TETRA TECH

October 15, 2014

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Remediation Division
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Subject: Final 2013 Annual Sampling and Monitoring Report, for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 0

Dear Ms. DeWitt:

Tetra Tech, Inc. (Tetra Tech) is submitting the Final 2013 Annual Sampling and Monitoring Report, for the Montana Pole and Treating Plant, Butte-Silver Bow, Montana, Revision 0. This document incorporates all Montana Department of Environmental Quality (DEQ) comments on the Draft 2013 Annual Sampling and Monitoring Report, Revision 0, received via email from DEQ on September 22, 2014.

If you have any questions, please call me at (406) 442-5588.

Sincerely,

Kathie M. Roos

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Enclosures

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FINAL

2013
ANNUAL SAMPLING AND MONITORING REPORT
FOR THE
MONTANA POLE AND TREATING PLANT
BUTTE-SILVER BOW, MONTANA

Revision 0

Prepared for:

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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per liter
µg/kg	Micrograms per kilogram
amp	Ampere
ARCO	Atlantic Richfield Company
BRW	Butte Reduction Works
BSB	Butte-Silver Bow
BTL	Butte Treatment Lagoons
Calgon	Calgon Carbon Corporation
CDM	Camp Dresser & McKee
Chamberlain	Chamberlain Pump Company Inc.
CIP	Community involvement plan
COC	Chain of custody
CTEC	Citizens Technical Environmental Committee of Butte
Dioxins	Polychlorinated dibenzo-p-dioxins
DEQ	Montana Department of Environmental Quality
EDD	Electronic data deliverable
EPA	U.S. Environmental Protection Agency
Furans	Polychlorinated dibenzofurans
GAC	Granulated activated carbon
GC/ECD	Gas Chromatography with Electron Capture Detection
GC/MS	Gas Chromatography/Mass Spectrometry
gpm	Gallons per minute
GWMP	Groundwater and Surface Water Monitoring Plan
HCC	Hydraulic control channel
HDPE	High-density polyethylene
LNAPL	Light non-aqueous phase liquid
Lockmer	Lockmer Plumbing Heating and Utilities, Inc.
LTU	Land treatment unit
MAE	Microwave assisted extraction
MBMG	Montana Bureau of Mines and Geology
MDHES	Montana Department of Health and Environmental Sciences
MDT	Montana Department of Transportation
mg/kg	Milligrams per kilogram
MPTP	Montana Pole and Treating Plant
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
O&M	Operations and maintenance
Pace	Pace Analytical Services, Inc.

ACRONYMS AND ABBREVIATIONS (Cont.)

PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
pg/L	Picograms per liter
PLC	Programmable logic controller
PRP	Potentially responsible party
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial investigation and feasibility study
ROD	Record of decision
RPD	Relative percent difference
SDG	Sample delivery group
Siemens	Siemens Water Technologies, LLC
SOX	Soxhlet extraction
SSP	Soil staging and pretreatment piles
TEF	Toxicity equivalence factor
Tetra Tech	Tetra Tech, Inc.
TEQ	Toxicity equivalence quotient
TSDF	Treatment, storage, and disposal facility
WET	Water & Environmental Technologies
WTP	MPTP water treatment plant
WWTP	Butte Metro Sewer Treatment Plant

EXECUTIVE SUMMARY

This annual report for the Montana Pole and Treating Plant (MPTP) site describes site monitoring, summarizes analytical data generated, and evaluates the progress made toward remedial objectives during the 2013 calendar year. The report also discusses additional specific site operation and maintenance (O&M) activities for 2013, such as non-routine maintenance activities at the MPTP water treatment plant (WTP), use of the south-side infiltration system, impacts to groundwater from dewatering near the site, operation of the land treatment unit (LTU), temporary on-site storage of hazardous waste (spent granulated activated carbon [GAC]), and other related projects completed at the site during the year.

The primary activities at the MPTP in 2013 included (1) O&M activities, and (2) sampling. The WTP facilities are currently in good working order; however, some potential piping upgrades are being evaluated. The following summarizes activities outside of normal WTP operation:

- There was a continued overall decrease in the maximum sustainable pumping rate in the near highway recovery trench (NHRT). The decrease in the sustainable pumping rate has been observed for several years and continued throughout 2013 (see Section 2.3.1 for details).
- A leak in the potable water supply line was documented on April 22, 2013. As a result of this leak, fresh water to the WTP was unavailable until the leak was repaired by Lockmer Plumbing Heating and Utilities, Inc. (Lockmer), on April 26, 2013 (see Section 2.3.2 for details).
- The WTP operated on a non-routine basis for approximately 3 weeks (May 22, 2013, to June 17, 2013) to offset groundwater pumping by Butte-Silver Bow (BSB) at the Butte Metro Sewer Treatment Plant, also referred to as the wastewater treatment plant (WWTP), north of Silver Bow Creek. Dewatering by BSB to lower the groundwater table was needed at the WWTP to conduct routine maintenance associated with the secondary clarifiers (see Section 2.3.3 for details).
- Spikes in the concentrations of pentachlorophenol (PCP) were documented at the end of the third quarter 2013 for the WTP station BABB (between carbon tank) and station EFF (treated effluent) samples collected on September 16, 2013, and September 23, 2013. Split samples were collected to verify the original sample results. The confirmation data supported a conclusion that GAC replacement was necessary (see Section 2.3.4 for details).
- A carbon supplier was procured, and on November 13, the primary GAC train's two tanks were pressurized and approximately 15,000 pounds of spent GAC and associated water were transferred into a holding tank located outside the south wall of the WTP. New GAC was then transferred into the empty tanks and the carbon change-out was completed. Valve settings were changed such that the former secondary treatment train became the new primary treatment train, and the former primary treatment train (with new GAC) became the new secondary treatment train (see Section 2.3.5 for details).
- The NHRT pump motor (18-year-old motor with 2-year-old pump end) failed on December 14, 2013, tripping a safety relay and shutting down; at that point, no recovery from that trench could be obtained. To compensate, the flow rate in the near creek recovery trench (NCRT) was increased from 205 gallons per minute (gpm) to 305 gpm to ensure the total recovery flow remained consistent. Because of the cold weather, the plumbing for the NHRT system was

drained to the degree possible to mitigate any potential freeze issues (see Section 2.3.6 for details).

- Ponding of a large volume of water was noted on December 16, 2013, immediately south of the interstate highway berm, indicating a significant break in the main potable water supply line to the WTP. The on-site potable water shut-off valve was immediately closed and Lockmer was called to investigate and repair the broken line. The area of the break was then dug up, the break was located and repaired, and the hole was backfilled (see Section 2.3.7 for details).
- On December 26, 2013 the WTP experienced a freeze-up of the programmable logic controller (PLC) unit for the plant lift pumps. The issue appeared to be associated with back-wash activities when a second pump was called for. The issue was resolved remotely (see Section 2.3.8 for details).

The concentrations of PCP in WTP effluent samples (station EFF) were always below the 1 micrograms per liter (µg/L) MPTP Record of Decision (ROD) cleanup level in 2013, except for the period from September 16, 2013 (11.1 µg/L), to October 7, 2013 (3.79 µg/L). These results led to a change-out of GAC in the primary carbon tanks as discussed in Section 2.3.5.

The concentrations of polychlorinated dibenzo-p-dioxins (dioxin) and polychlorinated dibenzofurans (furans), collectively referred to as "dioxins" have varied over time, and dioxins have been detected in WTP effluent samples collected during sampling events each year. Results for sampling conducted in 2013 indicate that concentrations of dioxin (toxicity equivalence quotient [TEQ]) in WTP effluent have met the ROD cleanup level (10 picograms per liter [pg/L]). The concentration of dioxin (TEQ) in the WTP treated effluent sample collected on August 12, 2013, was 0.37 pg/L.

The concentrations of metals, polycyclic aromatic hydrocarbons (PAH), chlorophenols, and anions for WTP samples collected in 2013 were all below the ROD cleanup levels (where established).

No floating product was recovered within the groundwater collection system during 2013, continuing a trend that started in February 2009.

The LTU was tilled on May 1, 2013, and July 18, 2013, for the sampling zones that had not met the cleanup standard for PCP during the 2012 LTU soil sampling event. Soil moisture conditions in May 2013 were sufficiently high to avoid generation of dust. During the tilling that occurred on July 18, 2013, LTU soil conditions were characterized as "wet" as a result of the 0.37 inch of precipitation received on July 16, 2013, through July 17, 2013. Neither odors nor dust were documented during tilling operations at any time in 2013. The LTU was irrigated seven times during the third quarter of 2013 on an as-needed basis to control dust.

The most recent soil sampling event was conducted on October 1, 2013, when 10 soil samples (two samples from LTU zones 2, 3, 4, 5, and 6: one shallow soil sample [0 to 24 inches] and one deep soil sample [24 to 36 inches]) were collected and analyzed for PCP. Additionally, 10 soil samples (one soil sample from each of the 10 LTU zones: one composite sample [0 to 36 inches]) were collected and analyzed for dioxins. The aliquots from the respective depths were homogenized and representative samples from each depth were analyzed for PCP or dioxins, as appropriate.

The concentrations of PCP in LTU soils in 2013 were below the ROD cleanup level (34 milligrams per kilogram [mg/kg]) in LTU zones 2, 5, and 6, but slightly exceeded this cleanup level in LTU zones 3 and 4. The average concentration of PCP in all LTU zones sampled (zones 2, 3, 4, 5, and 6) in 2013 was 26.8 mg/kg, which is less than the ROD cleanup level (34 mg/kg). The average PCP concentration in 2013 is likely biased high because the zones below clean up levels in 2012 were not included in the 2013 sampling event.

LTU soils were not analyzed for PAH during this round of sampling, since all sections of the LTU had previously met the cleanup goal for PAH in two successive sampling efforts.

1.0 INTRODUCTION AND PURPOSE

This annual report for the Montana Pole and Treating Plant (MPTP) site describes site monitoring, summarizes analytical data generated, and evaluates the progress made toward remedial objectives during the 2013 calendar year. The report also discusses additional specific site operation activities for 2013, such as non-routine operation and maintenance (O&M) activities at the MPTP water treatment plant (WTP), use of the south-side infiltration system, impacts to groundwater from dewatering near the site, operation of the land treatment unit (LTU), temporary on-site storage of hazardous waste (spent activated granulated carbon [GAC]), and other related projects completed at the site during the year.

1.1 REPORT ORGANIZATION

Section 1.0 provides a summary of the site's operational and regulatory history. WTP operation and related activities are discussed in Section 2.0. LTU operations, soil treatment, and soil sampling are summarized in Section 3.0. Section 4.0 provides the results of surface water and groundwater monitoring and an assessment of overall system performance and compliance with the requirements of the MPTP Record of Decision (ROD) (U.S. Environmental Protection Agency [EPA] and Montana Department of Environmental Quality [DEQ] 1993). Historical residential well sampling results are summarized in Section 5.0. Additional site activities are discussed in Section 6.0. Section 7.0 summarizes database management. Tables and figures follow the text. An electronic copy of the Microsoft Access database for the MPTP site is provided in Appendix A. PCP results for WTP, groundwater and surface water, as well as selected groundwater level data are provided in Appendix B. Appendices C through H provide an assortment of photologs, plume maps, and results from Mann-Kendall statistical testing.

1.2 SITE HISTORY

The MPTP is located in Butte, Montana, and operated as a wood treating facility from 1946 to 1984 (EPA and DEQ 1993) (Figure 1.1). During most of this period, a solution of about 5 percent pentachlorophenol (PCP), mixed with petroleum carrier oil similar to diesel, was used to preserve poles, posts, and bridge timbers. The PCP solution was applied to wood products in butt vats and pressure cylinders (retorts). Creosote was used as a wood preservative for a brief period in 1969.

The plant initially included a pole peeling machine, two butt treating vats, on-site chemical storage tanks, and related ancillary facilities. Major modifications to the plant occurred between 1949 and 1951 and again around 1956. Sometime between 1949 and 1951, a 73-foot-long, 6-foot-diameter retort was

installed to increase the efficiency of timber treatment production. A second retort, 66 feet long and 7 feet in diameter, was installed around 1956.

On May 5, 1969, an explosion occurred while a charge of poles was being treated in the east butt-treating vat. The explosion generated a fire that destroyed the east vat, boiler room, and retort building. Although the boiler, retorts, and auxiliary equipment were damaged, the plant was rebuilt and functional by December 1969. Petroleum and PCP product reportedly spilled from the east butt-treating vat as a result of the explosion and fire. Additional seepage of product occurred from both retorts as a result of broken pipes and valves damaged by the fire. Reportedly, none of the on-site chemical storage tanks was ruptured as a result of the fire.

In response to implementation of the Resource Conservation and Recovery Act (RCRA), a closed-loop process water system was constructed in 1980. The closed-loop water recovery system was operated by collecting wastewater in storage tanks, recirculating this water through the condensing system, and then evaporating excess water using aeration sprays. On May 17, 1984, the MPTP ceased operations.

1.3 SITE INVESTIGATION

In March 1983, a complaint was filed by a local citizen concerning oil seeping into Silver Bow Creek near the MPTP facility. The Montana Department of Health and Environmental Sciences (MDHES) (now DEQ) investigated the complaint and discovered an oil seep on the south side of Silver Bow Creek directly downgradient from the MPTP facility. Further investigation of the site revealed oil-saturated soils adjacent to the creek and on MPTP property. Subsequent sampling confirmed the presence of PCP, polycyclic aromatic hydrocarbons (PAH), polychlorinated dibenzo-p-dioxins (dioxin) and polychlorinated dibenzofurans (furans), collectively referred to as “dioxins” in site soils and oil samples. MDHES and EPA completed both a preliminary assessment and site inspection and a subsequent Hazard Ranking Score in July 1985.

