TOSTON SMELTER

ADDENDUM NO. 1
TO THE
EXPANDED ENGINEERING EVALUATION/AND COST ANALYSIS
FOR THE
TOSTON SMELTER SITE
RADERSBURG MINING DISTRICT
BROADWATER COUNTY, MONTANA

Prepared for:

Department of Environmental Quality
Mine Waste Cleanup Bureau
P.O. Box 200901
Helena, Montana 59620-0901

Prepared by:

Tetra Tech, Inc.
7 West 6th Avenue, Suite 612
Helena, Montana 59601

(406) 442-5588

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1.0 INTRODUCTION

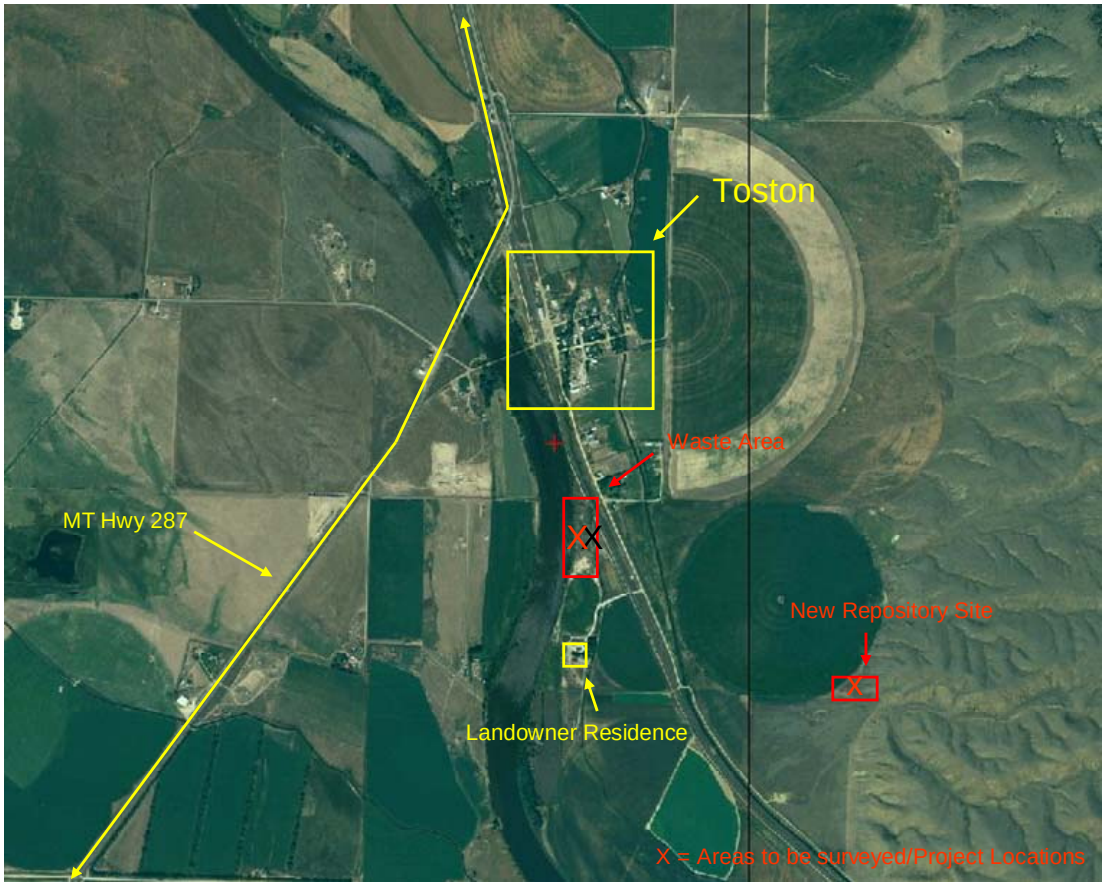
Tetra Tech EM Inc. (TtEMI) received a task order (TO #17) from the Montana Department of Environmental Quality's Mine Waste Cleanup Bureau (MDEQ/MWCB) to prepare an addendum to the expanded engineering evaluation and cost analysis (EEE/CA) for the Toston Smelter Site. The purpose of this EEE/CA addendum is to address mine waste located within the Missouri River stream bed; determine the impacts of the relocation of the irrigation canal that runs through the Toston Smelter Site; to analyze an alternative site for the mine waste repository, and to select the containment features of the repository. The Toston Smelter Site is located 1 mile south of the townsite of Toston, Montana in Section 26, Township 5 North, Range 2 East, Montana principle meridian.

The preferred reclamation alternative for the Toston Smelter Site as identified in the 1999 EEE/CA is Alternative 4 (excavation and on-site disposal in an engineered repository) for all on-site smelter wastes. The original location of the proposed repository was immediately south of the waste site along the Missouri River. The newly proposed repository site is located about one mile east of the river near the base of the Big Belt Mountains.

2.0 TOSTON SMELTER WASTE DESCRIPTION AND CHARACTERIZATION

A detailed cultural resource inventory and assessment for the Toston Smelter site has been prepared for MDEQ by GCM Services, Inc. (June 1998). In the early 1880s, large amounts of silver-gold ore was stockpiled at mines in the Radersburg Mining District because the ore was unsuitable for the wet-process mills in the area. In June 1885 construction of the Toston Smelter began. The original sandstone blast furnace was replaced with a Herreshoff cast iron, water-jacketed blast furnace in 1886. The smelter used locally obtained coal, limestone, and pyrite to fuel the smelter and flux the ores. The smelter produced matte that was shipped off site for refining and slag that was disposed of on the banks of and in the Missouri River. At peak production in 1888, the smelter worked around the clock reducing 100 tons of ore into one 20 ton carload of matte. By the end of 1888, the smelter ceased operation. The smelter was in existence until 1899. After 1899, the smelter was dismantled and the rail spur tracks were removed.

Figure 1 Vicinity Map



This section describes the waste characteristics and analytical results for the Toston Smelter site including the waste types, locations, volumes, physical properties, and off-site metals analyses collected during the RI (TtEMI 1998). Characterization of the waste types was used to determine the potential risk to human health and the environment, and the final reclamation alternatives for the site. A variety of soil and mining-related waste materials was sampled during the RI. A general description of the collection of field samples, metals analyses, and data evaluation is further divided in the following subsection. The different waste types are mixed together in many areas of the smelter site preventing the calculation of separate volumes for each specific waste type.

Evaluation of the laboratory results and the human health and ecological risk assessments presented in the original EECA (Tetra Tech 1999) suggests that the primary contaminants of concern useful for site characterization at the Toston Smelter site are arsenic, copper, lead, and zinc. Peak concentrations of these metals within the samples are as follows:

- Arsenic: 16,700 mg/kg in the waste rock (WR-1) and 1,580 mg/kg in the slag (SL-1)
- Copper: 833 mg/kg in slag (SL-2) and 406 mg/kg in the sulfide waste sample (TP-1)
- Lead: 130,000 mg/kg in the slag (SL-1) and 11,800 mg/kg in the sulfide waste sample (TP-1)
- Zinc: 5,430 mg/kg in the slag (SL-2)

Samples of surface water from the Missouri River upstream and downstream of the site and groundwater from the three wells closest to the site were collected in April 1998. The samples were analyzed for metals and water quality parameters. The arsenic concentration in samples from the Helm domestic well and the Missouri River exceeded the WQB-7 human health water quality standard for arsenic (18 micrograms per liter [μg/L])(MDEQ 1995). The grab sample from the squatter's well exceeded the WQB-7 human health water quality standards for iron (300 μg/L) and manganese (50 μg/L). The samples from the hand dug Helm well and the Missouri River downstream from the site exceeded the WQB-7 human health water quality standards for mercury (0.14 μg/L). However, the mercury results from all the samples indicate that the exceedances were likely due to analytical variability and that the results from all the samples were near the human health standard (0.14 μg/L).

The measured differences in metals concentrations in the Missouri River samples collected upstream and downstream of the site are within the range of normal analytical variability. This suggests that the Toston Smelter site was not producing a measurable change in the concentration of metals in the river.

3.0 SAMPLING

Within the last 10 years since the original EECA and RA were written, areas of waste were displaced by various activities such as the relocation of the irrigation canal. The full extent of the displacement was not fully known so further sampling was performed. This section describes the sampling performed and the results of the sampling. The sample log can be found in Appendix B.

