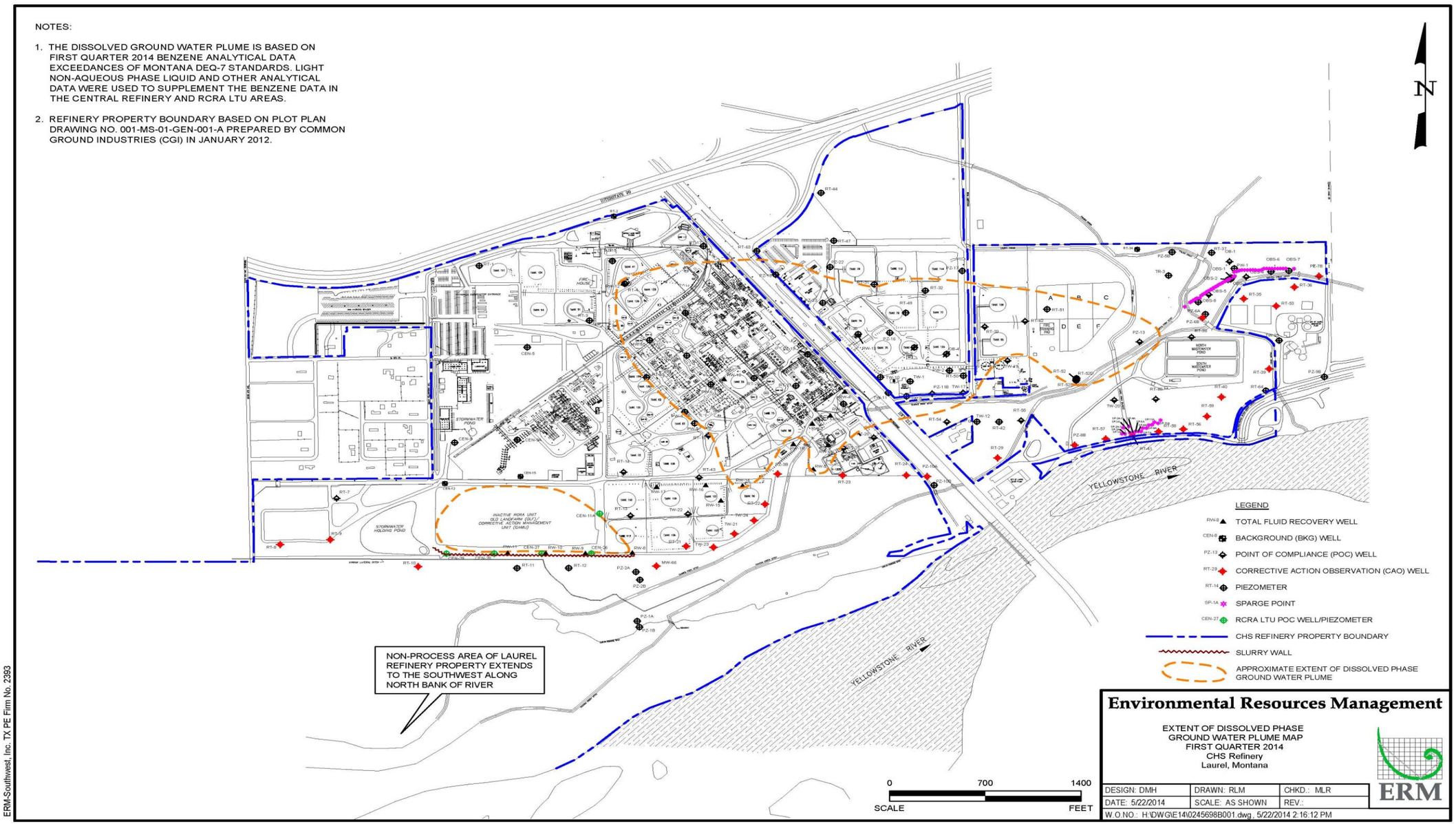