Also in July 1985, the EPA Emergency Response Branch began a removal action on the site to minimize impacts to Silver Bow Creek and to stabilize the site. In October 1989, EPA granted MDHES the initial enforcement funding to conduct potentially responsible party (PRP) noticing and to negotiate and issue an administrative order. In April 1990, MDHES signed an administrative order on consent with Atlantic Richfield Company (ARCO) under which ARCO agreed to conduct a remedial investigation and feasibility study (RI/FS) at the site. In June 1990, ARCO began the RI/FS following the MDHES-and EPA-approved RI/FS work plan.

In June 1992, EPA proposed an additional removal action to control and recover the light non-aqueous phase liquid (LNAPL) (floating oils) in groundwater identified during the RI. The older remedial system installed in 1985 was shut down when the MPTP water treatment facility went into operation on January 22, 1993.

1.4 REMEDY IMPLEMENTATION AND STATUS

The MPTP cleanup is being implemented in six phases. The design for Phase 1 of the remedial action was finalized in June 1996; construction occurred from May 1996 to November 1997. The primary remedy components completed during Phase 1 of the remedial action consisted of construction of the LTU and 13 soil staging and pretreatment piles (SSP), building an addition to the previous WTP, construction of two groundwater recovery trenches that form the current remedy extraction system (the near highway recovery trench [NHRT] and the Near Creek Recovery Trench [NCRT]), removal of the previous EPA groundwater recovery system, and excavation of the north-side contaminated soils.

Phase 2 consisted of removal and disposal of hazardous and nonhazardous waste debris remaining on site. The design for Phase 2 of the remedial action was finalized in December 1998; construction occurred from March 1999 to May 1999. Off-site disposal methods included incineration or placement in hazardous and nonhazardous waste landfills, as appropriate. Metal debris was pressure washed and recycled.

Phase 3 consisted of excavating the south-side contaminated soils, off-loading Phase 1 treated soils from the LTU, placing approximately 132,000 cubic yards of contaminated soil on the LTU, installing the north- and south-side infiltration systems, and relocating sewer and potable water lines. The design for Phase 3 of the remedial action was finalized in July 1999; construction occurred from October 1999 to December 2000. The infiltration system was operated continuously through November 2002. Since that time, the south-side infiltration system has been used periodically to maintain adequate groundwater levels to operate recovery trench pumps and aid in flushing the contaminated soils remaining beneath the interstate. The north side infiltration system has not been used since 2002.

Phase 4 is ongoing and involves the continued capture and treatment of contaminated groundwater and the biological treatment of contaminated soils. This phase includes off-loading the LTU as surface soil lifts are remediated to below the action limits set for the site in the ROD. The next and final off-load will likely include all remaining soil on the LTU.

Phase 5 addresses the contaminated soils beneath the interstate that divides the site. In March 2009, Tetra Tech, Inc. (Tetra Tech), submitted a report titled "Final Treatability Study Workplan, Montana Pole and Treating Plant Site – Phase 5" (Tetra Tech 2009) that evaluated areas of residual soil contamination and potential remedial technologies. The report incorporated a literature review of three in situ treatment technologies: in situ chemical oxidation, in situ soil flushing, and in situ bioremediation. Two technologies were retained at that time for further evaluation:

- Modified Fenton's Reagent
- In Situ Soil Flushing

In 2013, the 2009 treatability study was revisited as was suggested in the Third Five-Year Review (DEQ 2011) to account for more recent field data, and to take into consideration (1) the planned construction activities and associated construction dewatering at the Butte Metro Sewer Treatment Plant, also referred to as the wastewater treatment plant (WWTP), and (2) the impact of dewatering on ongoing remediation at the MPTP site. As part of this effort, a draft memorandum was prepared that considered but dismissed the two previous potentially applicable technologies and outlined a conceptual approach and approximate costs for full-scale implementation of three new potentially promising alternatives (Tetra Tech 2013a):

- Bioventing – Vertical Well Approach
- Bioventing – Horizontal Well Approach
- Chemical Oxidation – Horizontal Well Approach

Due to complications associated with the upcoming WWTP construction dewatering, further evaluation of these technologies will be temporarily put on hold and evaluated again later. As described on page 44 of the ROD (EPA and DEQ 1993): "After it has been determined by the lead agency, in consultation with the support agency, that recovery of hazardous substances from these areas is no longer effective or practical and contaminant levels have plateaued, these areas will be addressed by *in situ* bioremediation as outlined under Performance Standards for Groundwater."

Phase 6 consists of removal and disposal of the soil treatment facilities on the south side of the site and final revegetation of all disturbed areas. Phase 6 began with dismantling the SSPs in 2004. It is expected that the final land use at the site will be determined in conjunction with Butte-Silver Bow (BSB) County and interested citizens, with certain constraints on land use specified by the EPA and DEQ to ensure long-term protectiveness of the remedy, consistent with the ROD.

2.0 WATER TREATMENT PLANT

The following sections provide information related to WTP operations and analytical results for 2013. A number of operational issues arose during the year that required immediate response. The more significant issues included:

- A decrease in the maximum sustainable pumping rate in the NHRT
- A leak in the water supply line at the west side of the decontamination pad (April)
- Changes in WTP operations to offset groundwater pumping at the WWTP north of Silver Bow Creek (May to June)
- Elevated concentrations of PCP in samples collected between the primary and secondary carbon tanks and in treated plant effluent, leading to a need for carbon change-out at the WTP (September and October)
- Failure of the NHRT pump (December)
- A break in the main potable water supply line that caused on-site flooding south of the interstate highway embankment (December)
- Seizure of the programmable logic controller (PLC) unit for the WTP lift pumps (December)

Other than needing to address the above issues, O&M of the MPTP WTP was conducted on a routine basis for the remainder of 2013. Overall plant operations including redirection of treated plant effluent to the south-side infiltration system, operational issues encountered and corrective actions taken to address these issues, and collection and analysis of trench and WTP samples are discussed in the sections below.

2.1 WATER TREATMENT PLANT OPERATIONS

The groundwater treatment system at the site consists of a WTP, two groundwater recovery trenches (NHRT and NCRT), and the south-side infiltration system consisting of eight infiltration cells (Figure 2.1). In 2013 the WTP flow rate ranged from 295 gallons per minute (gpm) to 424 gpm; the WTP treated an average of 337 gpm for the 2013 reporting period (Table 2.1).

Water from the NHRT is first pumped to an oil and water separator to facilitate recovery of any floating product (no product has been recovered in this system since early 2009). The combined water from the NHRT (via the oil and water separator) and from the NCRT is then pumped through a four-tank (two parallel carbon trains consisting of primary and secondary carbon tanks connected in series) GAC treatment system. After carbon treatment, the water (treated effluent) is discharged to Silver Bow Creek.

In 2013, some WTP treated effluent was pumped to the south-side infiltration system as discussed in Section 2.2.

The WTP samples collected between the lead and lag carbon units (station BABB), while higher than the effluent, remained near the discharge standard for the majority of the year. Exceptions were noted between September 16, 2013, and November 18, 2013 at which time the concentrations of PCP in BABB samples were higher than usual (the maximum BABB concentration was 31.1 µg/L on September 23, 2013). On November 13, 2013, the GAC in the primary carbon tanks was changed-out as explained in Section 2.3.5.

Approximately 45 kilograms of dissolved PCP were removed from groundwater at the site in 2013. Since the facility went into operation in January 1993, the WTP has treated almost 3 billion gallons of contaminated water (Table 2.2) and has removed approximately 1,684 kilograms of dissolved PCP from the groundwater. These amounts are in addition to PCP removed through oil recovery operations and natural attenuation. More than 60,000 gallons of free product have also been recovered and disposed of since January 1993.

The NHRT and NCRT, along with their associated pumps, have been reasonably effective in capturing site groundwater. Groundwater capture and plume containment monitoring are evaluated by verifying gradients from downgradient wells toward the trenches and through numerous water level readings. Performance monitoring including an assessment of compliance with ROD cleanup levels is discussed in Section 4.0.

The WTP primary carbon tanks were backwashed five times in 2013 (February 11, 2013; June 24, 2013; September 27, 2013; November 11, 2013; and November 18, 2013). The secondary carbon tanks were backwashed six times (February 27, 2013; May 6, 2013; July 1, 2013; September 10, 2013; September 27, 2013; and November 13, 2013). The backwashing that occurred in November 2013 was related to the GAC change-out that occurred on November 13, 2013 (see Section 2.3.5).

The WTP facilities are currently in good working order; however, some potential piping upgrades are being evaluated. If implemented, the upgrade would (1) reduce the complexity of the current WTP, (2) reduce heating costs, and (3) reduce the cost of maintaining and replacing pumps, especially during extremely cold weather.

2.2 INJECTION ACTIVITIES

Approximately 25 to 30 gpm of treated WTP water continued to be directed to the west side storm drainage area near the west end of the NHRT in 2013 (Figure 1.1). Treated water has been directed to this area by gravity flow since April 2010 to improve the groundwater gradient in a critical capture area for the site PCP plume, while at the same time increasing the groundwater gradient within the NHRT to direct more contaminant toward the recovery pump location at manhole #2 (Figure 1.1). This action should also add oxygenated water to the aquifer, which may stimulate biological treatment.

Also in 2013, treated WTP effluent was, at times, directed to the south-side infiltration system as described below (Figure 2.1). The rates of injection are set by the plant operator, taking into consideration capture gradients, general aquifer elevation, impacts of precipitation and ponding caused by beaver activity, as well as contaminant recovery rates in the WTP. Any effluent not directed to the west side of the NHRT as described above or to the south-side infiltration system was discharged to Silver Bow Creek. Injection activities for each quarter of 2013 are discussed in detail below.

First Quarter

The location and rate of injection within the south-side infiltration system varied throughout the first quarter, as follows:

- From January 1 to January 13, 2013, 150 gpm of treated plant water from the WTP was directed to infiltration cell 8.
- From January 14 to January 20, 2013, 150 gpm of treated plant water was directed to infiltration cell 4.
- From January 21 to February 14, 2013, 150 gpm of treated plant water was directed to infiltration cell 1.
- From February 15 to March 10, 2013, 150 gpm of treated plant water was directed to infiltration cell 6.
- On March 11, 2013, the rate of injection of treated plant water to the south-side infiltration system was reduced from 150 gpm to 100 gpm to better control the PCP plume along the eastern edge of the MPTP site. From March 11 to March 31, 2013, 100 gpm of treated plant water was directed to infiltration cell 6.

Second Quarter

Approximately 100 gpm of treated effluent from the WTP was directed to infiltration cell 6 from April 1, 2013, to June 30, 2013.

Third Quarter

Approximately 100 gpm of treated effluent from the WTP was directed to infiltration cell 6 of the south-side infiltration system from July 1, 2013, to September 30, 2013 (4:30 p.m.).

Fourth Quarter

In response to extremely heavy rainfall throughout September and elevated concentrations of PCP at the WTP, the redirection of treated plant effluent to the south-side infiltration system was terminated on September 30, 2013, to reduce the effects of flushing high concentrations of contaminants from under the interstate highway embankment and to reduce the overall flow rate through the treatment system (see Section 2.3.4). The rate of injection was maintained at 0 gpm for the entire fourth quarter.

2.3 OPERATIONAL ISSUES

A number of non-routine operational issues arose in 2013, some of which required an immediate response. The more significant issues are discussed below.

2.3.1 Overall Decrease in the Maximum Sustainable Pumping Rate in the NHRT

An apparent decrease in the maximum sustainable pumping rate in the NHRT has been observed for several years and continued throughout 2013. Specifically, the maximum sustainable pumping rate in the NHRT has decreased (at a given trench water elevation) about 30 gpm since about 2005. It appears that perforated piping and gravels in the NHRT may be partially clogged, inhibiting flow from trench gravels to the recovery plumbing, thus likely accounting for the need to reduce the recovery rate at this location. Modification of the NHRT piping to improve flow was considered by the plant operator, and on March 27, 2013, a 2-inch-diameter hole was drilled in the standpipe for the well point at manhole #2 to facilitate a greater rate of groundwater flow into and within the NHRT. Since this modification was made, the maximum NHRT pump rate at a given value of head has increased approximately 10 to 15 gpm over conditions prior to March 27, 2013.

2.3.2 April 22, 2013, Leak in the Potable Water Supply Line

A leak in the potable water supply line at the west side of the decontamination pad was discovered on April 22, 2013. As a result of this leak, fresh water to the plant was unavailable until the leak was repaired by Lockmer Plumbing Heating and Utilities, Inc. (Lockmer), on April 26, 2013. The repair consisted of re-welding a 90-degree fitting for a 4-inch high-density polyethylene (HDPE) line that

services the hydrant for the decontamination pad. No other plumbing issues arose in 2013 related to this leak or repair work.

2.3.3 May 22, 2013, Change in WTP Pumping to Offset BSB WWTP Groundwater Pumping

The WTP operated on a non-routine basis for approximately 3 weeks (May 22 to June 17, 2013) to offset groundwater pumping at the WWTP north of Silver Bow Creek. Dewatering by BSB to lower the groundwater table was needed at the WWTP to conduct routine maintenance associated with the secondary clarifiers. The discharge rate and volume of groundwater pumped at the WWTP were monitored by consultants for BSB and averaged approximately 225 gpm between May 24, 2013, and June 5, 2013. Groundwater extracted at the WWTP was discharged directly to the Butte Reduction Works (BRW) pond; overflow from the pond then reported to the hydraulic control channel (HCC), the Butte Treatment Lagoons (BTL), and ultimately to Silver Bow Creek (Water & Environmental Technologies [WET] 2013).

On May 22, 2013, the pumping rate in the NCRT was increased from 220 gpm to 310 gpm in an attempt to partially offset groundwater pumping at the WWTP. The higher rate was maintained through June 10, 2013. The pumping rate in the NHRT for the period from May 28, 2013 to June 17, 2013, decreased from 120 gpm to about 110 to 119 gpm as a result of the lower water table and resulting decreased hydraulic head in the trench.