HR Lane Construction was contracted to excavate five test pits with a backhoe. The first test pit (TP-10) was excavated to determine if there was any hazardous waste in the form of smelter brick at the bottom of a filled hole that is assumed to be a flume from the river. No brick was found.

Three test pits TP-12, TP-13 and TP-14 were excavated to determine if the diversion of the canal had displaced any mine waste. Soil was compositely sampled from each pit. The final pit TP-15 was excavated to determine the quality of the potential borrow soil for the planned excavation. Composite surface samples were taken on the road to determine if any of the road material required disposal. Sediment samples were taken at intervals of 50 feet along the shore to a distance of 20ft. All sample locations are visible in the sample log in Appendix B. All samples were tested for metals. TP-15 was also subjected to an agronomical analysis to help determine the characteristics of the borrow soil for growth potential.

Eleven sediment samples were taken from the Missouri River at 50 foot intervals for 500 feet. Samples were taken as far from the shoreline as safety allowed up to a distance of 20 feet. Smelter waste was visible in one sample upriver of the main slag pile and in all samples from that point downriver for 200 feet.

A brick from a waste pile on the bank of the river was subjected to a Toxicity Characteristic Leaching Profile (TCLP) analysis to determine whether or not it was hazardous waste. All sample results can be found in Appendix C.

3.1 SAMPLE RESULTS

Soil sample results from TP-10-9 pit show that there are no contaminants present at levels above cleanup guideline levels. However TP-12-6 contained lead levels of 7,600 mg/kg. This result supports the conclusion that smelter waste was indeed relocated into the original irrigation ditch as fill when the new ditch was excavated. The remaining test pits were under recreational cleanup guidelines for metals.

Sample results show that all of the surface soil samples contained lead above recreational cleanup guidelines. SS-100 contained 29,000 mg/kg lead, SS-101 contained 27,000 mg/kg lead, and SS-102 contained 10,000 mg/kg lead. Based on these results the soils from the road will also be excavated and placed in the repository.

Of the 11 sediment samples two showed lead levels above recreational cleanup guidelines and slag was visible in five of the samples collected. The two samples that exceeded guidelines for lead were SD-101-16 (3,900 mg/kg) and SD-102-17 (58,000 mg/kg). The locations where both of these samples were collected are upriver of the slag pile, showing the slag pile is not the sole source of surface water contamination.

Elevated zinc was also noted in three of the sediment samples, SD 106-12 (540 mg/kg), SD-109-20 (640 mg/kg) and SD-110-20 (940 mg/kg). While these levels are not in excess of recreational cleanup levels for soil (440,000 mg/kg), they are probably indicative of the presence of smelter slag in these samples.

3.2 RECOMMENDATIONS BASED ON SAMPLE RESULTS

Based on the results of the samples taken from the road and the river sediment, Tetra Tech EM Inc. recommends that both the stream sediments and that the material making up the road be removed and placed in the repository.

4.0 MONITORING WELL

On April 4, 2008, O'Keefe Drilling Company was contracted by Tetra Tech EM Inc. to install a monitoring well down gradient of the new repository site. The well was drilled to demonstrate adequate depth to groundwater underneath the repository ensuring the feasibility of constructing the repository without a bottom liner. The dual air rotary method was used to drill the well. The well was drilled to a depth of 55 feet and no groundwater was encountered. The soils description from the well log shows silty sands from ground level to 50 feet and very fine sands from 50 to 55 feet.

5.0 EXCAVATION PLANS

The smelter site has been divided into five areas for the purpose of detailing the excavation depths. The areas and excavation depths are shown in Appendix A and are described below:

- Area #1 consists of a 60,671 square feet (SF) area east of the canal which will be excavated to a depth of 1 foot.
- Area #2 consists of a 137,053 SF area west of the canal which will be excavated to a depth of 18 inches.

- Area #3 consists of the slag pile bordering the Missouri River which has an area of 1,471 SF and will be excavated to a depth of 13 feet from its peak.
- Area #4 consists of the slag and waste pile in the western field which has an area of 7,886 SF and will be excavated to a depth of 6 feet.
- Area #5 consists of a 13,473 SF area of the Missouri River 675 feet long and 20 feet wide which will be excavated to a depth of 1 foot.
- Area #6 consists of a 4,592 SF area of the road within the area that is planned to be regraded.
- Area #7 consists of a 7,800 SF area of the road south of the area to be regraded.

The total area of these seven areas combined is 5.4 acres. The total volume of waste to be excavated from these areas and placed in the repository is approximately 13,000 cubic yards (CY). A diagram detailing the numbered areas and excavation depths can be found on Figure 2 in Appendix A.

6.0 COMPARISON OF RECLAMATION ALTERNATIVES

This section includes a brief evaluation of several reclamation alternatives for the Toston Smelter Site. This evaluation includes a comparison of three alternatives relative to the seven evaluation criteria used in the EEE/CA including costs. A No-Action alternative was already proposed in the original EEE/CA and is not discussed here. The reclamation activities conducted under each alternative are similar except for the location of the mine waste repository and the containment features of the repository. Under Alternative 4A the repository would be constructed in the originally proposed location near the river with a top and bottom liner and a leachate collection system. Under Alternatives 4B and 4C the repository would be constructed at a higher elevation near the base of the mountains. Alternative 4B proposes using a top and bottom liner for the repository and a leachate collection system. Alternative 4C proposes constructing a repository with no bottom liner or leachate collection system.

Each alternative includes additional waste removal from within the Missouri River stream bed. Removal of this waste will require additional effort to minimize impact to the river. A Section 404 permit from the US Army Corps of Engineers will be required for any dredge or fill work completed within the Missouri River stream bed.

Important design parameters for the alternatives are the following:

Alternative 4A: Repository Constructed in Originally Proposed Site with a bottom liner and leachate collection system.

- Waste volume: 13,000 CY
- Repository area: 1.4 acres
- Waste haul distance: Less than 2,000 feet (one way)
- Soil borrow volume: 2,400 CY
- Total revegetation area: 7 acres

Alternative 4B: Repository Constructed at the Newly Proposed Site with a bottom liner and leachate collection system.

- Waste volume: 13,000 CY
- Repository area: 1.4 acres
- Waste haul distance: 2 miles (round trip)
- Total revegetation area: 7 acres

Alternative 4C: Repository Constructed at Newly Proposed Site with no bottom liner or leachate collection system.

- Waste volume: 13,000 CY
- Repository area: 1.4 acres
- Waste haul distance: 2 miles (round trip)
- Total revegetation area: 7 acres

The estimated cost of Alternative 4A is shown in Table 1, the estimated cost of Alternative 4B is shown in Table 2 and the estimated cost of Alternative 4C is shown in Table 3. Table 4 lists the ability of each alternative to meet the threshold criteria and the primary balancing criteria. The differences in costs and ability to meet the evaluation criteria are therefore related to differences brought about due to the repository location and necessary construction materials.

TABLE 1

COST ESTIMATE - ALTERNATIVE 4A
MODIFIED RCRA REPOSITORY AT ORIGINAL SITE

Cost Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
Mobilization, Bonding & Insurance	1	LS	$40,000.00	$40,000.00
Site Preparation and Storm Water Control	7	AC	$1,000.00	$7,000.00
Repository Excavation	2,300	CY	$3.00	$6,900.00
Repository Bottom Liner (GCL & GDF)	7,200	SY	$15.00	$108,000.00
Waste Excavation	13,000	CY	$3.00	$39,000.00
Sediment Excavation	500	CY	$25.00	$12,500.00
Waste Hauling, Placement, and Compaction	13,000	CY	$2.00	$26,000.00
Repository Cap (GCL & GDF)	7,200	SY	$15.00	$108,000.00
Repository Cover Soil	4,800	CY	$2.00	$9,600.00
Excavation Area Regrading	5.8	AC	$1,500.00	$8,700.00
River Bank/Floodplain Construction	680	LF	$50.00	$34,000.00
Excavation Area Cover Soil	7,600	CY	$5.00	$38,000.00
Leachate Collection System	1		$15,000.00	$15,000.00
Farm Road Reconstruction	1,000	LF	$10.00	$10,000.00
Fertilize, Seed, and Mulch	7	AC	$2,000.00	$14,000.00
Farm Fence	1,350	LF	$5.00	$6,750.00
Cleanup and Demobilization	1	LS	$5,000.00	$5,000.00
Subtotal Construction Costs				**$488,450.00**
Construction Contingencies		15 % of Construction Cost		$73,267.50
Engineering Design and Construction Oversight		15 % of Construction Cost		$73,267.50
Total Capital Costs				**$634,985.00**
Yearly Operation and Maintenance (O&M) Costs				
Site Inspections	3	EA	$500.00	$1,500.00
Site Maintenance		1 % of Construction Cost		$4,884.50
Subtotal O&M Costs				**$6,384.50**
O&M Contingencies		15%		$957.68
Total Yearly O&M Cost				**$7,342.18**
Present Worth of O&M Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$91,116.39**
Total Present Worth				**$726,101.39**

Assumptions: Unit costs based on professional judgment and recent bids for similar work at the other Montana abandoned mine reclamation projects.