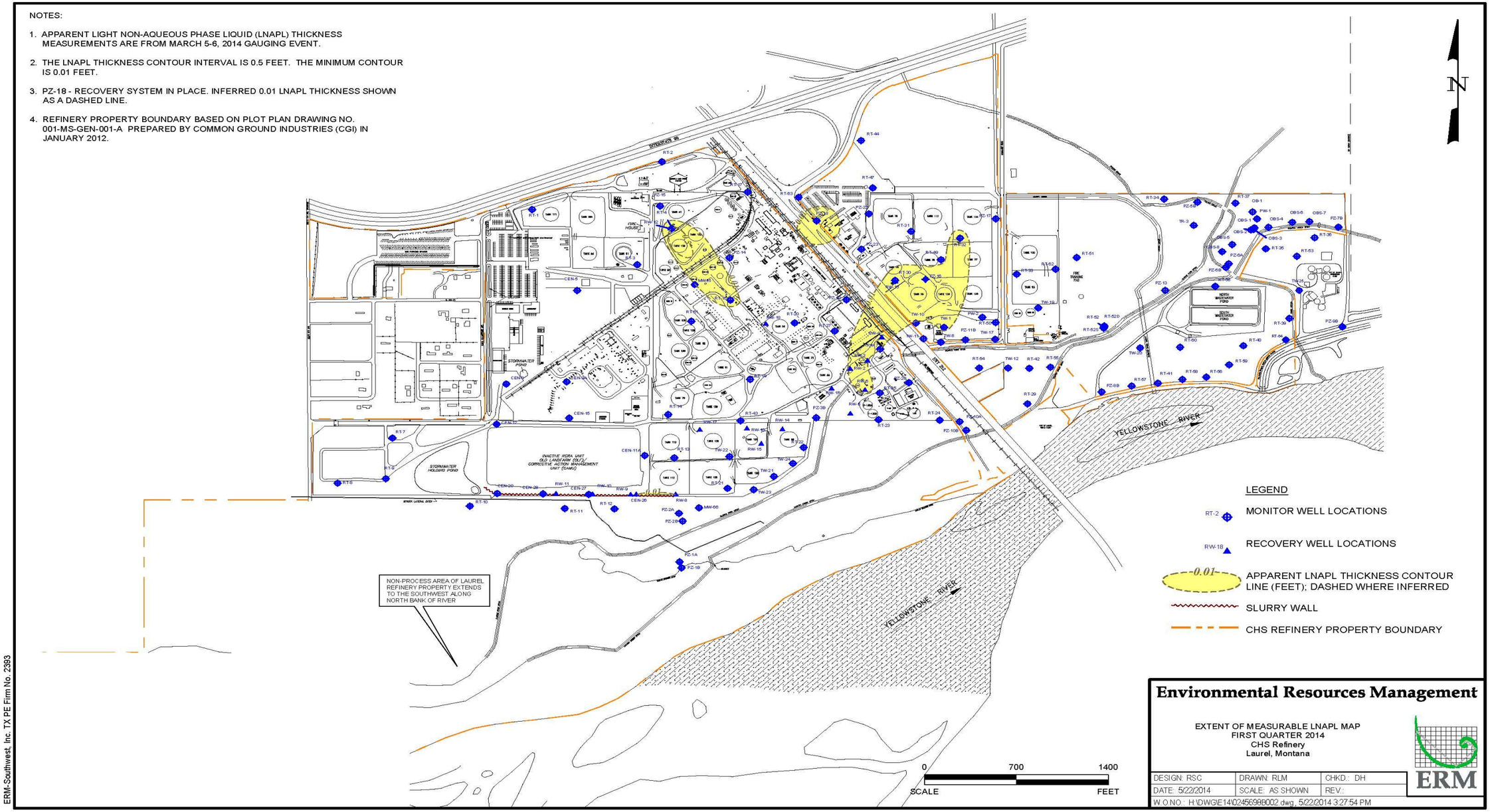