2.3.4 WTP Effluent Exceedances and WTP Split Sampling Results

Increased concentrations of PCP were documented at the end of the third quarter 2013 for the BABB and EFF WTP samples collected on September 16, 2013, and September 23, 2013 (Table 2.3). Both sets of data were received from the Montana Bureau of Mines and Geology (MBMG) laboratory on the same date (September 27, 2013). Elevated data were at first considered possibly anomalous based on (1) the previously estimated remaining life of the primary carbon beds (1.5 years), (2) possible recent issues with laboratory data quality as previously noted in the 2013 third quarterly monitoring report (Tetra Tech 2013b), and (3) the lack of an upward trend in the concentrations of PCP in BABB and EFF samples.

In response, MBMG reanalyzed stored aliquots of the September 16, 2013, and September 23, 2013, plant samples as a check on the initial analysis. The samples were reanalyzed on the same day (September 27, 2013) and the initial results were confirmed. At that point, the following mitigating actions were taken:

- September 30, 2013. The ongoing redirection of treated plant effluent to the south-side infiltration system was terminated to reduce the effects of flushing high concentrations of

contaminants from under the interstate highway embankment and to reduce the overall flow rate of the treatment system.

- October 1, 2013. The pumping rate in the NHRT was reduced from 120 gpm to 115 gpm and the pumping rate in the NCRT was reduced from 220 gpm to 210 gpm. The pumping rates continued to be further reduced until October 29, 2013, when the NHRT pumping rate was set and maintained at 105 gpm, and the NCRT pumping rate was set and maintained at 200 gpm. Reduction in pumping rates increased the residence time in the carbon beds and helped to improve removal efficiencies.

Split samples were collected at MPTP WTP stations IN, BABB, EFF, NCRTEFF, and NHRTEFF on October 7, 2013, and October 14, 2013. A total of 12 samples (including field duplicates and field blanks) were analyzed for PCP at both the MBMG (using EPA Method 528 [1]) and Pace laboratories (using EPA Method 515.3 [2]). The difference in analytical methods used was solely a function of laboratory preferences and thus could not be avoided; some variation in results would be expected based on the differences in the analytical methods employed. The October 2013 WTP split sampling results are provided in Table 2.4.

The variance between the original and split sample concentrations was calculated as a relative percent difference (RPD) for each original/split sample pair. The formula for RPD is:

$$RPD = \frac{|A - B|}{(A + B)/2} \quad x \quad 100$$

where: A = First duplicate concentration (MBMG original sample)
B = Second duplicate concentration (Pace split sample)

In general, the industry accepted goal for RPDs is 35 percent (or lower). The analysis provided in Table 2.4 indicates that nine of 12 (75 percent) liquid matrix split samples met the RPD goal of 35 percent (or less). Three of 12 (25 percent) did not meet this goal, and in each case the MBMG concentration in the original sample was less than the Pace Laboratory concentration in the split sample.

Even using different methods for analysis, the average RPD for 12 samples was 24.6 percent, which is within the 35 percent (or lower) project goal. Based on these data, the split sample analysis suggested

[1] EPA Method 528 - Phenols in Water by GC/MS. Official Name: Determination of Phenols in Drinking Water by Solid Phase Extraction and Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS)

[2] EPA Method 515.3 - Chlorinated Acids by GC/ECD. Official Name: Determination of Chlorinated Acids in Drinking Water by Liquid-Liquid Extraction, Derivitization, and Gas Chromatography with Electron Capture Detection

there were no laboratory data quality issues or concerns serious enough to warrant additional follow-up. Therefore, the original MBMG analytical data were accepted as representative of actual WTP conditions for the October 7, 2013, and October 14, 2013, WTP sampling events. These data supported a conclusion that GAC replacement was necessary.

2.3.5 November 13, 2013, Carbon Change-Out

Under a sole-source contract, Siemens was procured for the carbon change-out on November 6, 2013. Documentation associated with the carbon change-out procurement and delivery is provided in the 2013 third quarter monitoring report (Tetra Tech 2013b).

On November 13, 2013, the primary GAC train's two tanks were pressurized one at a time to transfer approximately 15,000 pounds of spent GAC and associated water into the holding tank located outside the south wall of the WTP. After this transfer had been completed, approximately 15,000 pounds of virgin coconut shell GAC (not reactivated) were transferred from the Siemens delivery truck to the two primary GAC tanks.

During cleanout of the two primary GAC tanks (located south of the two secondary GAC tanks), an unquantifiable volume of carbon (heal) could not be removed from the "B" (western) tank because of heavy encrustation and the inability to use pressurized water to dislodge the encrusted carbon from the bottom of the tank as it filled with water. While the primary GAC "B" (western) tank was significantly more encrusted than the primary GAC "A" (eastern) tank, both tanks exhibited conditions representative of what is thought to be iron and\or manganese fouling. The material in the primary "A" tank was fluid enough to elute, which was not the case for some of the material in the primary "B" tank. Currently, there is an imbalance of new carbon mass between the two tanks because of the encrusted carbon that was left in the primary "B" tank.

After the carbon change-out was completed, the valve settings were changed such that the former secondary treatment train became the new primary treatment train, and the former primary treatment train (with new GAC) became the new secondary treatment train.

A hose was connected to the bottom of the 11,000-gallon storage tank so that contaminated water from the tank could drain to a sump inside the WTP and be treated with other plant influent before discharge. The storage tank was appropriately labeled. The decanted spent GAC will be transported for off-site incineration at an appropriate RCRA approved treatment, storage, and disposal facility (TSDF) when outside ambient temperatures and tank contents are above freezing.

2.3.6 December 9, 2013, NHRT Pump Failure and Related Issues

On the morning of December 9, 2013, an alarm in the queue showed the NHRT pump drive had faulted during the evening, even though the pump was running as expected. Later that morning, a system alarm sounded, indicating flooding in the NCRT meter vault. The frozen-shut vault lid was pried open and the vault was inspected. Flooding was not encountered within the vault, but the surfaces of the vault were covered with heavy frost — a condition that likely lead to the spurious vault-flood alarm. This false alarm did not clear for several days.

Later during the morning of December 9, 2013, the NHRT pump drive went off with a ground fault; the fault was cleared and the pump started again and ran. Early in the morning of December 10, 2013, the drive faulted again via ground fault alarm and shut down. The plant operator attempted troubleshooting and repair, but the pump continued to cycle on and off via the alarm for the remainder of the day. At this point, Lockmer was contacted and a service call was scheduled for the next day. During the evening of December 10, 2013, the NHRT pump shut off via a fault again and the plant operator bypassed the drive to keep the pump running as a result of the cold weather.

A Lockmer electrician arrived on December 11, 2013, and conducted a thorough inspection of the NHRT pump system. The inspection found that the ground wire to the pump had approximately 0.2 amperes (amps) of current, indicating that there was leakage to ground. A decision was made to let the system run during the day, hoping that the ground leak was possibly caused by moisture in a wiring connection and to discount the possibility of impending pump failure. At the end of the day, the same level of current to ground was noted, indicating the pump was likely failing. Chamberlain Pump Company Inc. (Chamberlain) was contacted and arrangements were made to change out the pump.

Also on December 11, 2013, the lift pumps in the treatment area shut off without any indication of an alarm. The plant operator was unable to get any response from the system in an attempt to restart the pumps. The system was powered down three times in an attempt to start the pumps, but all attempts failed. The already onsite Lockmer electrician checked the system and found that the onboard logic controller and input panel had faulted and was frozen and unresponsive. The Tetra Tech electrical engineer was contacted by the plant operator to troubleshoot the system and was able to clear the faulted logic controller and input panel remotely. Concurrent with these issues, the Number 2 lift pump ceased operating because fuses had blown. The fuses were replaced and the system started up with no further issue.

On December 12, 2013, the Tetra Tech electrical engineer was again contacted to correct a tank level control malfunction. He found that the malfunction was caused by two out-of-range values that were hitting the logic controller at the same time, causing a lock-up.

On December 13, 2013, the plant operator inspected heat tapes in the pump vaults and other locations, bolstering insulation where possible. At this time, he noted that that the heat trace for the NCRT vault had tripped on ground fault and was off. Faulting occurred several times after the initial trip; the likely cause is assumed to be related to condensation and freezing in the outside vaults.

The NHRT pump motor (18-year-old motor with 2-year-old pump end) failed completely on Saturday, December 14, 2013, tripping a safety relay and shutting down; at that point, no recovery from that trench could be obtained. To compensate, the flow rate in the NCRT was increased from 205 gpm to 305 gpm to ensure the total recovery flow remained consistent. Because of the cold weather, the plumbing for the NHRT system was drained to the degree possible to mitigate any potential freeze issues.

The NHRT pump was changed out by Chamberlain without any issues on December 17, 2013. The old pump and associated plumbing were covered with what appeared to be either an iron or a manganese precipitate, or microbial growth. Pump fouling has been noted since 2009 each time the pump has been serviced. The old motor was not salvageable; however, the old pump end was cleaned and put in inventory for future use. Photographs of the NHRT pump after removal and initial cleaning are provided in Appendix C. In the short term, the NHRT pump will be pulled, and the pipes and pump screen will be cleaned on a regular schedule. A long-term solution for the NHRT and pump fouling is being investigated. As part of that investigation, a sample of the material causing pump-fouling will be collected and analyzed the next time the pump is cleaned.

2.3.7 December 16, 2013, Water Supply Line Rupture

The plant operator noted ponding of a large volume of water immediately south of the interstate highway berm while making his rounds on Monday morning, December 16, 2013 (see Appendix D). The ponding appeared to indicate a significant break in the main potable water supply line to the MPTP plant. The on-site potable water shutoff valve was immediately closed and Lockmer was called to investigate and repair the broken line. Extreme cold, and cycles of freeze and thaw were a likely contributor to the line rupture.

A bilge pump and two pumper trucks were used to redirect the ponded water in the immediate area of the break to other parts of the site so that the water line could be physically accessed. Most of the flood water was directed to areas on the south side of the site, but a portion was pumped to the north side of the site in the area of wells INF-01through INF-03 to manage the entire volume and keep it all on site.

The area of the break was then dug up using a medium-sized excavator. The break was located and repaired, and the hole was backfilled with clean road mix because the pile of excavated material quickly froze in place. A photolog of these activities is provided in Appendix D.

Issues related to upgrading of the water line will be addressed in coordination with the next LTU offload to factor in soil depths and the reconfigured land surface elevations.

2.3.8 December 26, 2013, PLC Seizure

On Thursday, December 26, the WTP experienced a freeze-up of the PLC unit for the plant lift pumps. The issue appeared to be associated with back-wash activities when a second pump was called for. Tetra Tech electrical engineers were able to remotely correct these PLC issues on December 30, 2013. This problem emphasized the need for manual control of the lift pumps. This issue will be rectified in 2014.

2.4 WATER TREATMENT PLANT SAMPLING RESULTS

Samples of the WTP influent (station IN), effluent (station EFF), and from between the two carbon units (station BABB) are collected on a weekly basis and are analyzed for PCP. Effluent from the NHRT and NCRT are sampled monthly and are analyzed for PCP. WTP monitoring stations are shown on Figure 2.2. A summary of the PCP sampling and analysis conducted in 2013 is provided in Table 2.5.

The concentrations of PCP for WTP samples for the 2001 to 2013 period of record are provided in Table 2.3 and Appendix A. PCP concentrations have generally decreased over time in the influent samples, ranging from about 130 µg/L to 631 µg/L in 2001, to 0.852 µg/L to 176 µg/L in 2013. Sampling results throughout 2013 indicate that approximately 95 percent of the contaminant load to the WTP comes from the NHRT and that 5 percent of the contaminant load comes from the NCRT.

The concentrations of PCP in WTP effluent samples (station EFF) were always below the 1 µg/L ROD cleanup level in 2013, except for the period September 16, 2013 (11.1 µg/L), to October 7, 2013 (3.79 µg/L). These elevated data resulted in a change-out of GAC in the primary carbon tanks as discussed in Section 2.3.5.

Supplemental monitoring of water levels in selected groundwater wells was conducted from May 22 to June 4, 2013, in response to the maintenance dewatering conducted by BSB at the WWTP (Appendix B). In addition, split samples were collected at several monitoring points including the WWTP discharge, the BRW pond, the HCC, and the BTL. Sediment split samples were also collected at some locations. Data collected during this supplemental monitoring were presented in a report prepared by WET, consultants to

Butte-Silver Bow County (WET 2013). Laboratory data for split sample results have been entered into the MPTP database for future reference, if needed (Appendix A).

The calculated dioxin toxicity equivalence quotient (TEQ) for WTP samples for the 2001 to 2013 period of record are provided on Table 2.6 and Appendix A. Dioxin levels have varied over time, and low levels of dioxins have been detected in WTP effluent samples collected during sampling events each year. Results indicate that not all of the dioxin is removed in the treatment process, but that concentrations of dioxin (TEQ) in WTP effluent have met the ROD cleanup level (10 picograms per liter [pg/L]) since 2001. The concentration of dioxin TEQ in the WTP treated effluent sample collected on August 12, 2013 was 0.37 pg/L.

The concentrations of metals, PAH, chlorophenols, and anions for WTP samples collected from four stations (NHRTEFF, NCRTEFF, IN, and EFF) during the August 12, 2013, annual sampling event are provided on Table 2.7 and Appendix A. The concentrations of constituents in the MPTP WTP effluent sample (station EFF) were all below the ROD cleanup levels. There are no ROD cleanup levels for anions or for the other three stations (stations NHRTEFF, NCRTEFF, and IN).

2.4.1 Floating Product Recovery and Treatment

No measureable floating product (free oil) was observed in the NHRT during 2013. As discussed in Section 4.0, this lack of product continues a trend of zero measureable oil in the NHRT that commenced in February 2009, suggesting that the freely moving light oil phase of contamination is no longer a significant concern at MPTP.