Notes: LS = Lump Sum AC = Acre EA = Each
CY = Cubic Yard SY = Square Yard LF = Lineal Feet PF = Present Worth Factor
% = Percent O&M = Operation and Maintenance

TABLE 2
COST ESTIMATE - ALTERNATIVE 4B
MODIFIED RCRA REPOSITORY AT NEW SITE

Cost Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
Mobilization, Bonding & Insurance	1	LS	$40,000.00	$40,000.00
Site Preparation and Storm Water Control	7	AC	$1,000.00	$7,000.00
Repository Excavation	4,800	CY	$3.00	$14,400.00
Repository Bottom Liner (GCL & GDF)	7,200	SY	$15.00	$108,000.00
Waste Excavation	13,000	CY	$3.00	$39,000.00
Sediment Excavation	500	CY	$25.00	$12,500.00
Waste Hauling, Placement, and Compaction	13,000	CY	$4.00	$52,000.00
Repository Cap (GCL & GDF)	7,200	SY	$15.00	$108,000.00
Repository Cover Soil	4,800	CY	$2.00	$9,600.00
Excavation Area Regrading	5.8	AC	$1,500.00	$8,700.00
River Bank/Floodplain Construction	680	LF	$50.00	$34,000.00
Excavation Area Cover Soil	7,600	CY	$5.00	$38,000.00
Leachate Collection System	1		$15,000.00	$15,000.00
Farm Road Reconstruction	1,000	LF	$10.00	$10,000.00
Fertilize, Seed, and Mulch	7	AC	$2,000.00	$14,000.00
Farm Fence	1,350	LF	$5.00	$6,750.00
Cleanup and Demobilization	1	LS	$5,000.00	$5,000.00
Subtotal Construction Costs				**$521,950.00**
Construction Contingencies		15 % of Construction Cost		$78,292.50
Engineering Design and Construction Oversight		15 % of Construction Cost		$78,292.50
Total Capital Costs				**$678,535.00**
Yearly Operation and Maintenance (O&M) Costs				
Site Inspections	3	EA	$500.00	$1,500.00
Site Maintenance		1 % of Construction Cost		$5,219.50
Subtotal O&M Costs				**$6,719.50**
O&M Contingencies		15%		$1,007.93
Total Yearly O&M Cost				**$7,727.43**
Present Worth of O&M Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$95,897.34**
Total Present Worth				**$774,432.34**

Assumptions: Unit costs based on professional judgment and recent bids for similar work at the other Montana abandoned mine reclamation projects.

Notes: LS = Lump Sum AC = Acre EA = Each CY = Cubic Yard
SY = Square Yard LF = Lineal Feet PF = Present Worth Factor
% = Percent O&M = Operation and Maintenance

TABLE 3

COST ESTIMATE - ALTERNATIVE 4C
MODIFIED RCRA REPOSITORY AT NEW SITE WITH NO BOTTOM LINER OR LEACHATE COLLECTION SYSTEM

Cost Item	Quantity	Unit	Unit Cost	Cost
Capital Costs				
Mobilization, Bonding & Insurance	1	LS	$40,000.00	$40,000.00
Site Preparation and Storm Water Control	7	AC	$1,000.00	$7,000.00
Repository Excavation	4,800	CY	$3.00	$14,400.00
Repository Bottom Prep	7,200	SY	$2.00	$14,400.00
Waste Excavation	13,000	CY	$3.00	$39,000.00
Sediment Excavation	500	CY	$25.00	$12,500.00
Waste Hauling, Placement, and Compaction	13,000	CY	$4.00	$52,000.00
Repository Cap (GCL & GDF)	7,200	SY	$15.00	$108,000.00
Repository Cover Soil	4,800	CY	$2.00	$9,600.00
Excavation Area Regrading	5.8	AC	$1,500.00	$8,700.00
River Bank/Floodplain Construction	680	LF	$50.00	$34,000.00
Excavation Area Cover Soil	7,600	CY	$5.00	$38,000.00
Farm Road Reconstruction	1,000	LF	$10.00	$10,000.00
Fertilize, Seed, and Mulch	7	AC	$2,000.00	$14,000.00
Farm Fence	1,350	LF	$5.00	$6,750.00
Cleanup and Demobilization	1	LS	$5,000.00	$5,000.00
Subtotal Construction Costs				**$413,350.00**
Construction Contingencies		15 % of Construction Cost		$62,002.50
Engineering Design and Construction Oversight		15 % of Construction Cost		$62,002.50
Total Capital Costs				**$537,355.00**
Yearly Operation and Maintenance (O&M) Costs				
Site Inspections	3	EA	$500.00	$1,500.00
Site Maintenance		1 % of Construction Cost		$4,133.50
Subtotal O&M Costs				**$5,633.50**
O&M Contingencies		15%		$845.03
Total Yearly O&M Cost				**$6,478.53**
Present Worth of O&M Costs Based on 30 Year Life @ 7.00%		PF Factor = 12.41		**$80,398.50**
Total Present Worth				**$617,753.50**

Assumptions: Unit costs based on professional judgment and recent bids for similar work at the other Montana abandoned mine reclamation projects.

Notes: LS = Lump Sum AC = Acre EA = Each CY = Cubic Yard
SY = Square Yard LF = Lineal Feet PF = Present Worth Factor
% = Percent O&M = Operation and Maintenance

TABLE 4
COMPARATIVE ANALYSIS OF REPOSITORY ALTERNATIVES

Assessment Criteria	**Alternative 4A** Excavation and On-Site Disposal at Originally Proposed Site	**Alternative 4B** Excavation and On-Site Disposal at Newly Proposed Site with Top and Bottom Liners and Leachate Collection	**Alternative 4C** Excavation and On-Site Disposal at Newly Proposed Site with Top Liner Only
Public Health, Safety, and Welfare	Exposures expected to be eliminated.	Exposures expected to be eliminated.	Exposures expected to be eliminated.
Environmental Protectiveness	Exposures expected to be eliminated.	Exposures expected to be eliminated.	Exposures expected to be eliminated.
Chemical-Specific	Chemical-specific ARARs would be met.	Chemical-specific ARARs would be met.	Chemical-specific ARARs would be met.
Location-Specific	Location-specific ARARs would be met.	Location-specific ARARs would be met.	Location specific ARARs would be met.
Action-Specific	Action-specific ARARs would be met.	Action-specific ARARs would be met.	Location specific ARARs would be met.
Magnitude of Residual Risk	Contaminated materials remain on site. Risks reduced to acceptable levels.	Contaminated materials remain on site. Risks reduced to acceptable levels.	Contaminated materials remain on site. Risks reduced to acceptable levels.
Adequacy and Reliability of Controls	Reliability of caps dependent, in part, upon long-term maintenance.	Reliability of caps dependent, in part, upon long-term maintenance.	Reliability of caps dependent, in part, upon long-term maintenance.
Treatment Process Used and Materials Treated	No treatment process.	No treatment process.	No treatment process.
Volume of Contaminated Materials Treated	No treatment process.	No treatment process.	No treatment process.
Protection of Community During Reclamation Action	Fugitive emissions control may be required during construction.	Dust Suppression may be necessary while transporting wastes.	Dust Suppression may be necessary while transporting wastes.
Protection of On-Site Workers During Removal Action	Expected to be sufficient. Safety hazards likely more prevalent than hazards associated with wastes.	Expected to be sufficient. Safety hazards likely more prevalent than hazards associated with wastes.	Expected to be sufficient. Safety hazards likely more prevalent than hazards associated with wastes.
Time Until Removal Action Objectives are Achieved	One field season.	One field season.	One field season.
Ability to Construct	Construction of Repository Relatively Simple.	Construction of Repository Relatively Simple.	Construction of Repository Relatively Simple.
Ease of Implementing More Action if Necessary	Waste materials not readily accessed without destroying cap and liner. Other actions easily implemented such as additional armoring/ stabilization, or other methods.	Waste materials not readily accessed without destroying cap and liner. Other actions easily implemented such as additional armoring/ stabilization, or other methods.	Waste materials not readily accessed without destroying cap and liner. Other actions easily implemented such as additional armoring/ stabilization, or other methods.