Figure 4
LNAPL Groundwater Plume

NOTES:

1. APPARENT LIGHT NON-AQUEOUS PHASE LIQUID (LNAPL) THICKNESS MEASUREMENTS ARE FROM MARCH 5-6, 2014 GAUGING EVENT.
2. THE LNAPL THICKNESS CONTOUR INTERVAL IS 0.5 FEET. THE MINIMUM CONTOUR IS 0.01 FEET.
3. PZ-18 - RECOVERY SYSTEM IN PLACE. INFERRED 0.01 LNAPL THICKNESS SHOWN AS A DASHED LINE.
4. REFINERY PROPERTY BOUNDARY BASED ON PLOT PLAN DRAWING NO. 001-MS-GEN-001-A PREPARED BY COMMON GROUND INDUSTRIES (CGI) IN JANUARY 2012.



Environmental Resources Management

EXTENT OF MEASURABLE LNAPL MAP
FIRST QUARTER 2014
CHS Refinery
Laurel, Montana

DESIGN: RSC	DRAWN: RLM	CHKD.: DH
DATE: 5/22/2014	SCALE: AS SHOWN	REV.:

W.O.NO.: H:\DWG\E14\0245699B002.dwg, 5/22/2014 3:27:54 PM

ERM-Southwest, Inc. TX PE Firm No. 2393

Figure 5
Proposed Corrective Measures for Soil

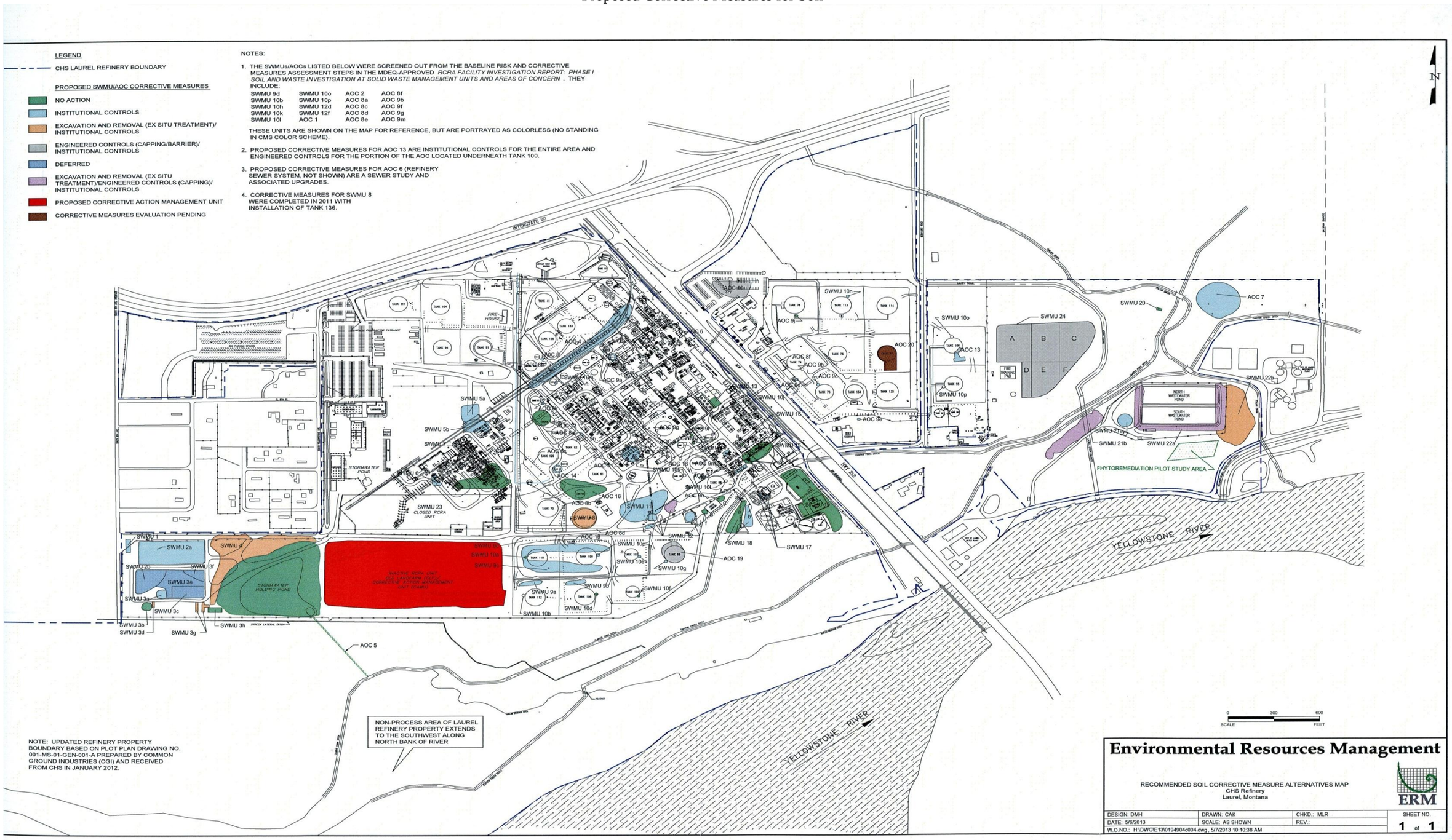


Figure 6
Proposed Corrective Measures for Groundwater