2.5 WATER TREATMENT PLANT IMPROVEMENTS

As discussed in Section 2.3, the only WTP improvements made in 2013 included the change-out of GAC in the WTP primary carbon tanks on November 13, 2013, and replacement of the NHRT pump motor on December 17, 2013.

3.0 LAND TREATMENT UNIT OPERATIONS

Historical LTU soil management, LTU operation in 2013, and the results of LTU sampling are discussed in the following sections.

3.1 HISTORICAL LTU SOIL MANAGEMENT

Loading of soil into the LTU (Figure 1.1) began in the fall of 1996. By spring 1997, approximately 2 feet of soil from the north-side excavation had been placed on the LTU. During fall 1999, 18 of the 24 inches of treated soils (approximately 24,000 cubic yards) were removed and backfilled on the north side. Six to 8 feet of contaminated soil that had been excavated from the south side were placed on the LTU during the fall of 1999 and summer of 2000. During the fall of 2000, 18 inches of treated soils (approximately 24,000 cubic yards) were removed and used as backfill in the south-side excavation area. During the spring of 2001, contaminated soils from the north-side sewer main replacement project were placed on LTU zones 1 and 2.

In the fall of 2001, 18 to 24 inches of soil (approximately 27,000 cubic yards) were removed from LTU zones 2 to 10 and backfilled into the south-side excavation area. The LTU was tilled monthly during the 2001 treatment season. In response to complaints from residents in the nearby neighborhood regarding odors from the LTU, the tilling frequency was reduced to annually beginning in 2002. The LTU was tilled to a depth of approximately 8 inches in November 2002 and again in October 2003. In 2005, the top 30 inches of LTU soils were determined to have met the treatment standards for PCP and PAH. The top 24 inches of treated soils (approximately 29,000 cubic yards) were offloaded, leaving a 6-inch "buffer" of treated soils in an attempt to minimize odor. The treated soils were backfilled into the south-side excavation areas on site.

The LTU was tilled in October 2005 after the summer offload. In 2007, 32,000 cubic yards of treated soil were offloaded from the LTU and backfilled on the southern portion of the site. The five remaining SSP piles were dismantled, and 8,000 cubic yards of contaminated soil were moved from the SSPs and placed on the LTU for final treatment. Work in 2009 associated with NHRT modifications and the sewer realignment project added approximately 2,000 cubic yards of excavated soil, which was placed on the western portion of the LTU.

In 2010, approximately 3.2 million gallons of water were applied to the LTU through a center pivot unit at regular intervals from April to September to facilitate biologic degradation of the contaminants. Irrigation water was supplied from the retention pond, with make-up water being added from the WTP as

necessary. The LTU soil was tilled once in April 2010. A small volume of soil excavated during the interstate highway bridge replacement project was placed on the LTU in June 2010.

In 2011, the collection pipe located between the NHRT manhole #2 and the west-end cleanout was cleaned. A very small volume of solid material and an estimated 15,000 gallons of water removed during the cleanout were transferred into a vacuum collection truck and was placed on the LTU for bioremediation. In addition, approximately 200 cubic yards of soil from highway pier drilling was removed by the Montana Department of Transportation (MDT) contractor and placed on the LTU as part of the MDT bridge replacement project. Lastly, 182 linear feet of drill cuttings (approximately 2.3 cubic yards) from five groundwater monitoring well borings were placed on the LTU. The LTU was irrigated on 14 separate days during the second and third quarters of 2011 (2,141,200 gallons were applied). No soil was tilled at the LTU during 2011.

In 2012, the LTU was tilled during the second quarter for the five sampling zones (LTU zones 2, 3, 4, 5, and 10) that had not met the cleanup standard for PCP during the 2011 LTU soil sampling event. In addition, the LTU was irrigated on an as-needed basis during the second and third quarters to control fugitive dust when conditions were dry (8 days, between May 14, 2012, and September 5, 2012). A total of 1,171,900 gallons of irrigation water were applied in 2012.

3.2 LTU OPERATIONS IN 2013

Including the sand layer, the volume of contaminated soil that remains on the LTU is estimated at 53,000 cubic yards; the sand layer is approximately 6 inches thick (approximately 15 percent by volume).

The LTU was tilled on May 1, 2013, and July 18, 2013, for the three sampling zones (LTU zones 2, 3, and 4) that had not met the cleanup standard for PCP during the 2012 LTU soil sampling event. Soil moisture conditions in May 2013 were sufficiently high to avoid generation of dust. During the tilling that occurred on July 18, 2013, LTU soil conditions were characterized as “wet” as a result of the 0.37 inch of precipitation received on July 16, 2013, through July 17, 2013.

In 2013, the LTU was irrigated seven times during the third quarter on an as-needed basis to control dust. Irrigation occurred on July 2, 2013, July 9, 2013, July 11, 2013, July 22, 2013, July 25, 2013, August 13, 2013, and August 20, 2013. A total of 884,700 gallons of irrigation water were applied. LTU water application data for 2013 are provided in Table 3.1. Historical LTU water application data for the 1999 to 2013 period of record are provided in Table 3.2. Neither odors nor dust were detected during tilling operations at any time in 2013.

The LTU irrigation system was winterized mid-September 2013, which included turning off the water, draining the system, and turning off power to the system. No other LTU maintenance of any significance occurred after that date.

3.3 LTU SOIL SAMPLING AND RESULTS

Soil in the LTU has been sampled on an annual basis starting in 2007. As specified in the Site-Wide Operations and Maintenance Manual (Camp Dresser & McKee [CDM] 2000), soil in the LTU was monitored using composite samples from each of the 10 zones, as shown in Figure 1.1. The most recent soil sampling event was conducted on October 1, 2013, when 10 soil samples (two samples from LTU zones 2, 3, 4, 5, and 6 (one shallow soil sample [0 to 24 inches] and one deep soil sample [24 to 36 inches]) were collected and analyzed for PCP. Additionally, 10 soil samples (one soil sample from each of the 10 LTU zones: one composite sample [0 to 36 inches]) were collected and analyzed for dioxins. The aliquots from the various depths were homogenized, and representative samples from each depth were analyzed for PCP or dioxins, as appropriate.

Table 3.3 summarizes the analytical data from the 2013 sampling event and also displays historical results from LTU sampling events in October 2007, July 2008, October 2008, July 2009, October 2010, September 2011, and September 2012.

Table 3.3 indicates that the concentrations of PCP in LTU soils in 2013 were below the ROD cleanup level (34 milligrams per kilogram [mg/kg]) in LTU zones 2, 5 and 6 but slightly exceeded this cleanup level in LTU zones 3 and 4. The average concentration of PCP in all LTU zones sampled in 2013 was 26.8 mg/kg, which is less than the ROD cleanup level (34 mg/kg). The average PCP concentration in 2013 is likely biased high because the zones below clean up levels in 2012 were not included in the 2013 sampling event.

In 2013, Pace analyzed LTU soil samples for dioxin using both the microwave assisted extraction (MAE) and Soxhlet extraction (SOX) methods and reported the results for each extraction method. Dioxin (TEQ) data from both extractions were calculated using the dioxin toxicity equivalency factors (TEF) provided in the ROD (EPA and DEQ 1993). The concentrations of dioxin (TEQ) (SOX) in LTU soils exceeded the ROD cleanup level (0.2 micrograms per kilogram [µg/kg]) in all 10 LTU Zones in 2013 (Table 3.3). The maximum concentration (4.2 µg/kg) was detected in the sample collected from zone 2 (SOX). The average concentration of dioxin (TEQ) in the LTU was 0.27 µg/kg for the MAE, and was 2.4 µg/kg for SOX; both average TEQ values are greater than the ROD cleanup level (0.2 µ/kg). According to Pace, it is unclear why substantially different results were obtained via the MAE versus the SOX methods when

both methods routinely yield similar findings. Pace is currently looking into this issue and will debrief DEQ if an explanation can be provided. Results of LTU soil analyses are provided in Table 3.3 and Appendix A. A photolog showing LTU soil sampling is provided in Appendix E.

LTU soils were not analyzed for PAH during this round of sampling, since all sections of the LTU had previously met the cleanup goal for PAH in two successive sampling efforts.

3.4 LTU POND SAMPLING AND RESULTS

During the August 12, 2013, annual sampling event, the LTU underdrain discharge and LTU retention pond water were sampled and analyzed for PCP. The LTU discharge sample is representative of leachate associated with the under drain of the soil treatment area. Leachate from the underdrain gravity flows to the LTU retention pond. The concentration of PCP in LTU discharge on August 12, 2013 was 679 µg/L. The LTU retention pond water sample is representative of water that has been temporarily stored in the retention pond; the concentration of PCP in the LTU retention pond water on August 12, 2013, was substantially lower (16.1 µg/L). These data support a conclusion that physical and biological degradation of PCP occurs in the LTU pond.

4.0 SURFACE WATER AND GROUNDWATER MONITORING

Water quality at the MPTP site was monitored on a regular basis from 2001 until August 2010 as specified in the "Site-Wide Operations and Maintenance Manual" (CDM 2000). The MPTP sampling program was revised starting with the November 2010 sampling event as specified in the "Final Groundwater and Surface Water Monitoring, Plan (GWMP), Revision 0" (Tetra Tech 2011). Data presented in this annual report were collected according to the guidelines provided in the GWMP, Revision 2 (Tetra Tech 2013c). GWMP Revision 2 supersedes previous versions of this document. Future revisions to the GWMP, if needed, will continue to be numbered sequentially.

During February 2013, a semi-annual sampling event was conducted and all groundwater and surface water samples were analyzed for PCP. The annual sampling event for surface water and groundwater was conducted in August 2013. Table 2.5 provides a summary of all sampling conducted in 2013.

4.1 SURFACE WATER MONITORING

As part of routine monitoring for the MPTP site, three surface water locations (SW-05, SS-06A, and SW-09) were sampled in February 2013 (PCP only) and again in August 2013 (for PCP and the extended parameter list of analytes), as outlined in Table 2.5. In addition to PCP (by Method 528), the extended

parameter list included PAH (by Method SW8270C), dioxins (by Method SW8290), and chlorophenols (by Method SW8270C). Surface water monitoring locations sampled in 2013 are provided on Figure 4.1 and include:

- SW-05: on Silver Bow Creek, due west (downstream) of the MPTP site
- SS-06A: on Silver Bow Creek, on the downstream side of the MPTP site but immediately upstream from the WTP effluent discharge rill
- SW-09: on Silver Bow Creek, due east (upstream) of the MPTP site

The concentrations of PCP in surface water for the 2001 through 2013 period of record are summarized in Table 4.1, Appendix A, and Appendix B. In 2013, the concentrations of PCP at surface water stations SW-05, SS-06A, and SW-09 were all below the ROD surface water cleanup level (1.0 µg/L).

Over the last 5-year period, the following important observations have been noted:

- The concentrations of PCP at the upstream surface water station, SW-09, have been consistently below the ROD surface water cleanup level for PCP (1 µg/L), and very near or below the laboratory detection limit (0.2 µg/L).
- The concentrations of PCP at stations SW-05 and SS-06A have been consistently below the ROD surface water cleanup level for PCP (1 µg/L).

Surface water stations SW-05, SS-06A, and SW-09 were sampled during the annual sampling event on August 12, 2013, and the samples were analyzed for the extended parameter list of analytes. Results are provided in Table 4.2 (dioxins), Table 4.3 (PAH and chlorophenols), and Appendix A (full database). The concentrations of constituents in surface water in 2013 were all below the ROD surface water cleanup levels (where available).

4.2 GROUNDWATER MONITORING

The locations of all MPTP groundwater monitoring wells are provided on Figure 4.2. Analytical results for PCP in groundwater for seven representative monitoring wells (10-12, BMW-01A, BMW-01B, GW-14R-98, HCA-21, INF-04, and MW-11-04) for the 2000 to 2013 period of record are provided in Table 4.4, Appendix A, and Appendix B. Results are discussed further in Section 4.4 below.

Table 4.5 provides analytical results for dioxins in groundwater for historic sampling, and for samples collected from seven representative monitoring wells (10-12, BMW-01A, BMW-01B, GW-14R-98,

HCA-21, INF-04, and MW-11-04) during the 2013 annual sampling event as specified in the GWMP Revision 2 (Tetra Tech 2013c). Analytical results for PAH and chlorophenols in groundwater for these same seven monitoring wells are provided in Table 4.6 and Appendix A. Results are discussed further in Section 4.4 below.

A potentiometric surface map was prepared using static water level data collected on August 2, 2013, from 60 shallow monitoring wells (Figure 4.3). Figure 4.3 indicates that the hydraulic gradient at the MPTP was generally from the southeast to the northwest. The magnitude of the hydraulic gradient was approximately 0.004 foot/foot. These results are consistent with values obtained during historical sampling events since 2005.

Groundwater contours have been influenced by beaver-related activity (beaver dam construction and resulting ponding of water) since the third quarter of 2010. Beaver activity and damming present in August 2013 resulted in localized flooding and groundwater mounding, as exemplified in Figure 4.3. Groundwater mounding in this area assists in facilitating the flow of groundwater south of Silver Bow Creek back toward the NCRT, thus aiding in recovery of dissolved contaminants. It is expected that groundwater mounding will continue when beaver dams are present and beaver activity persists. A detailed discussion of beaver activity along Silver Bow Creek near the MPTP site in 2013 is presented in Section 6.6.

Figure 4.4 provides a more focused analysis of the August 2, 2013, groundwater elevations and interpreted flow directions in the vicinity of the NCRT. Figure 4.4 indicates there is radial flow and hydraulic capture in the shallow aquifer in the vicinity of the NCRT.

Starting on April 20, 2010, and continuing throughout all of 2013, 25 to 30 gpm of treated effluent from the WTP has been continuously diverted to the storm drain at the west end of the NHRT in an effort to influence the hydraulic gradient in this area (Figure 1.1). Groundwater elevation data in 2013 indicate that the water levels in monitoring well A-99 were consistently higher than water levels in wells inside the NHRT, suggesting there may be some effect.