TABLE 4
(Continued)
COMPARATIVE ANALYSIS OF REPOSITORY ALTERNATIVES

Assessment Criteria	**Alternative 4A** Excavation and On-Site Disposal at Originally Proposed Site	**Alternative 4B** Excavation and On-Site Disposal at Newly Proposed Site with Top and Bottom Liners and Leachate Collection	**Alternative 4C** Excavation and On-Site Disposal at Newly Proposed Site with Top Liner Only
Availability of Services and Capacities	Available locally and within the state.	Available locally and within the state.	Available locally and within the state.
Availability of Equipment and Materials	Available locally and within the state.	Available locally and within the state.	Available locally and within the state.
ESTIMATED TOTAL PRESENT WORTH COST	**$726,101.39**	**$774,432.34**	**$617,753.50**

Each alternative is considered protective of human health and the environment because wastes would be effectively isolated in either on-site or off-site repositories. The repositories would isolate the mine wastes from contact with potential receptors, and would reduce the potential for dust inhalation and off-site exposure via erosion. All alternatives would comply with ARARs by isolating the contaminated materials from contact with potential receptors, reducing releases to surface water, and reducing the potential for leaching of metals into groundwater. Although Alternatives 4B and 4C are more protective than Alternative 4A in terms of proximity to the river to reduce leaching of metals into surface water, Alternative 4A and Alternative 4B are more protective than Alternative 4C in terms of isolating the contaminated material from contact with potential receptors and reducing the leaching of metals into groundwater. However, based on the low levels of precipitation expected at this site, the low probability of any precipitation penetrating the upper GCL liner, and the significant depth to groundwater at the alternate repository site as indicated by the result of the monitoring well installation; the elimination of the lower repository liner as proposed for Alternative 4B seems justified.

Alternative 4C is the least expensive alternative with a present worth cost of $617,800 followed in order from least expensive to most expensive by Alternatives 4A and 4B. The present worth cost of Alternative 4A is $726,100. The present worth of Alternative 4B is $774,500. The differences in the present worth between these two alternatives and Alternative 4C are $108,300 and $156,700; differences of 17.5 percent and 25.4 percent respectively compared to the cost of Alternative 4C. The difference in costs between the three alternatives is mostly related to cost of constructing a bottom liner and leachate collection system for Alternatives 4A and 4B.

7.0 SUMMARY

Based on the detailed and comparative analysis of the above three reclamation alternatives for mine wastes from the Toston Smelter site, the preferred alternative is Alternative 4C. This alternative provides acceptable protection, effectiveness and lower short-term risks, and lower costs when compared to Alternative 4A and 4B. Alternative 4A and 4B are equivalent in protection and effectiveness and have less long-term risks than Alternative 4C, because they include a bottom liner and leachate collection system for maximum containment. The preferred alternative, Alternative 4C, most effectively reclaims the mine site, is easily implementable, provides a high level of protection to human health and the environment, and is cost effective.

REFERENCES

Reclamation Investigation Report for the Toston Smelter Site. Tetra Tech EM Inc. November, 1998.

Expanded Engineering Evaluation/and Cost Analysis for the Toston Smelter Site. Tetra Tech EM Inc. 1999.

APPENDIX A

AS-CONSTRUCTED DIAGRAMS

Toston Smelter Site
Broadwater County, Montana

APPENDIX A
EXCAVATION AREAS AND DEPTHS

TETRA TECH EM, INC.

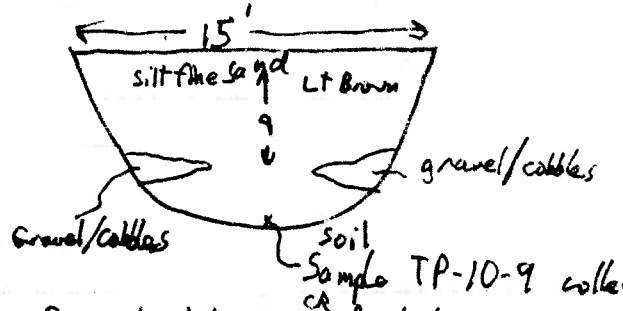
Appendix A-AREAS.dwg - DWH - 05/16/2008

APPENDIX B

SAMPLE LOG

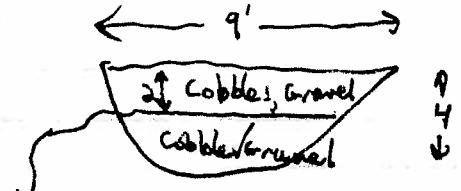
Toston Smelter 3-18-08

TP-10 9:00



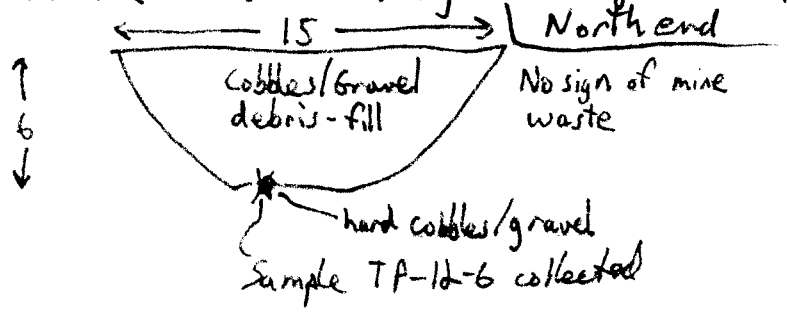
No waste observed, 2 foundation stones
Pit located at location of old sinkhole

TP-11 9:45



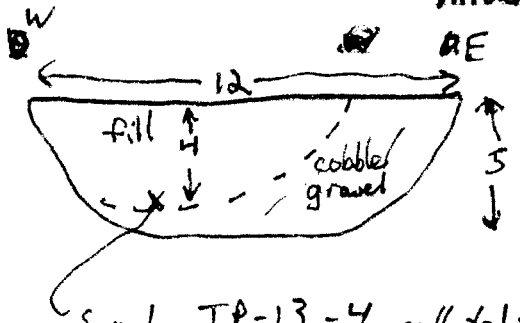
is not the location of the old
Irrigation ditch

TP-12 Located along filled irrigation Ditch



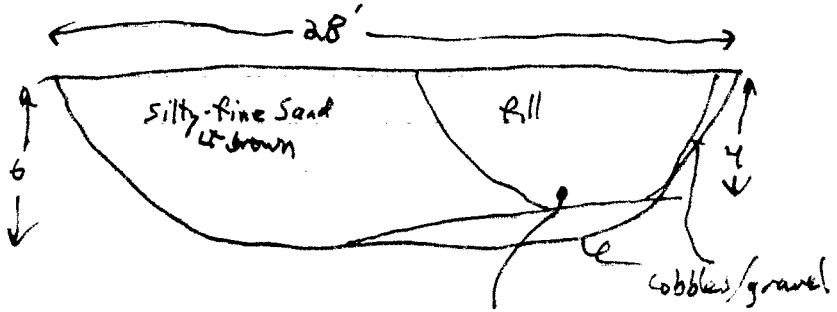
Sample TP-12-6 collected

TP-13 located along filled irrigation ditch middle



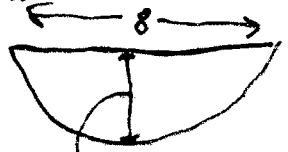
Sample TP-13-4 collected from bottom of fill. fine sand + silt.
No visible mine waste

TP-14 located along filled in irrigation ditch south end



Sample TP-14-4 collected from bottom of fill fine sand-gravel-cobbles chunk of slag, ore no other visible mine waste.

TP-15 at south end for agronomic analysis

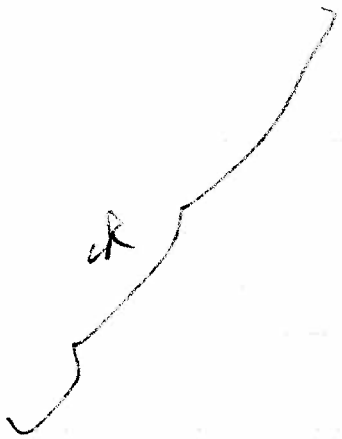


Sample TP-15 composite with depth

SD-10 collected from toe of slag pile about 8' from shore mix of Med sand to gravel. surface is armored with cobbles.

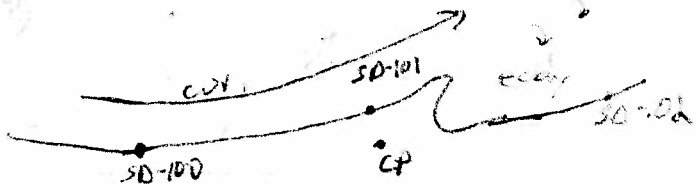
Additional equipment needed
long rope - safety
insulated upper

Collected 3 surface soil sample SS-100, SS-101, SS-102 from north to south opposite backhoe pits.



3-25-08
Sediment Sampling chris Reynolds Colin McCoy
SD-100 located 50' south of control point.
attempted to sample at 20' and 10' from shore
current is swift with a straight shot from upgradient

SD-101 located adjacent to control point, There is a small point starting about 20ft upstream curving gently

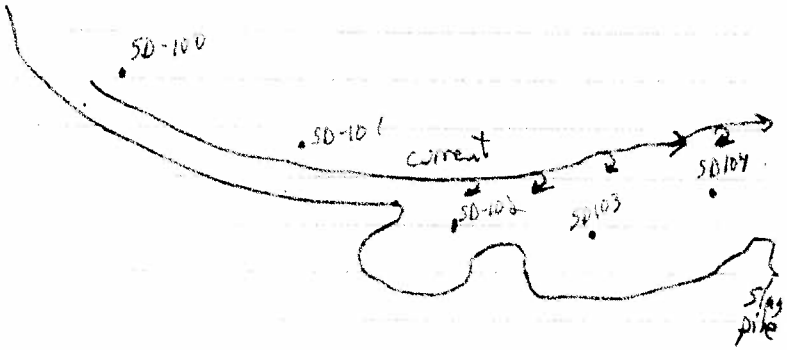


Collected sample 16 ft from shore could not get further due to current/depth

SD-102 located 50' N of CP.
shore is in eddy collected sample at edge of eddy / downstream current
22 ft from shore. - To rocky No sample sampled at 17'

3-25-08

SD-103 located 100' N of CP
eddy extends 38 feet from shore
Sample of fine sand with grassy (aquatic) veg
indicate deposition area
sample collected 23' from shore

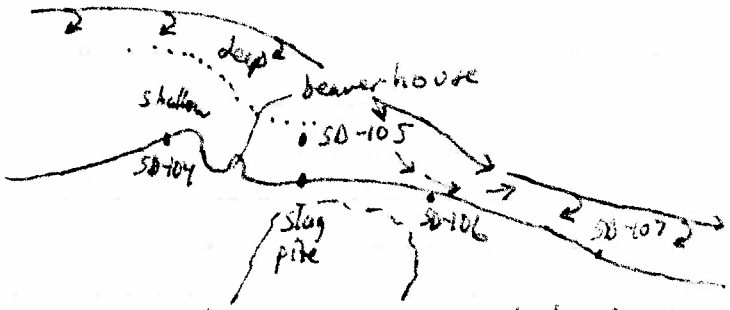


SD-104 located 150' N of CP
stream bottom drops off at ~~@~~ 28' from shore, ~~stream bed~~ sample collected 23' from shore, fines present

Bank from SD-100 to SD-105 has been armored with slag.

3-25-08

SD-105 located 200' N of CP
adjacent to S end of slag pile
stream bottom drops off about 10' from shore, sample collected 9' from shore



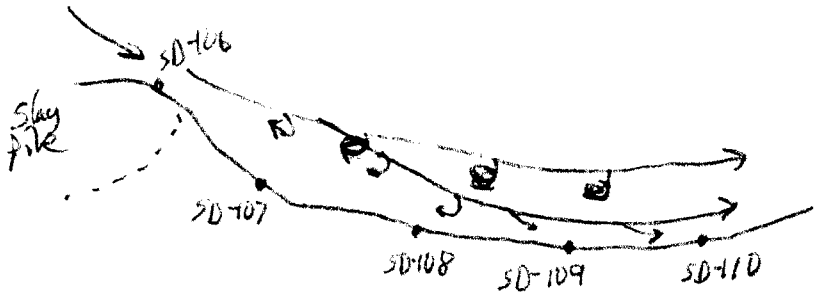
approximate downstream extent of eddy is tip of slag pile

SD-106 located 250' N of CP
adjacent to N end of slag pile
stream bottom drops off about 9 feet from shore & stabilizes at about 4' deep for at least the next 5 feet.
sample collected 12' from shore.
lots of bucket bottoms in water

3-25-08

~~SD-103 located 100 ft N of CP~~

SD-107 located 300' N of CP
metal and slag in water
stream bottom drops off at 19' from shore sample collected at 17' from shore. eddy slows current.

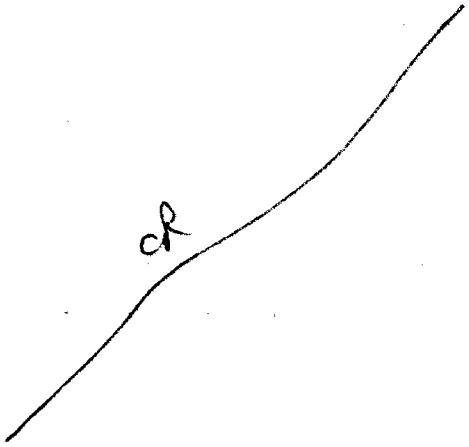


SD-108 located 350' N of CP
some slag in sediment
stream bottom slopes continuously to a depth of 4'~ 21 feet from shore
sample collected 20' from shore
eddy slows current

3-25-08

SD-109 located 400' N of CP
trace slag in sediment
stream bottom slopes continuously to a depth of 4' ~ 25' from shore
sample collected 20' from shore
No eddy - current is downstream.

SD-110 located 450' N of CP
Trace slag in sediment
stream bottom slopes continuously to a depth of 2.5' ~ 20' from shore, sample collected 20' from shore, No eddy - current is swift downstream.



3-31-08

Samples were dryed

Sample descriptions

SD-100-20 coarse to fine gravel trace course sand. No visible slag

SD-101-16 coarse to fine gravel with a moderate amount of ~~slag~~ sand. no visible ~~sand~~ slag

SD-102-17 not enough sample to dry. gravel and coarse sand. slag present in sample

SD-103-23 silt and fine sand, water plant debris. NO visible slag

SD-104-23 silt and fine sand. no visible slag.

SD-105-11 silt and fine sand, peat like material in sample, no visible ~~sand~~ slag

SD-106-12 coarse sand and gravel lots of slag in sample.

SD-107-17 med-coarse sand with gravel sized chunks of slag.

SD-108-20 medium sand to gravel. slag is coarse sand to gravel in size [redacted] 15% of total sample

SD-109-20 medium sand to gravel slag is coarse sand to gravel in size slag is 10% of total sample

SD-110-20 medium sand to gravel slag is mostly coarse sand and gravel slag is 15% of sample.

Brick with molten slag found ~20ft upstream of SD-100-20. Sample [redacted] BR-100

APPENDIX C

SAMPLE RESULTS

ENERGY LABORATORIES, INC. * 3161 E. Lyndale * P.O Box 5688 * Helena, MT 59604
Toll Free 877.472.0711 * 406.442.0711 * FAX 406.442.0712 * helena@energylab.com

ANALYTICAL SUMMARY REPORT

May 02, 2008

MT DEQ
PO Box 200901
Helena, MT 59620

Workorder No.: H08040107

Project Name: Toston Smelter

Energy Laboratories Inc received the following 12 samples from MT DEQ on 4/7/2008 for analysis.