4.3 DISCONTINUATION OF SELECTED METALS AND ANIONS ANALYSES

The ROD requires that treated discharge to surface water (station EFF) be analyzed for six metals, including arsenic, cadmium, chromium, copper, lead, and zinc (EPA and DEQ 1993). Therefore, the plant effluent sample (station EFF) continues to be analyzed for this suite of metals (by EPA Method 200.8) on an annual basis as specified in the GWMP Revision 2 (Tetra Tech 2013c). These data are provided in Table 2.7 and Appendix A.

Other contaminants of interest not specifically called out in the ROD but that have been historically included for analysis for various reasons include the anions bicarbonate, bromide, chloride, fluoride, phosphate, and nitrate/nitrite. Even though it is not required by the ROD, the plant effluent sample (station EFF) continues to be analyzed for anions (by EPA Method 300.0) on an annual basis. Anion data for the WTP in 2013 are provided in Table 2.7 and Appendix A. There are no ROD cleanup levels or DEQ-7 numeric water quality criteria for anions.

4.4 PERFORMANCE MONITORING

The concentrations of PCP from the February (semi-annual) and August (annual) groundwater sampling events were evaluated to assess the distribution of PCP in groundwater during 2013. The results of groundwater monitoring and an assessment of compliance with ROD requirements and cleanup levels are presented in the following sections.

4.4.1 2013 Semi-Annual and Annual Groundwater Sampling Events

Samples from 60 shallow monitoring wells, four intermediate wells, and eight deep wells were analyzed for PCP by Method 528 during the 2013 first- and third-quarter sampling events (Appendix A and Appendix B). Data from shallow wells were plotted and contoured to evaluate trends in concentration and the spatial distribution of PCP contamination. Figure 4.5 and Figure 4.6 provide the distribution of PCP in groundwater on the south side of Silver Bow Creek based on data collected during the February 2013 semi-annual sampling event and the most current (August 2013) annual sampling event.

In general, Figures 4.5 and 4.6 indicate the presence of a plume of PCP approximately 750 feet wide by 1,500 feet long on the south side of Silver Bow Creek oriented along the principal direction of groundwater flow (southeast to northwest). The figures indicate there are several PCP “hot spots” that include:

- An area of contamination between INF-13 and MW-S-01 due south of the interstate highway

- One larger area of contamination (near monitoring wells MW-11-02 and MW-11-04) located adjacent to the MPTP building and beneath the interstate highway embankments

- An area of contamination parallel to the railroad tracks (in the vicinity of monitoring well MW-I-01 due north of the NCRT and adjacent to the former location of NorthWestern Energy power poles

During the August 2013 annual sampling event, groundwater samples from five shallow monitoring wells (10-12, GW-14R-98, HCA-21, INF-04, and MW-11-04) and two deep wells (BMW-01A and BMW-01B) were analyzed for the extended parameter list of analytes, including PAH, dioxins, and chlorophenols as per the GWMP Revision 2 (Tetra Tech 2013c). These seven wells were selected to provide a range of representative groundwater quality conditions across the site relative to (1) the location of the PCP plume (as defined by the 1µg/L PCP contour interval), and (2) PCP "hot spots" within the plume. The rationale for selecting these wells included:

- Monitoring wells 10-12 (shallow), BMW-01A (deep), and BMW-01B (deepest) were selected because they can be considered downgradient sentinel monitoring wells (shallow and deep well completions) on the south bank of Silver Bow Creek. Data from these wells can be used to evaluate plume capture and the potential for off-site migration of contaminants.

- Monitoring wells GW-14R-98 (shallow) and HCA-21 (shallow) were selected because they are located on the south bank of Silver Bow Creek within the PCP plume footprint, have a long-term period of record, and can be used to evaluate progress of groundwater remediation over time.

- Monitoring wells INF-04 and MW-11-04 were selected because they are located in or near "hot spots" along the centerline of the PCP plume.

All available dioxin results for groundwater (both historic, and for 2013) are provided in Table 4.5 and Appendix A. In 2013, the dioxin (TEQ) was below the 30 pg/L ROD groundwater cleanup level in all seven monitoring wells. Analytical results for PAH and chlorophenols are provided in Table 4.6 and Appendix A. The concentrations of PAH and chlorophenols in groundwater (the only exception being PCP) were below ROD groundwater cleanup levels (where established) for the seven selected wells.

4.4.2 Quality Control

Quality control samples were collected and analyzed in 2013 as per the GWMP Revision 2 (Tetra Tech 2013c). Quality control samples consisted of source water blanks and field duplicate samples for liquid matrix samples. Source water blanks (distilled water supplied by the laboratory) were prepared at a

frequency of one per 20 samples per sampling event to assess potential external sources of contamination. Field duplicates were also collected at a frequency of one per 20 water samples per sampling event.

Source Water Blanks

A total of 68 source water blanks were prepared and analyzed in 2013 (Table 4.7). The concentrations of constituents for 66 of 68 (97 percent) source water blanks were below the corresponding detection limit values. Two of 68 (3 percent) samples indicated concentrations above the detection limit value, but were qualified as "estimated" (J or BJ). These data are interpreted to mean there was little or no cross contamination in the sampling process for sampling conducted in 2013.

Field Duplicates

A total of 72 field duplicate samples were collected and analyzed in 2013 to evaluate precision. Precision is the degree of mutual agreement between individual measurements of the same property under similar conditions. PCP and extended parameter field duplicate samples were collected at the same time and from the same source at a frequency of one per 20 liquid matrix samples per sampling event. The variance between the samples was then calculated as a RPD. The formula for RPD is:

$$RPD = \frac{|A - B|}{(A + B)/2} \quad x \quad 100$$

where: A = First duplicate concentration (original sample)
B = Second duplicate concentration (duplicate sample)

As previously mentioned, the RPD goal for this project is 35 percent (or lower). Seventy-one of 72 duplicate samples (98.6 percent) met the RPD goal (Table 4.8). The average RPD for all duplicate samples in 2013 was 4.6 percent. Based on these results, the level of precision for sampling conducted in 2013 met the overall project goal.

4.4.3 Data Evaluation and Progress of Remediation

One WTP station (EFF), three surface water stations (SW-05, SS-06A, and SW-09), and five groundwater stations (BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21) were selected to evaluate compliance with ROD cleanup levels. Figure 4.7 provides the location of these representative monitoring

stations relative to the location of the recent PCP plume boundary (August 2, 2013). To be in compliance, the ROD requires that the following cleanup criteria be met:

1. The WTP effluent (station EFF) must meet the 1 µg/L discharge to surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).

2. Surface water in Silver Bow Creek (stations SW-05, SS-06A, and SW-09) must meet the 1 µg/L surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).

3. The PCP plume must remain on site. For this analysis, this criterion is assumed to be met if the concentration of PCP in groundwater in downgradient sentinel monitoring wells (stations BMW-01A, BMW-01B, and 10-12) continue to meet the ROD groundwater cleanup level for PCP (1 µg/L).

4. The concentrations of PCP in groundwater from representative monitoring wells along the south bank of Silver Bow Creek within the plume footprint (stations GW-14R-98, and HCA-21) must indicate that the trend in PCP concentration over time is decreasing, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.

5. The concentrations of dioxins, PAH, and chlorophenols in groundwater at representative monitoring wells along Silver Bow Creek (stations BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21) must meet the specified cleanup levels listed in the ROD).

6. The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (short-term trend for the previous 5 years).

7. The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (long-term trend, since the ROD was signed [21 years]).

Compliance with ROD cleanup requirements was assessed as part of this annual report by comparing concentrations of site contaminants to ROD cleanup levels, digitizing the area of the PCP plume for various points in time, and performing Mann-Kendall statistical tests for trends in (1) plume size versus time, and (2) PCP concentration versus time (for monitoring wells GW-14R-98, and HCA-21). The data collected in 2013 were used to evaluate whether the above seven criteria were met. Results are summarized in Table 4.9; this table indicates all seven ROD requirements listed above were satisfied in 2013, with the exception that the WTP treated plant effluent temporarily exceeded the discharge to surface water cleanup between September 16, 2013, and October 7, 2013 (see Section 2.3.5 for details). Digitized PCP plumes and plume area calculations are provided in Appendix F. Output from Mann-Kendall statistical testing is provided in Appendix G.

The long-term trend in the area of the PCP plume indicates ongoing remedial activities have significantly reduced the area of the PCP plume. Specifically, over the past 21 years (since the ROD was signed), the total area of the PCP plume on the south side of Silver Bow Creek (based on the 1 µg/L isocontour line) has decreased from 41.7 acres in 1993 to 17.5 acres in August 2013. This decrease represents a 58 percent reduction in the area of the PCP plume (17.5 acres). The long-term plume area comparison is provided in Figure 4.8.

Continued groundwater monitoring and statistical analysis of the area of the PCP plume will be conducted in future annual reports to further evaluate the short-term trend in plume area and make operational adjustments, if necessary. Compliance with ROD cleanup levels will also be evaluated on an annual basis.

4.4.4 Light Non-Aqueous Phase Liquids

LNAPL was not detected in any well during any sampling conducted in calendar year 2013. The historical volume of LNAPL recovered for the 2000 through 2013 period of record is provided in Table 4.10.

5.0 RESIDENTIAL WELL MONITORING

The historical concentrations of PCP in groundwater collected from residential wells have been below the ROD cleanup level for several years leading up to 2010; therefore, no residential wells were sampled in 2013. The results of residential well sampling for the 2001 to 2013 period of record are provided in Table 5.1.

6.0 ADDITIONAL ACTIVITIES

The additional activities that took place at the MPTP site in 2013 are described in the following sections.

6.1 COMMUNITY INVOLVEMENT

A kickoff meeting between DEQ and Tetra Tech personnel was held in February 2013 for the preparation of a community involvement plan (CIP) for the MPTP site. The purpose of the plan is to guide communication with stakeholders and the public regarding the remaining MPTP cleanup activities. Tetra Tech submitted the draft CIP to DEQ on March 28, 2013.

In May 2013, Tetra Tech met with DEQ to discuss the draft CIP and other community involvement projects. In June, Tetra Tech completed revisions to the CIP, provided information on the *Frequently Asked Questions* document, and provided information for a fact sheet.

On October 15, 2013, Tetra Tech met with Citizens Technical Environmental Committee of Butte (CTEC) representatives in Helena, Montana to jointly prepare an agenda for the upcoming CTEC meeting in Butte, Montana on October 29, 2013. On October 29, 2013 representatives of DEQ, EPA, and Tetra Tech delivered a PowerPoint presentation regarding the progress of remediation at the MPTP site to CTEC committee members and the public at the Public Library in Butte, Montana.

6.2 WEED SPRAYING

Noxious weeds were sprayed by Full Armor, LLC, on June 18, 2013. The area of coverage included the entire site plus a small buffer along the site fence lines and an area where the pole mound removal was conducted in early 2012. All weed spraying was completed in less than 8 hours using a hand sprayer. A return pass was conducted on August 19, 2013, to address late emerging weeds. The site was assessed and found to be free of visible weeds in September 2013.

6.3 SUMMARY OF BEAVER ACTIVITY IN 2013

Groundwater contours have been influenced by beaver-related activity (beaver dam construction and resulting ponding of water) since the third quarter of 2010. Beaver activity has periodically resulted in localized flooding and groundwater mounding, as exemplified in Figure 4.3 and Figure 4.4. Groundwater mounding along Silver Bow Creek north of the WTP assists in facilitating the flow of groundwater south of Silver Bow Creek back toward the NCRT, thus aiding in recovery of remaining dissolved contaminants in this area. During the first quarter, ARCO removed all beaver dams over a 4-day period on January 15 to 18, 2013; however, a new beaver dam near monitoring well BMW-09 was in place by February 16, 2013. This dam was removed by ARCO on March 7, 2013, but beavers constructed another dam on Silver Bow Creek near monitoring well GW-06-R by March 15, 2013.

At the end of the second quarter of 2013, at least two beaver dams were in place: one near monitoring well GW-06-R, and one adjacent to the BMW-9 nested well pair. At times during the second quarter of 2013, water was backed up in the stream behind the dams, and out-of-bank flooding conditions were present along Silver Bow Creek north of the MPTP site.

At the end of the third quarter of 2013, at least five beaver dams were in place on Silver Bow Creek at locations closest to surface water monitoring stations SS-06A and SW-09, within the plant effluent discharge rill, and near monitoring wells BMW-9A and GW-06-R. At times during the third quarter of 2013, water was backed up in the stream behind one or more dams, and out-of-bank flooding conditions were noted along Silver Bow Creek north of the MPTP site.

At the beginning of the fourth quarter of 2013, at least five beaver dams were in place: one just below surface water station SW-09, one near station SS-06A, one between the WTP discharge pipe and Silver Bow Creek (the WTP discharge rill), one adjacent to the BMW-9 nested monitoring well pair, and one near monitoring well GW-06-R. Surface water monitoring stations are shown in Figure 4.1. Except for the beaver dam in the discharge rill, all beaver dams were removed by ARCO's contractor (Jordan Contracting) on December 18, 2013. A photolog of beaver dam removal activities are provided in Appendix H.

Water levels in the vicinity of the NCRT decreased several feet after ARCO removed the beaver dams. In response, the pumping rate in NHRT had to be reduced from 100 gpm to 90 gpm on December 23, 2013, to compensate for decrease in groundwater levels.

In the future, it is anticipated that DEQ will make no effort to remove beaver dams on Silver Bow Creek because beaver dam-induced flooding north of the MPTP site helps maintain a hydraulic gradient toward the NCRT, which enhances capture of PCP-contaminated groundwater in this area. Current conditions will likely change as beavers will likely rebuild dams. In addition, there is always the possibility that ARCO may remove beaver dams on Silver Bow Creek at some point in the future, since this area is managed by ARCO as part of the Butte Priority Soils Operable Unit.