Sample ID	Client Sample ID	Collect Date	Receive Date	Matrix	Test
H08040107-001	SD-100-20	03/31/08 17:00	04/07/08	Soil	Mercury in Solid By CVAA Metals by ICP, Total Digestion, Total Metals Digestion, Mercury by CVAA
H08040107-002	SD-101-16	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-003	SD-102-17	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-004	SD-103-23	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-005	SD-104-23	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-006	SD-105-11	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-007	SD-106-12	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-008	SD-107-17	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-009	SD-108-20	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-010	SD-109-20	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-011	SD-110-20	03/31/08 17:00	04/07/08	Soil	Same As Above
H08040107-012	BR-100	03/31/08 17:00	04/07/08	Solid	Metals by ICP/ICPMS, Total Mercury, TCLP TCLP Extraction, Non-volatiles

BRANCH LABORATORY LOCATIONS
eli-b - Energy Laboratories, Inc. - Billings, MT, EPA # MT00005
eli-c - Energy Laboratories, Inc. - Casper, WY, EPA# WY00002
eli-g - Energy Laboratories, Inc. - Gillette, WY, EPA# WY00006
eli-h - Energy Laboratories, Inc. - Helena, MT, EPA# MT00945
eli-r - Energy Laboratories, Inc. - Rapid City, SD, EPA# SD00012
eli-t - Energy Laboratories, Inc. - College Station, TX, EPA# TX01520

SUBCONTRACTING ANALYSIS
Subcontracting of sample analyses to an outside laboratory may be required. If so, ENERGY LABORATORIES, INC. will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories are indicated within the Laboratory Analytical Report.

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)
Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

ELI appreciates the opportunity to provide you with this analytical service. For additional information, including certifications, and analytical services visit our web page www.energylab.com.

ENERGY LABORATORIES, INC. • P.O. Box 5688 • 3161 East Lyndale Ave. • Helena, MT 59604
877-472-0711 • 406-442-0711 • 406-442-0712 fax • helena@energylab.com

LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: Toston Smelter
Workorder: H08040107

Report Date: 04/28/08
Date Received: 04/07/08

		Analysis		Hg, Total	Ag-T	As-T	Cd-T	Cr-T	Cu-T	Fe-T	Mn-T	Ni-T	Pb-T	Sb-T
		Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	**Client Sample ID**	**Up**	**Low**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
H08040107-001	SD-100-20	0	0	< 0.50	< 5	25	2	< 5	25	14000	260	< 5	410	12
H08040107-002	SD-101-16	0	0	< 0.50	12	45	3	8	43	21000	500	6	3900	28
H08040107-003	SD-102-17	0	0	< 0.50	210	730	8	14	140	59000	1400	10	58000	250
H08040107-004	SD-103-23	0	0	< 0.50	< 5	24	< 2	9	< 10	6900	160	6	180	20
H08040107-005	SD-104-23	0	0	< 0.50	< 5	21	< 2	6	< 10	4700	250	< 5	47	16
H08040107-006	SD-105-11	0	0	< 0.50	< 5	19	< 2	8	< 10	6300	210	6	19	18
H08040107-007	SD-106-12	0	0	< 0.50	< 5	27	3	7	50	16000	300	< 5	450	27
H08040107-008	SD-107-17	0	0	< 0.50	< 5	19	< 2	8	< 10	6900	140	6	240	17
H08040107-009	SD-108-20	0	0	< 0.50	< 5	21	< 2	< 5	33	6400	100	< 5	620	8
H08040107-010	SD-109-20	0	0	< 0.50	15	32	2	7	53	14000	230	5	170	20
H08040107-011	SD-110-20	0	0	< 0.50	< 5	36	4	12	59	26000	490	6	820	35
H08040107-012	BR-100	0	0											

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: Toston Smelter
Workorder: H08040107

Report Date: 04/28/08
Date Received: 04/07/08

		Analysis		Zn-T	As	Cd	Cr	Cu	Fe	Mn	Pb	Sb	Hg	Ag
		Units		mg/kg	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H08040107-001	SD-100-20	0	0	350										
H08040107-002	SD-101-16	0	0	150										
H08040107-003	SD-102-17	0	0	450										
H08040107-004	SD-103-23	0	0	33										
H08040107-005	SD-104-23	0	0	25										
H08040107-006	SD-105-11	0	0	27										
H08040107-007	SD-106-12	0	0	540										
H08040107-008	SD-107-17	0	0	31										
H08040107-009	SD-108-20	0	0	28										
H08040107-010	SD-109-20	0	0	640										
H08040107-011	SD-110-20	0	0	950										
H08040107-012	BR-100	0	0		< 0.5	< 0.1	< 0.5	< 0.01	0.10	0.26	1.2	0.00292	< 0.02	< 0.5

Chain of Custody and Analytical Request Record

Page 1 of 2

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

Company Name: Tetra Tech EM Inc.	Project Name, PWS #, Permit #, Etc.: Toston Smelter
Report Mail Address: 7 West 6th Ave Ste 612 Helena, MT 59601	Contact Name, Phone, Fax, E-mail: Colin McCoy (406) 442-5588 — Sampler Name if other than Contact:
Invoice Address: P.O. Box 200901 Helena, MT 59620	Invoice Contact & Phone #: Devin Clary (406) 841-5029 — 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 _____

Number of Containers
Sample Type: A Air W Water S Soils/Solids V Vegetation B Bioassay O Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Total Metals	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)
1 SD-100-20	3.31.08		Soils			X	
2 SD-101-16							
3 SD-102-17							
4 SD-103-23							
5 SD-104-23							
6 SD-105-11							
7 SD-106-12							
8 SD-107-17							
9 SD-108-20							
10 SD-109-20							

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments: See pl Metals

Shipped by: Hand

Cooler ID(s) _____

Receipt Temp _____ °C

Custody Seal Y N
Intact Y N
Signature Match Y N
Lab ID

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print): Colin McCoy	Date/Time: 4-7-08	Signature:	Received by (print):	Date/Time:	Signature:
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

Chain of Custody and Analytical Request Record

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

Company Name: Tetra Tech EM, Inc	Project Name, PWS #, Permit #, Etc.: Tooele Smelter
Report Mail Address: 7 West 6th Ave Ste 612 Helena, MT 59601	Contact Name, Phone, Fax, E-mail: Colin McCoy (406) 442-5588 — Sampler Name if other than Contact:
Invoice Address: PO Box 200961 Helena, MT 59620	Invoice Contact & Phone #: Dawn Clary (406) 874-5029 — 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 _____

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Total Metals	TCLP	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)
1 SD-110-20	3-31-08		Soil	X				
2 BR-100	3-31-08		Soil		X			
3								
4								
5								
6								
7								
8								
9								
10								

ANALYSIS REQUESTED

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments:
As, Ba, Be, Cd, Cr, Cu, Fe, Pb, Mn, Mg, Ni, Ag, Zn

Shipped by: Hand

Cooler ID(s) _____

Receipt Temp ___ °C

Custody Seal Y N
Intact Y N
Signature Y N
Match
Lab ID

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print): Colin McCoy	Date/Time: 11-7-08	Signature:
Relinquished by (print):	Date/Time:	Signature:

Received 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.

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: Toston Smelter
Workorder: H08040107

Report Date: 04/28/08
Date Received: 04/07/08

		Analysis		Ni	Se	Zn
		Units		mg/L	mg/L	mg/L
Sample ID	Client Sample ID	Up	Low	Results	Results	Results
H08040107-001	SD-100-20	0	0			
H08040107-002	SD-101-16	0	0			
H08040107-003	SD-102-17	0	0			
H08040107-004	SD-103-23	0	0			
H08040107-005	SD-104-23	0	0			
H08040107-006	SD-105-11	0	0			
H08040107-007	SD-106-12	0	0			
H08040107-008	SD-107-17	0	0			
H08040107-009	SD-108-20	0	0			
H08040107-010	SD-109-20	0	0			
H08040107-011	SD-110-20	0	0			
H08040107-012	BR-100	0	0	< 0.05	< 0.1	< 1

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: Toston Smelter
Workorder: H08030309

Report Date: 04/21/08
Date Received: 03/20/08

		Analysis		pH-SatPst	COND	Na-SatPst	SO4-SatPst	Sand	Silt	Clay	Texture	K-NH4OAc	Nitrate as N, KCL	OM-WB
		Units		s_u_	mmhos/cm	meq/l	meq/L	%	%	%	unitless	mg/kg	lbs/acre	%
Sample ID	**Client Sample ID**	**Up**	**Low**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**	**Results**
H08030309-001	TP-10-9	0	0											
H08030309-002	TP-12-6	0	0											
H08030309-003	TP-13-4	0	0											
H08030309-004	TP-14-4	0	0											
H08030309-005	TP-15	0	0	7.2	1.85	6.90	21.3	60	28	12	SL	269	1	0.32
H08030309-006	SS-100	0	0											
H08030309-007	SS-101	0	0											
H08030309-008	SS-102	0	0											
H08030309-009	SD-10	0	0											

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: Toston Smelter
Workorder: H08030309

Report Date: 04/21/08
Date Received: 03/20/08

		Analysis		Lime	P-Olsen	NO3	Hg, Total	Ag-T	As-T	Cd-T	Cr-T	Cu-T	Fe-T	Mn-T
		Units		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
H08030309-001	TP-10-9	0	0				< 0.50	< 5	13	< 2	11	< 10	11000	250
H08030309-002	TP-12-6	0	0				< 0.50	9	210	3	10	99	16000	300
H08030309-003	TP-13-4	0	0				< 0.50	< 5	53	< 2	10	21	11000	130
H08030309-004	TP-14-4	0	0				< 0.50	< 5	50	4	12	26	14000	220
H08030309-005	TP-15	0	0	8.6	8.4	< 1	< 0.50	< 5	12	< 2	12	< 10	11000	280
H08030309-006	SS-100	0	0				< 0.50	43	710	7	10	260	31000	420
H08030309-007	SS-101	0	0				< 0.50	35	720	10	12	440	35000	430
H08030309-008	SS-102	0	0				< 0.50	14	710	7	10	110	19000	350
H08030309-009	SD-10	0	0				< 0.50	< 5	29	3	< 5	84	22000	340

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LABORATORY ANALYTICAL REPORT

Client: MT DEQ
Project: Toston Smelter
Workorder: H08030309

Report Date: 04/21/08
Date Received: 03/20/08

		Analysis		Ni-T	Pb-T	Sb-T	Zn-T
		Units		mg/kg	mg/kg	mg/kg	mg/kg
Sample ID	Client Sample ID	Up	Low	Results	Results	Results	Results
H08030309-001	TP-10-9	0	0	6	190	< 5	40
H08030309-002	TP-12-6	0	0	6	7600	28	250
H08030309-003	TP-13-4	0	0	< 5	1200	9	82
H08030309-004	TP-14-4	0	0	< 5	700	13	670
H08030309-005	TP-15	0	0	7	< 10	7	32
H08030309-006	SS-100	0	0	7	29000	83	530
H08030309-007	SS-101	0	0	7	27000	75	650
H08030309-008	SS-102	0	0	7	10000	32	450
H08030309-009	SD-10	0	0	< 5	810	18	1600

ENERGY LABORATORIES
877-472-0711 • 406-442-0711 • 406-442-0712 fax • helena@energylab.com

TO: Montana DEQ
ADDRESS:

LAB NO.: H08030309-001-009
DATE: 4/21/08

Toston Smelter

FERTILIZER RECOMMENDATIONS

Fertilizer Suggested in Actual Pounds per Acre

FIELD	TP-15	TP-15
CROP	Grass	Grass
PROJECTED YIELD	1T	2T
Nitrogen		
Total	30	75
Preplant	30	75
Topdress	0	0
Phosphorus (P_2O_5)		
Broadcast	25	35
Banded		
Potassium (K_2O)		
Broadcast	0	0
Banded		
Sulphur (S)	0	0
Zinc (Zn)		
Iron (Fe)		
Gypsum	0T	0T
Compost	10T	15T

COMMENTS: The TP-15 soil's organic matter is only 0.32%. To insure good grass establishment and growth, apply the above recommended compost amounts listed above plus recommended fertilizer.

PREPARED BY: Neal Fehringer, Certified Professional Agronomist, C.C.A., (406) 860-3647.

Chain of Custody and Analytical Request Record

Page 1 of 1

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

Company Name: Tetra Tech EM Inc	Project Name, PWS #, Permit #, Etc.: Toston Smelter
Report Mail Address: 7 West 6th Avenue Suite 612, Helena, MT 59601	Contact Name, Phone, Fax, E-mail: Colin McCoy (406) 442-5588 colin.mccoy@ttemi.com
Invoice Address: DEQ PO Box 200901, Helena, MT 59620	Invoice Contact & Phone #: Devin Clary (406) 841-5029
	Sampler Name if other than Contact: same
	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 _____

Number of Containers
Sample Type: A W S V B O
Air Water Soils/Solids Vegetation Bioassay Other

ANALYSIS REQUESTED

SAMPLE IDENTIFICATION (Name, Location, Interval, etc.)	Collection Date	Collection Time	MATRIX	Metals	Agricultural Soils Comp	SEE ATTACHED	Normal Turnaround (TAT)	RUSH Turnaround (TAT)
1 TP-10-9	3-18-08	9:30	1 S	X			X	
2 TP-12-6	3-18-08	10:30	1 S	X			X	
3 TP-13-4	3-18-08	10:45	1 S	X			X	
4 TP-14-4	3-18-08	11:45	1 S	X			X	
5 TP-15	3-18-08	12:15	2 S	X	X		X	
6 SS-100	3-18-08	12:25	1 S	X			X	
7 SS-101	3-18-08	12:27	1 S	X			X	
8 SS-102	3-18-08	12:30	1 S	X			X	
9 SD-10	3-18-08	13:00	1 S	X			X	
10								

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments:
Metals include: Sb, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Ag, Zn
Agricultural: pH, nitrate, sodium, sulfate, salt hazard, texture, lime, potassium, O.M., available phosph.
jar: Metals bag: agr.

Shipped by: Hand
Cooler ID(s)
Receipt Temp ____ °C
Custody Seal Intact Y N
Signature Match Y N
Lab ID

LABORATORY USE ONLY

Custody Record MUST be Signed

Relinquished by (print): Colin McCoy	Date/Time: 3/20/2008	Signature:	Received by (print): Roxanne Ivers
Relinquished by (print):	Date/Time:	Signature:	Received by (print):

Date/Time: 3-20-08 11:50 Signature:

Date/Time: Signature:

Sample Disposal: Return to client: ____ Lab Disposal: X

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.

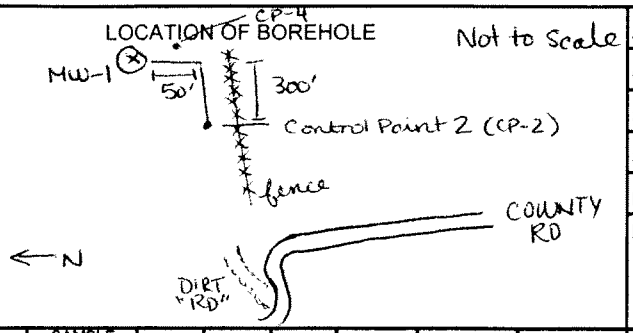
APPENDIX D

MONITORING WELL LOG

BOREHOLE LOG

Tetra Tech EM Inc.