7.0 DATABASE MANAGEMENT

The following database-related activities were completed in 2013:

- Uploaded all electronic data deliverables (EDD) received from the MBMG and Pace to the MPTP Microsoft Access2010 database
- Performed quality control (QC) of all chains of custody (COC), MBMG laboratory EDDs, MBMG sample delivery groups (SDG), and MBMG laboratory Microsoft Excel spreadsheets
- Added 2,022 records to the existing database; at the end of 2013 there were 6,813 individual data records in the database for the 2010 to 2013 period of record
- Corrected selected records in the MPTP database to address any QC issues uncovered during the QC review process
- Maintained an SDG versus COC "lookup table" to easily match SDGs to COCs for future reference.

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Water and Environmental Technologies (WET). 2013. Final Maintenance Dewatering Monitoring Results. September 3.

TABLES

TABLE 2.1
2013 WATER TREATMENT PLANT DISCHARGE RATES

Date	Weekly Discharge Rate [a] (gpm)
1/7/2013	340
1/14/2013	340
1/21/2013	340
1/28/2013	340
2/4/2013	340
2/11/2013	340
2/18/2013	340
2/25/2013	340
3/4/2013	340
3/11/2013	340
3/18/2013	340
3/25/2013	340
4/1/2013	340
4/8/2013	340
4/15/2013	340
4/22/2013	340
4/29/2013	340
5/6/2013	340
5/13/2013	340
5/20/2013	417
5/28/2013	424
6/3/2013	408
6/10/2013	335
6/17/2013	340
6/24/2013	340
7/1/2013	340
7/8/2013	340
7/15/2013	340
7/22/2013	340
7/29/2013	340
8/5/2013	340
8/12/2013	340
8/19/2013	340
8/26/2013	340
9/3/2013	337
9/9/2013	335
9/16/2013	340
9/23/2013	340
9/30/2013	340
10/7/2013	325
10/14/2013	321
10/21/2013	315
10/28/2013	315
11/4/2013	305
11/11/2013	305
11/18/2013	305
11/25/2013	305
12/2/2013	305
12/9/2013	304
12/16/2013	303
12/23/2013	321
12/30/2013	295
Annual Average	**337**

Notes:
a Approximate weekly discharge rate; daily fluctuations are possible
gpm Gallons per minute

TABLE 2.2
APPROXIMATE VOLUME OF WATER TREATED

Dates	Approximate Volume of Water Treated (gallons)
1993 through 1996	231,920,640
1996 through 1997	51,321,600
1998	96,832,800
1999	119,730,240
2000	113,904,000
2001	114,681,600
2002	184,464,000
2003	189,734,400
2004	163,857,600
2005	150,710,400
2006	216,360,000
2007	233,892,000
2008	181,332,000
2009	177,645,600
2010	176,076,000
2011	196,574,400
2012	179,193,600
2013	177,612,500
Total	**2,955,843,380**

TABLE 2.3
HISTORICAL CONCENTRATIONS OF PCP FOR WTP SAMPLES

Date	Laboratory	EPA Method	NCRT Effluent (µg/L)	NHRT Effluent (µg/L)	WTP Influent (µg/L)	WTP BABB (µg/L)	WTP Treated Effluent (µg/L)	ROD Cleanup Level[a] (µg/L)
2001 Range	MBMG	528	6.76 - 55.2	476 - 1185	130 - 631	--	0.1U - **1.12**	1.0
2002 Range	MBMG	528	11.5 - 24	272 - 842	143 - 463	--	0.1U - **7.08**	1.0
2003 Range	MBMG	528	4.3 - 8.8	140 - 304	47 - 262	17.0	0.04U - **1.7**	1.0
2004 Range	MBMG	528	2.4 - 6.7	97 - 192	33 - 82	0.11 - 4.1	0.056 - 0.39	1.0
2005 Range	MBMG	528	1.1 - 5.8	60 - 149	25.7 - 73.7	0.04 - 1.2	0.1U - 0.4	1.0
2006 Range	MBMG	528	1.56 - 6.06	98 - 180	4.21 - 98.8	0.062 - 9.83	0.1U - **3.35**	1.0
2007 Range	MBMG	528	2.69 - 3.92	63.2 - 286	19.3 - 310	0.126 - 1.05	0.06 - 0.483	1.0
2008 Range	MBMG	528	2.98 - 7.81	84.5 - 306	16.9 - 296	0.11 - 17.2	0.089 - **2.58**	1.0
2009 Range	MBMG	528	1.03 - 4.84	36.4 - 306	17.8 - 153	0.2U - 18.7	0.082 - **7.13**	1.0
2010 Range	MBMG	528	1.70 - 7.38	31.1 - 233	10.8 - 84.6	0.2U - 4.3	0.207 - **1.46**	1.0
2011 Range	MBMG	528	3.18 - 11.5	84.2 - 333	9.14 - 137	0.267 - 39.4	0.208 - **15.7**	1.0
2012 Range	MBMG	528	0.785 - 49.4	232 -379	35.5 - 161	0.456 - 14.6	0.23 - **1.03**	1.0
2013 Range	MBMG	528	2.54 - 8.71	126 - 345	0.852 -176	0.2U - 31.1	0.2U - **11.1**	1.0
1/7/2013	MBMG	528	4.05	317	68.5	0.503	0.306	1.0
1/14/2013	MBMG	528	--	--	67.8	0.467	0.332	1.0
1/21/2013	MBMG	528	--	--	91.2	0.677	0.347	1.0
1/28/2013	MBMG	528	--	--	108	3.29	0.702	1.0
2/4/2013	MBMG	528	6.42	204	176	1.22	0.532	1.0
2/11/2013	MBMG	528	--	--	101	0.653	0.408	1.0
2/18/2013	MBMG	528	--	--	93	4.79	0.449	1.0
2/25/2013	MBMG	528	--	--	76.5	0.577	0.33	1.0
3/4/2013	MBMG	528	6.23	345	97.9	0.72	0.394	1.0
3/11/2013	MBMG	528	--	--	72.8	0.677	0.371	1.0
3/18/2013	MBMG	528	--	--	128	0.879	0.472	1.0
3/25/2013	MBMG	528	--	--	94.5	0.576	0.318	1.0
4/1/2013	MBMG	528	5.32	294	100	0.656	0.306	1.0
4/8/2013	MBMG	528	--	--	84.9	0.564	0.332	1.0
4/15/2013	MBMG	528	--	--	95.8	0.918	0.318	1.0
4/22/2013	MBMG	528	--	--	81.2	0.545	0.328	1.0
4/29/2013	MBMG	528	--	--	81.1	0.646	0.32	1.0
5/6/2013	MBMG	528	4.92	238	96.5	0.644	0.333	1.0
5/13/2013	MBMG	528	--	--	85.4	0.837	0.362	1.0
5/20/2013	MBMG	528	--	--	58.2	0.526	0.384	1.0
5/28/2013	MBMG	528	--	--	53.4	0.574	0.36	1.0
6/3/2013	MBMG	528	2.54	174	40.2	0.715	0.52	1.0
6/10/2013	MBMG	528	--	--	47.6	0.945	0.367	1.0
6/17/2013	MBMG	528	--	--	50.8	0.515	0.274	1.0
6/24/2013	MBMG	528	--	--	56.9	0.676	0.268	1.0
7/1/2013	MBMG	528	4.3	156	46.4	0.63	0.32	1.0
7/8/2013	MBMG	528	--	--	49.7	0.702	0.328	1.0
7/15/2013	MBMG	528	--	--	50.6	0.583	0.344	1.0
7/22/2013	MBMG	528	--	--	60.6	1.13	0.29	1.0
7/29/2013	MBMG	528	--	--	34.4	0.549	0.359	1.0
8/5/2013	MBMG	528	--	--	56.3	0.77	0.327	1.0
8/12/2013	MBMG	528	6.08	169	63.8	0.704	0.448	1.0
8/19/2013	MBMG	528	--	--	0.852	0.2U	0.2U	1.0
8/26/2013	MBMG	528	--	--	50.2	0.2U	0.2U	1.0
9/3/2013	MBMG	528	6.53	149	49.8	0.2U	0.2U	1.0
9/9/2013	MBMG	528	--	--	62.7	1.47	0.69	1.0
9/16/2013	MBMG	528	--	--	61.1	22.8	**11.1**	1.0
9/23/2013	MBMG	528	--	--	89.1	31.1	**10.2**	1.0
9/30/2013	MBMG	528	--	--	80.7	22.2	**5.1**	1.0
10/7/2013	MBMG	528	8.71	180	83.8	30	**3.79**	1.0
10/14/2013	MBMG	528	--	--	71.7	9.74	0.299	1.0
10/21/2013	MBMG	528	--	--	71.6	14.6	0.23	1.0
10/28/2013	MBMG	528	--	--	38.9	0.398	0.291	1.0
11/4/2013	MBMG	528	7.21	159	66.3	20.3	0.21	1.0
11/11/2013	MBMG	528	--	--	59.7	20.3	0.2U	1.0
11/18/2013	MBMG	528	--	--	57.1	7.2	0.2U	1.0
11/25/2013	MBMG	528	--	--	37.8	0.325	0.2U	1.0
12/2/2013	MBMG	528	6.34	126	53.8	0.2U	0.2U	1.0
12/9/2013	MBMG	528	--	--	34.7	0.2U	0.2U	1.0
12/16/2013	MBMG	528	--	--	7.2	0.2U	0.2U	1.0
12/23/2013	MBMG	528	--	--	61.5	0.213	0.2U	1.0
12/30/2013	MBMG	528	--	--	59.0	0.254	0.2U	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
a	Cleanup level applies to the WTP effluent sample, only.
BABB	WTP sample collected from between primary and secondary carbon vessels
Bold	Concentration exceeds ROD discharge to surface water cleanup level (1.0 µg/L)
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology
MPTP	Montana Pole and Treating Plant
NCRT	Near creek recovery trench
NHRT	Near highway recovery trench
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyte not detected
WTP	MPTP water treatment plant

TABLE 2.4
ANALYSES OF SPLIT SAMPLES

STATION ID	DATE SAMPLED	SAMPLE ID	SAMPLE TYPE	DUPLICATE ID	[ORIGINAL SAMPLE] PCP CONCENTRATION MBMG (µg/L)	EPA Method (MBMG)	[SPLIT SAMPLE] PCP CONCENTRATION Pace (µg/L)	EPA Method (Pace)	RPD (Percent)
IN	10/07/13	IN100713	Field		83.8	528	68	515.3	20.8
BABB	10/07/13	BABB100713	Field		30	528	57	515.3	**62.1**
EFF	10/07/13	EFF100713	Field		3.79	528	3.3	515.3	13.8
NCRTEFF	10/07/13	NCRTEFF100713	Field		8.71	528	7.6	515.3	13.6
NHRTEFF	10/07/13	NHRTEFF100713	Field		180	528	178	515.3	1.1
OPOQVS	09/30/13	OPOQVS093013	FD	EFF093013	5.01	528	5.0	515.3	0.2
WTPVS	10/07/13	WTPVS100713	FB		<0.2	528	ND	515.3	0.0
IN	10/14/13	IN101413	Field		71.7	528	61.3	515.3	15.6
BABB	10/14/13	BABB101413	Field		9.74	528	21.6	515.3	**75.7**
EFF	10/14/13	EFF101413	Field		0.299	528	0.4	515.3	28.9
OPOQVS	10/14/13	OPOQVS101413	FB		<0.2	528	ND	515.3	0.0
BABB	10/14/13	WTPVS101413	FD	BABB101413	11.8	528	22.6	515.3	**62.8**
								Average RPD:	24.6

Notes

	The within-laboratory RPD for the MBMG labortory data is 19.1 percent
	The within-laboratory RPD for the Pace laboratory data is 4.5 percent

<	Less than
Bold	Exceeds the 35 percent (or lower) RPD project goal
µg/L	Micrograms per liter
EPA	U.S. Environmental Protection Agency
FB	Field blank
FD	Field duplicate
Field	MPTP WTP station
ID	Identification
MBMG	Montana Bureau of Mines and Geology
ND	Not detected
Pace	Pace Aanlytical
PCP	Pentachlorophenol
RPD	Relative percent difference
WTP	Water treatment plant

TABLE 2.5

SUMMARY OF MONITORING EVENTS

Monitoring Event[a]	Location	Number of Samples to be Collected and Analyzed[b]	Analytical Parameters of Interest	Method Number for Analysis
Weekly Sampling Event[a] (3)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1)	PCP	EPA Method 528
Monthly Sampling Event[a] (5)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1) NCRT/NHRT effluent (2)	PCP	EPA Method 528
Semi-Annual Sampling Event[a] (80)	Plant Water	Influent Water (1) Effluent Water (1) BABB Water (1) NCRT/NHRT effluent (2)	PCP	EPA Method 528
	Groundwater	Shallow Monitoring Wells (60)[c] Intermediate Monitoring Wells (4) Deep Monitoring Wells (8)	PCP	EPA Method 528
	Surface Water	Surface Water Stations (3)	PCP	EPA Method 528
Annual Sampling Event[a]	Plant Water	BABB Water (1)	PCP	EPA Method 528
	Plant Water	Influent Water (1) Effluent Water (1) NCRT/NHRT effluent (2)	PCP Metals (EFF only)[d] PAHs Dioxins and furans Chlorophenols Anions (EFF only)[d]	EPA Method 528 EPA Method 200.8 EPA Method SW8270C EPA Method SW8290 EPA Method SW8270C EPA Method 300.0
	Groundwater	Shallow Monitoring Wells (60)[c] Intermediate Monitoring Wells (4) Deep Monitoring Wells (8)	PCP	EPA Method 528

TABLE 2.5 (Cont.)

SUMMARY OF MONITORING EVENTS

Monitoring Event[a]	Location	Number of Samples to be Collected and Analyzed[b]	Analytical Parameters of Interest	Method Number for Analysis
(Continued) **Annual Sampling Event[a] (87)**	Groundwater	Shallow Monitoring Wells (5) Deep Monitoring Wells (2)	PCP PAHs Dioxins and furans Chlorophenols	EPA Method 528 EPA Method SW8270C EPA Method SW8290 EPA Method SW8270C
	Surface Water	Surface Water Stations (3)	PCP PAHs Dioxins and furans Chlorophenols	EPA Method 528 EPA Method SW8270C EPA Method SW8290 EPA Method SW8270C
Supplemental Measurement Event[e] (0)[a]	Groundwater	Shallow Monitoring Wells (21)[f] Intermediate Monitoring Wells (2)[f] Deep Monitoring Wells (9)[f]	Depth to groundwater measurement, only	Not Applicable

Notes:

a The number in parenthesis is the total number of samples that were collected per monitoring event.
b The number in parenthesis is the total number of samples that were collected per station.
c Depths to groundwater were also recorded for each shallow monitoring well.
d Analysis for metals included arsenic, cadmium, chromium, copper, lead, and zinc; analysis for anions included bicarbonate, bromide, chloride, fluoride, nitrate/nitrite and phosphate.
e Supplemental monitoring of water levels was conducted from May 22 to June 4, 2013 during maintenance dewatering at the WWTP.
f Depths to groundwater were measured, but no groundwater quality samples were collected.

BABB BABB station is located between the primary and secondary carbon units in the WTP.
EFF WTP effluent station (EFF)
EPA U.S. Environmental Protection Agency
MPTP Montana Pole and Treating Plant
NCRT Near creek recovery trench
NCRT/NHRT Refers to the NCRT effluent sample (NCRTEFF) and the NHRT effluent sample (NHRTEFF)
NHRT Near highway recovery trench
PAH Polycyclic aromatic hydrocarbon
PCP Pentachlorophenol
Plant Water MPTP water treatment plant process water
WTP MPTP water treatment plant

TABLE 2.6
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(µg/L)

Sample Date	NHRT Effluent (µg/L)	NCRT Effluent (µg/L)	WTP Influent (µg/L)	WTP Treated Effluent (µg/L)	ROD Cleanup Level[a] (µg/L)
8/13/2001	4.60E-07	9.20E-07	2.03E-06	2.40E-07	1.00E-05
2/4/2002	4.60E-07	1.60E-07	3.21E-06	1.30E-07	1.00E-05
8/12/2002	5.50E-07	1.19E-06	1.53E-06	2.10E-07	1.00E-05
2/3/2003	2.70E-07	4.17E-06	2.16E-06	6.90E-07	1.00E-05
8/4/2003	2.30E-07	2.16E-06	1.57E-06	3.00E-07	1.00E-05
2/2/2004	1.50E-07	8.30E-07	8.50E-07	1.40E-07	1.00E-05
8/2/2004	2.20E-07	3.09E-06	1.40E-06	5.60E-07	1.00E-05
8/8/2005	7.60E-07	1.29E-06	1.95E-05	1.28E-06	1.00E-05
2/6/2006	2.10E-07	8.50E-07	2.78E-06	1.00E-06	1.00E-05
8/21/2006	2.10E-07	2.70E-07	7.70E-07	2.86E-06	1.00E-05
8/27/2007	8.70E-08	8.10E-07	0.00E+00	3.10E-07	1.00E-05
8/26/2008	1.70E-07	1.58E-06	5.60E-07	1.70E-07	1.00E-05
8/10/2009	6.20E-07	3.92E-06	1.80E-06	1.80E-07	1.00E-05
8/16/2010	1.12E-05	5.84E-06	4.40E-06	5.80E-07	1.00E-05
8/15/2011 [b]	1.91E-07	1.90E-07	3.91E-07	7.60E-08	1.00E-05
8/13/2012	2.27E-05	1.21E-05	7.26E-06	4.40E-07	1.00E-05
8/12/2013	1.27E-04	7.72E-06	3.58E-05	3.69E-07	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR WTP SAMPLES

(pg/L)

Sample Date	NHRT Effluent (pg/L)	NCRT Effluent (pg/L)	WTP Influent (pg/L)	WTP Treated Effluent (pg/L)	ROD Cleanup Level[a] (pg/L)
8/13/2001	0.46	0.92	2.03	0.24	10.00
2/4/2002	0.46	0.16	3.21	0.13	10.00
8/12/2002	0.55	1.19	1.53	0.21	10.00
2/3/2003	0.27	4.17	2.16	0.69	10.00
8/4/2003	0.23	2.16	1.57	0.30	10.00
2/2/2004	0.15	0.83	0.85	0.14	10.00
8/2/2004	0.22	3.09	1.40	0.56	10.00
8/8/2005	0.76	1.29	19.50	1.28	10.00
2/6/2006	0.21	0.85	2.78	1.00	10.00
8/21/2006	0.21	0.27	0.77	2.86	10.00
8/27/2007	0.09	0.81	0.00	0.31	10.00
8/26/2008	0.17	1.58	0.56	0.17	10.00
8/10/2009	0.62	3.92	1.80	0.18	10.00
8/16/2010	11.20	5.84	4.40	0.58	10.00
8/15/2011 [b]	0.19	0.19	0.39	0.08	10.00
8/13/2012	22.70	12.10	7.26	0.44	10.00
8/12/2013	127.00	7.72	35.80	0.37	10.00

Notes:

TEQs were calculated using ROD TEFs with zero for non-detects

µg/L	Micrograms per liter
a	Cleanup level applies to the WTP effluent sample, only.
b	Data for this date appear to be anomalously low.
Bold	Concentration exceeds ROD discharge to surface watercleanup level (10 pg/L).
MPTP	Montana Pole and Treating Plant
NCRT	Near creek recovery trench
NHRT	Near highway recovery trench
pg/L	Picograms per liter
ROD	Record of Decision
TEF	Toxicity equivalence factor
TEQ	Toxicity equivalent
WTP	MPTP water treatment plant

TABLE 2.7
CONCENTRATIONS OF METALS, PAH, CHLOROPHENOLS, AND ANIONS FOR WTP SAMPLES

Sample ID:	NHRTEFF	NCRTEFF	IN	EFF	ROD
Sample Date:	August 12, 2013	August 12, 2013	August 12, 2013	August 12, 2013	Cleanup Level[b]
Units[a]:	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
ANALYTES					
METALS (EPA Method 200.8)					
ARSENIC	7.53	2.57	16.75	2.54	48
CADMIUM	0.25U	0.25U	0.25U	0.25U	1.1 (0.8) [c]
CHROMIUM	0.62	0.76	0.6	0.59	11
COPPER	1.96	2.13	1.54	1.16	12
LEAD	0.52	0.35	0.15U	0.15U	3.2
ZINC	10.39	16.61	9.31	17.07	110
PAH (EPA Method SW8270C)					
ACENAPHTHENE	1U	1U	1U	1U	-
ACENAPHTHYLENE	1U	1U	1U	1U	-
ANTHRACENE	1U	1U	1U	1U	-
BENZO(A)ANTHRACENE	1U	1U	1U	1U	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.1U	0.2 (0.05) [c]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2U	0.2
BENZO(G,H,I)PERYLENE	1U	1U	1U	1U	1
BENZO(K)FLUORANTHENE	1U	1U	1U	1U	1
CHRYSENE	1U	1U	1U	1U	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.2U	0.2U	0.2U	0.2
FLUORANTHENE	1U	1U	1U	1U	-
FLUORENE	1U	1U	1U	1U	-
INDENO(1,2,3-CD)PYRENE	1U	1U	1U	1U	1
NAPHTHALENE	1.4	1U	1U	1U	-
PHENANTHRENE	1U	1U	1U	1U	-
PYRENE	1U	1U	1U	1U	-
TOTAL D PAHs	1.4	1U	1U	1U	360
CHLOROPHENOLS (EPA Method SW8270C)					
2,3,4,6-TETRACHLOROPHENOL	5.5	1U	1.9	1U	-
2,3,5,6-TETRACHLOROPHENOL	1U	1U	1U	1U	267
2,4,6-TRICHLOROPHENOL	1U	1U	1U	1U	45
2,4-DICHLOROPHENOL	1U	1U	1U	1U	27
2-CHLOROPHENOL	1U	1U	1U	1U	6.5
PENTACHLOROPHENOL	169	6.08	63.8	0.448	1
ANIONS[a] (EPA Method 300)					
BICARBONATE ALKALINITY	293.1	262.88	273.16	271.75	-
BROMIDE	246	234	237	239	-
CHLORIDE	56.24	54.27	54.68	55.28	-
FLUORIDE	0.36	0.51	0.45	0.45	-
ORTHOPHOSPHATE	0.02U	0.03	0.02	0.02	-
NITRATE	2.09	6.28	4.66	4.72	-
NITRITE	0.09	0.01U	0.08	0.01U	-

Notes:
- No cleanup level specified in the ROD
a Concentration unit for anion constituents is mg/L
b Cleanup level applies to the WTP effluent sample, only
c The water quality standards for cadmium and benzo(a)pyrene outlined in Circular DEQ-7 are lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standards (in parentheses) currently take precedence over the ROD cleanup levels for these COCs.
The hardness-adjusted DEQ-7 Aquatic Life Standard for the chronic standard for cadmium is 0.8 ug/L.
The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L

Bold Concentration exceeds the ROD discharge to surface water cleanup level
DEQ Montana Department of Environmental Quality
EFF WTP treated effluent station (EFF)
EPA U.S. Environmental Protection Agency
ID Identification
IN WTP influent station (IN)
mg/L Milligrams per liter
MPTP Montana Pole and Treating Plant
NCRTEFF Near Creek Recovery Trench effluent
NHRTEFF Near Highway Recovery Trench effluent
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
ug/L Micrograms per liter
U Analyte not detected
WTP MPTP water treatment plant

TABLE 3.1
LTU WATER APPLICATION FOR 2013

Date	Meter (Before)	Meter (After)	LTU Water Application (gallons)	Comments
7/2/2013	50338700	50412900	74,200	-
7/9/2013	50412900	50533300	120,400	-
7/11/2013	50533300	50591500	58,200	-
7/22/2013	50591500	50735300	143,800	-
7/25/2013	50735300	50914800	179,500	-
8/13/2013	50914800	51097700	182,900	-
8/20/2013	51097700	51223400	125,700	-
Total volume applied to LTU in 2013 (gallons):			**884,700**	**-**

Notes:

-	No comment for this date
LTU	Land treatment unit

TABLE 3.2
HISTORICAL LTU WATER APPLICATION

Year	LTU Water Application (gallons)
1999	710,700
2000	425,250
2001	3,188,700
2002	2,321,700
2003	7,395,500
2004	5,034,300
2005	1,921,600
2006	7,007,600
2007	3,042,800
2008	5,784,800
2009	3,758,000
2010	3,169,400
2011	2,141,200
2012	1,171,900
2013	884,700
Total Volume Applied:	**47,958,150**