SHEET 1 OF 1



JOB NO.: S1613017	BOREHOLE DESIGNATION: MW-1
CLIENT: Montana DEQ	SURFACE ELEVATION:
SITE: ~~Kalv~~ TOSTON	DEPTH TO WATER: N/A
~~SUBSITE:~~ SMELTER SITE	LOGGED BY: J Allewalt
DRILLING CO.: ~~Cascade~~ O'KEEFE	DRILLING DATES: 4/4/08
DRILLING PERSONNEL/METHOD: Mike Downey, Keith - Air Rotary	

SAMPLE TYPE	SAMPLE DEPTH TOP	SAMPLE DEPTH BOT	BLOWS PER 6 INCHES	RECOVERED	DRIVEN	TIME	PID READING	ANALYSIS PHYSICAL	ANALYSIS CHEMICAL	DEPTH IN FEET	USCS SOIL TYPE GRAPHIC LOG	SOIL DESCRIPTION
	NO SAMPLES REQ.									5		0-5: Topsoil; soil is silty sand w/ few fines. Dry
										10		5-10: Sandy gravel. Fn gravel w/ trace coarse; slightly damp.
										15	SM	10-15: Sandy gravel as above w/ more fractured rock fragments from air hammer. Limestone + sedimentary fragments. Slightly damp.
										20	SM	15-20: As above; gravel is coarse, sand is coarse.
											SM	19-22: Sandy gravel as above but w/ some fines; slightly cohesive, slightly damp.
										25	SM	22-27: Sandy gravel - more uniform fractured rock (limestone, sedimentary). Few sand. Gravel is angular. Slightly damp. No water.
										30	SM	
										35	SM	30-35: Same as above; trace cobbles. No water.
										40	SM	35-40: Sandy gravel as above, ~30% coarse sand; slightly damp, no water.
										45	SM	40-45: Same as above. No water.
										50	SM	45-50: Same as above. No ground water.
										55	ML	50-54: Very fine sand. No groundwater.

TD @ 56.5' bgs Well put in @ 55'

Screen = 35-55' bgs

April 4, 2008 TOSTON SMELTER

45°-50° Breezy, cloudy, dry. SITE

Monitoring well installation below repository.

0800 Leave Helena. Jessica Allewalt & Colin McCoy, TetraTech EM. Call O'Keefe driller Mike Downey to coordinate arrival & give directions.

0850 Check in w/ landowner Tom Helm; he is out & around. Meet up w/ drill equipment rigs; take to approximate location. They only have 2 guys + 3 rigs to utilize, so they drive back to E. Helena to get drill rig.

0900 Meet up w/ Tom Helm + locate monitoring well location. Discuss repository plan + seed mix for rep. cap as we wait

1015 Drill rig arrives – go through rig review on ~~[illegible]~~ rig before ~~[illegible]~~ Setting up.

4/4/08 cont. TOSTON MW-1

1030–1130 Setting up rig + equipmt @ monitoring well location. Devin Clary (DEQ) + G. Sturm (Tt) on-site

1210 Begin drilling.

1210 – 1330 Drilling borehole. Mixed silty sand w/ fractured rock. No water in hole. Material is slightly damp. Go to 55' so drillers won't have to cut casing @ odd length (= cut @ all). Fine sands from 50–54' bgs.

1330 – 1445 Setting well. Screen from 55'–35' w/ 5' sand above. Slot 0.010 Oglesby Norton silica sand; 3/8" bentonite chip hole plug above sand. Will pour concrete around protective casing on Monday when they return for their water truck.

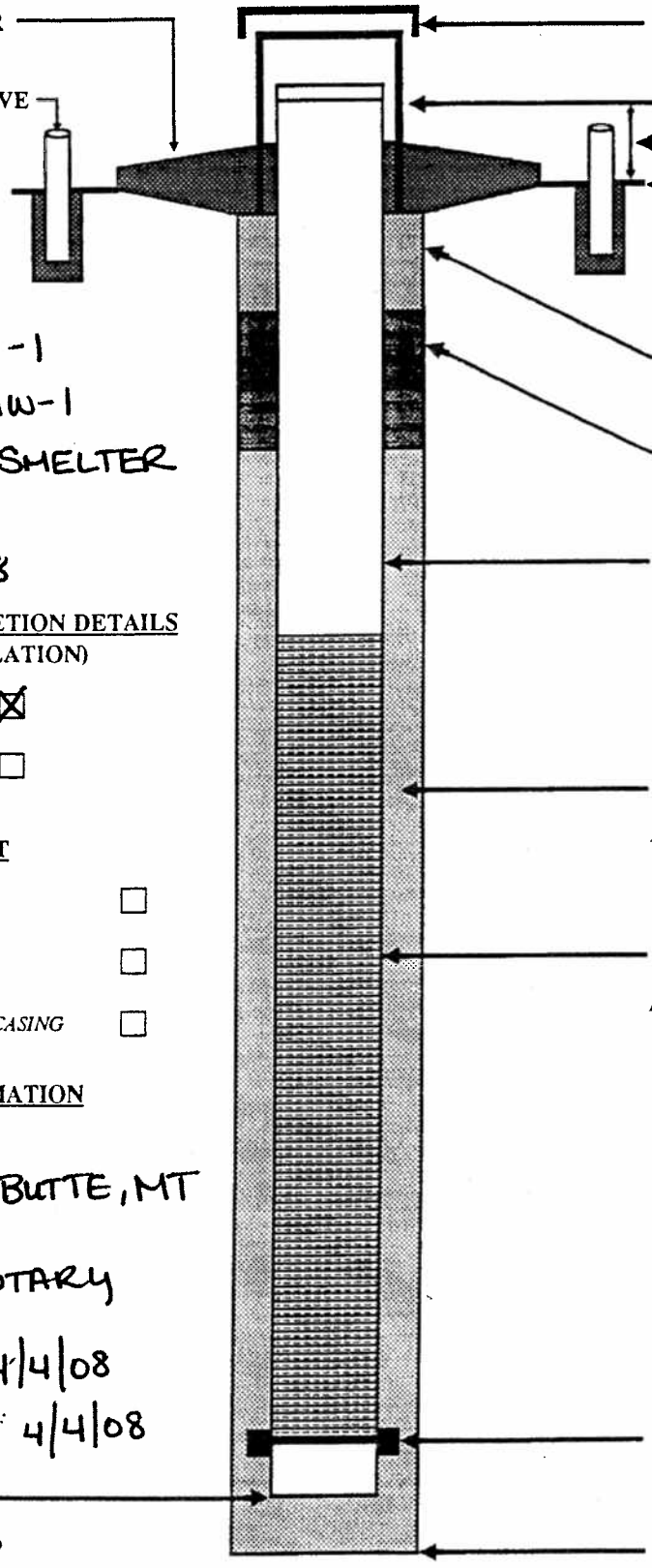
1500 Go show well to landowner Tom Helm,

1515 Leave site – head to Helena.

E Hewalt

TETRATECH EM INC

MONITORING WELL COMPLETION DIAGRAM



3-FOOT DIAMETER CONCRETE PAD

3-INCH PROTECTIVE STEEL POSTS EMBEDDED IN CONCRETE

LOCKING PROTECTIVE CASING

ELEVATION TOC: _____ FEET

STICK UP: _____ FEET

GROUND ELEVATION : _____ FEET

* 2 bags of sand inside protective casing

CEMENT/BENTONITE GROUT
FROM ~4' TO 0 FT. BELOW GROUND

BENTONITE ~~CHIPS~~ 3/8" CHIPS
FROM 30' TO 8' FT. BELOW GROUND

_____ PVC RISER CASING
FROM 35' TO 2' FT. ABOVE ~~BELOW~~ GROUND

_____ SAND PACK
FROM 56.5' TO 30' FT. BELOW GROUND

_____ SLOT PVC SCREEN
FROM 55' TO 35' FT. BELOW GROUND

STAINLESS STEEL CENTRALIZERS:
FEET
FEET

TOTAL DEPTH OF BOREHOLE : 56.5 FT.

_____ BOREHOLE

BACKFILL MATERIAL : SAND (1.5')

WELL

WELL NO.: MW-1

BOREHOLE NO.: MW-1

SITE: TOSTON SMELTER

SUBSITE:

DATE: 4/4/08

SURFACE COMPLETION DETAILS
(TYPE OF INSTALLATION)

ABOVE GROUND ☒

FLUSH MOUNT ☐

MEASURING POINT

TOP OF CASING ☐

GROUND SURFACE ☐

TOP OF PROTECTIVE CASING ☐

DRILLING INFORMATION

DRILLING COMPANY:
O'KEEFE, BUTTE, MT

DRILLING METHOD:
AIR ROTARY

DRILLING DATE(S):
4/4/08

INSTALLATION DATE(S): 4/4/08

BOTTOM OF WELL
55 FEET: bgs

WATER ADDED DURING DRILLING

YES ☐ GALLONS: _____

NO ☒

C:\FORMS\WELL2A.FRM mb/7-31-02