Note:
LTU Land treatment unit

TABLE 3.3
LTU SAMPLING RESULTS FOLLOWING 2007 LTU OFFLOAD

	2-Oct-07		2-Jul-08	2-Oct-08	8-Jul-09	14-Oct-10	19-Sep-11		26-Sep-12		1-Oct-13		
Sample	PCP	Dioxin TEQ	PCP	PCP	PCP	PCP	PCP	Dioxin TEQ	PCP	Dioxin TEQ	PCP	Dioxin TEQ	Dioxin TEQ
Cleanup levels	34 mg/kg	(0.2 µg/kg)	34 mg/kg	34 mg/kg	34 mg/kg	34 mg/kg	34 mg/kg	(0.2 µg/kg)	34 mg/kg	(0.2 µg/kg)	34 mg/kg	(0.2 µg/kg)	(0.2 µg/kg)
Units	mg/kg	µg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	µg/kg	mg/kg	µg/kg	mg/kg	µg/kg	µg/kg
Laboratory	MBMG	TAL	MBMG	MBMG	MBMG	MBMG	MBMG	Pace	MBMG	Pace	MBMG	Pace	Pace
Method	8270	8290	8270	8270	8270	8270	8270	8290	8270	8290	8270	8290	8290
Extraction	NA	MAE	NA	NA	NA	NA	NA	MAE	NA	MAE	NA	MAE	SOX
LTUZ01 0-24"	20.7	--	**82.10**	**61.9**	**42**	22.2	18.6	--	13.9	--	--	--	--
Duplicate of LTUZ01 0-24"	--	--	--	--	--	20.9	--	--	--	--	--	--	--
LTUZ01 24-36"	17.5	--	**69.10**	**52.2**	**41.2**	20.8	10.3	--	1.3	--	--	--	--
LTUZ01 Comp	--	**1.9**		--	--	--	--	**0.3**	--	**3.6**	--	**0.4**	**2.5**
LTUZ02 0-24"	28.4	--	**109**	**75.7**	**81.1**	**67.3**	**34.9**	--	32.6	--	20.3	--	--
LTUZ02 24-36"	**87.6**	--	**124**	**160**	**162**	**64.4**	**47.6**	--	**36.2**	--	18.6	--	--
Duplicate LTUZ02 24-36"	--	--	--	--	--	--	**56.7**	**0.2**	--	--	--	--	--
LTUZ02 Comp	--	**9.1**		--	--		--	**0.3**	--	**2.8**	--	**0.2**	**4.2**
LTUZ03 0-24"	**55.9**	--	**187**	**79.5**	21.5	14.5	**97.9**	--	**91.7**	--	**39.1**	--	--
Duplicate LTUZ03 0-24'	--	--		**183**	--	--	--	--	--	--	--	--	--
LTUZ03 24-36"	**153**	--	**343**	--	**149**	16.6	**96.1**	--	**77.7**	--	**39.3**	--	--
Duplicate LTUZ03 24-36"	--	--	--	--	--	--	--	--	**55.2**	--	--	--	--
LTUZ03 Comp	--	**2.6**		--	--	--	--	**1.0**	--	**1.8**	--	0.1	**2.3**
Duplicate LTUZ03 Comp	--	--		--	--	--	--	--	--	**1.3**	--	--	--
LTUZ04 0-24"	15.9	--	**156**	**36.2**	**46.9**	14.6	**49.9**	--	12.2	--	**45.7**	--	--
LTUZ04 24-36"	13.4	--	**246**	**256**	**37.2**	14.5	**50.9**	--	13.1	--	**40.9**	--	--
LTUZ04 Comp	--	**1.6**		--	--	--	--	**0.6**	--	**2.8**	--	**0.3**	**1.9**
Duplicate LTUZ04 Comp	--	--	--	--	--	--	--	--	--	--	--	0.1	**2.9**
LTUZ05 0-24"	18.3	--	**49.1**	**63.3**	**42.6**	**34.0**	**51.8**	--	**37.2**	--	13.9	--	--
LTUZ05 24-36"	15.5	--	**64.2**	**147**	**50.1**	**50.7**	**41.9**	--	**34.2**	--	12.2	--	--
LTUZ05 Comp	--	**1.2**		--	--	--	--	**0.4**	--	**3.7**	--	0.2	**1.0**
LTUZ06 0-24"	21.8	--	**40.6**	**50.5**	**63.9**	28.5	33.4	--	**41.3**	--	19.3	--	--
LTUZ06 24-36"	16.7	--	32.1	**93.3**	**79**	31.6	32.8	--	**46.2**	--	19.1	--	--
LTUZ06 Comp	--	**1.9**		--	--	--	--	**0.4**	--	**2.5**	--	**0.5**	**2.7**
LTUZ07 0-24"	18.9	--	3.6	--	--	--	20.2	--	20.1	--	--	--	--
Duplicate LTUZ07 0-24"	--	--	--	--	--	--	--	--	--	--	--	--	--
LTUZ07 24-36"	13.0	--	32.6	--	--	--	20.3	--	22.4	--	--	--	--
LTUZ07 Comp	--	**1.1**	--	--	--	--	--	**0.3**	--	**6.0**	--	**0.3**	**3.7**
LTUZ08 0-24"	13.1	--	1.9	--	--	--	27.6	--	18.6	--	--	--	--
LTUZ08 24-36"	33.7	--	4.7	--	--	--	28.2	--	15.7	--	--	--	--
LTUZ08 Comp	--	**1.3**	--	--	--	--	--	**0.6**	--	**1.9**	--	**0.3**	**3.2**
LTUZ09 0-24"	9.26	--	2.74	--	--	--	16.3	--	6.2	--	--	--	--
LTUZ09 24-36"	32.0	--	2.3	--	--	--	22.8	--	5.8	--	--	--	--
LTUZ09 Comp	--	**1.1**	--	--	--	--	--	0.1	--	**1.0**	--	**0.5**	**2.0**
LTUZ10 0-24"	15.4	--	4.1	--	--	--	32.0	--	1.4	--	--	--	--
LTUZ10 24-36"	15.0	--	4.1	--	--	--	**35.8**	--	6.5	--	--	--	--
Duplicate LTUZ10 24-36"	10.4	--	--	--	--	--	--	--	--	--	--	--	--
LTUZ10 Comp	--	**0.9**	--	--	--	--	--	0.1	--	**1.6**	--	0.1	**2.2**
Duplicate LTUZ10 Comp	--	**1.3**	--	--	--	--	--	--	--	--	--	--	--

Notes:
October 2007 sampling was conducted after 2007 LTU offload and after addition of SSP soils for final treatment.
Dioxin toxicity equivalency quotients (TEQ) were calculated using dioxin toxicity equivalency factors (TEF) provided in the ROD.

--	Not analyzed	Pace	Pace Analytical
Bold	Concentration greater than cleanup level	PCP	Pentachlorophenol
Comp	Composite	ROD	Record of Decision
LTU	Land treatment unit	SOX	Soxhlet extraction
MAE	Microwave assisted extraction	SSP	Soil salvage piles
MBMG	Montana Bureau of Mines and Geology Laboratory	TAL	Test America Laboratories / Severn Trent Laboratories, Inc.
mg/kg	Milligrams per kilogram	TEF	Toxicity equivalency factor
NA	Not Applicable	TEQ	Toxicity equivalency quotient

TABLE 4.1
HISTORICAL CONCENTRATIONS OF PCP FOR SURFACE WATER SAMPLES

Surface Water Station:	**SW-05**	**SS-06A**	**SW-09**	ROD Cleanup Level (µg/L)
Analyte:	PCP	PCP	PCP	
Units:	(µg/L)	(µg/L)	(µg/L)	
Laboratory:	MBMG	MBMG	MBMG	
EPA Method:	8270/528[a]	8270/528[a]	8270/528[a]	
2001 Range	0.071 - **1.8**	--	--	1.0
2002 Range	0.423 - **2.36**	--	--	1.0
2003 Range	0.058 - 0.15	--	--	1.0
2004 Range	--	--	--	1.0
2005 Range	0.45 - 0.071	--	--	1.0
2006 Range	0.038 - **1.03**	--	0.6	1.0
2007 Range	0.1U - 0.349	--	0.1U - 0.246	1.0
2008 Range	0.1U - 0.349	--	0.1U - 0.246	1.0
2009 Range	0.061 - 0.188	--	0.064 - 0.454	1.0
2010 Range	0.2U - 0.186	0.2U	0.2U	1.0
2011 Range	0.2U - 0.281	0.2U	0.2U	1.0
2012 Range	0.2U - 0.670	0.2U	0.2U	1.0
2013 Range	0.2U	0.2U - 0.214	0.2U	1.0
February 4, 2013 (semi-annual sampling event)	0.2U	0.214	0.2U	1.0
August 12, 2013 (annual sampling event)	0.2U	0.2U	0.2U	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
a	U.S. EPA Method 8270 was used prior to 2011; U.S. EPA Method 528 was used beginning in 2011.
Bold	Concentration exceeds ROD surface water cleanup level (1.0 µg/L)
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology laboratory
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyte not detected

Data prior to October 2010 have not been back-checked against original laboratory data sheets.

TABLE 4.2

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(µg/L)

Sample Date	SW-05 (µg/L)	SS-06A (µg/L)	SW-09 (µg/L)	ROD Cleanup Level (µg/L)
8/21/2006	0	--	0	1.00E-05
8/26/2007	7.70E-07	--	--	1.00E-05
8/25/2008	0	--	5.10E-08	1.00E-05
8/10/2009	0	--	0	1.00E-05
8/16/2010	0	--	0	1.00E-05
8/15/2011	8.10E-08	1.09E-07	1.70E-08	1.00E-05
8/13/2012	3.47E-07	4.10E-08	3.40E-08	1.00E-05
8/13/2013[a]	2.27E-07	2.50E-08	1.86E-06	1.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR SURFACE WATER SAMPLES

(pg/L)

Sample Date	SW-05 (pg/L)	SS-06A (pg/L)	SW-09 (pg/L)	ROD Cleanup Level (pg/L)
8/21/2006	0	--	0	10.00
8/26/2007	0.77	--	--	10.00
8/25/2008	0	--	0.05	10.00
8/10/2009	0	--	0	10.00
8/16/2010	0	--	0	10.00
8/15/2011	0.08	0.11	0.02	10.00
8/13/2012	0.35	0.04	0.03	10.00
8/12/2013[a]	0.23	0.03	1.86	10.00

Notes:

0	All dioxin cogeners were below the reporting limit and set to 0 for the calculation of TEQ, resulting in a TE value equal to 0.
--	Not sampled
µg/L	Micrograms per liter
pg/L	Picograms per liter
a	Significant rain event on August 1, 2013 (0.6 inch)
Bold	Concentration exceeds the ROD surface water cleanup leve
ROD	Record of Decision
TEQ	Toxicity equivalent quotient

TABLE 4.3
CONCENTRATIONS OF PAH AND CHLOROPHENOLS FOR SURFACE WATER SAMPLES

Surface Water Station:	**SW-05**	**SS-06A**	**SW-09**	**ROD Cleanup Level (µg/L)**
Sample Date:	**8/12/2013**	**8/12/2013**	**8/12/2013**	
Laboratory:	**MBMG**	**MBMG**	**MBMG**	
Units:	**(µg/L)**	**(µg/L)**	**(µg/L)**	
ANALYTES				
PAH (EPA Method 8270)				
ACENAPHTHENE	1U	1U	1U	-
ACENAPHTHYLENE	1U	1U	1U	-
ANTHRACENE	1U	1U	1U	-
BENZO(A)ANTHRACENE	1U	1U	1U	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.2/0.05[a]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2
BENZO(G,H,I)PERYLENE	1U	1U	1U	1
BENZO(K)FLUORANTHENE	1U	1U	1U	1
CHRYSENE	1U	1U	1U	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.31	0.2U	0.2
FLUORANTHENE	1U	1U	1U	-
FLUORENE	1U	1U	1U	-
INDENO(1,2,3-CD)PYRENE	1U	1U	1U	1
NAPHTHALENE	1U	1U	1U	-
PHENANTHRENE	1U	1U	1U	-
PYRENE	1U	1U	1U	-
Total D PAH	1U	1U	1U	360
CHLOROPHENOLS (EPA Method 8270)				
2,3,4,6-TETRACHLOROPHENOL	1U	1U	1U	-
2,3,5,6-TETRACHLOROPHENOL	1U	1U	1U	267
2,4,6-TRICHLOROPHENOL	1U	1U	1U	7
2,4-DICHLOROPHENOL	1U	1U	1U	27
2-CHLOROPHENOL	1U	1U	1U	45
PENTACHLOROPHENOL (EPA Method 528)	0.2U	0.2U	0.2U	1.00

Notes:
- No cleanup level specified in ROD
µg/L Micrograms per liter
a The water quality standard for benzo(a)pyrene outlined in Circular DEQ-7 is lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standard (in parentheses) currently takes precedence over the ROD cleanup level for this analyte. The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L
Bold Concentration exceeds the ROD surface water cleanup level
DEQ Montana Department of Environmental Quality
EPA U.S. Environmental Protection Agency
MBMG Montana Bureau of Mines and Geology
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
U Undetected

TABLE 4.4
HISTORICAL CONCENTRATIONS OF PCP FOR SELECTED GROUNDWATER SAMPLES

Monitoring Well:	**10-12**	**BMW-01A**	**BMW-01B**	**GW-14R-98**	**HCA-21**	**INF-04**	**MW-11-04**	**ROD Cleanup Level (µg/L)**
Units:	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	
Laboratory:	**MBMG**	**MBMG**	**MBMG**	**MBMG**	**MBMG**	**MBMG**	**MBMG**	
EPA Method:	**8270/528[a]**	**8270/528[a]**	**8270/528[a]**	**8270/528[a]**	**8270/528[a]**	**8270/528[a]**	**8270/528[a]**	
2000 Range	NI	--	--	**9.02 - 34.5**	**265**	**787 - 1,500**	NI	1.0
2001 Range	NI	--	--	**2.1 - 38.9**	**253**	**14 - 663**	NI	1.0
2002 Range	NI	--	--	**1.6 - 37.5**	**165 - 201**	**5.4 - 72.3**	NI	1.0
2003 Range	NI	--	--	**1.8 - 28**	**171**	**12 - 151**	NI	1.0
2004 Range	NI	--	--	**1.3 - 4.6**	**84**	**13 - 17**	NI	1.0
2005 Range	NI	--	--	**1.1 - 37.5**	**57**	**28 - 35**	NI	1.0
2006 Range	NI	--	--	**17.5 - 72.7**	**1.11 - 39.2**	**18 - 205**	NI	1.0
2007 Range	NI	--	--	**2.25 - 15.2**	**20.2 - 20.6**	**119 - 199**	NI	1.0
2008 Range	NI	--	--	**1.1 - 4.41**	**13.7 - 26.3**	**102 - 124**	NI	1.0
2009 Range	NI	0.2U	0.2U	0.2U - **2.6**	**3.69 - 28.9**	**44.2 - 79.3**	NI	1.0
2010 Range	0.605 - **1.03**	0.186	0.164	0.806 - **3.45**	0.873 - **7.67**	**80.0 - 81.3**	NI	1.0
2011 Range	0.618 - **1.51**	NS	NS	0.60 - **1.45**	**6.18 - 16.9**	**31.7 - 56.3**	**3,490**	1.0
2012 Range	0.2U - 0.351	0.2U	0.2U	**1.05**	**1.16 - 9.35**	**1.61 - 67.7**	**1,440 - 1,450**	1.0
2013 Range	0.213 - 0.305	0.2U - 0.251	0.2U	0.297	0.49	**21.5 - 43.2**	**1,536 - 7,400[b]**	
February 2013 (semi-annual sampling event)	0.305	0.251	0.2U	Frozen	Frozen	**21.5**	**1,536**	1.0
August 2013 (annual sampling event)	0.213	0.2U	0.2U	0.297	0.49	**43.2**	**7,400[b]**	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
a	EPA Method 8270 was used prior to 2011; EPA Method 528 was used in 2011 and thereafter
b	Insufficient water to fully bail well prior to collecting sample; concentration biased high
Bold	Concentration exceeds ROD groundwater cleanup level
EPA	U.S. Environmental Protection Agency
Frozen	Monitoring well frozen - unable to sample
MBMG	Montana Bureau of Mines and Geology
NI	Monitoring well was net yet installed.
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyte not detected

TABLE 4.5
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(µg/L)

Sample Date	10-12 (µg/L)	BMW-01A (µg/L)	BMW-01B (µg/L)	GW-12 (µg/L)	GW-14R-98 (µg/L)	HCA-21 (µg/L)	INF-04 (µg/L)	INF-05 (µg/L)	INF-06 (µg/L)	MW-11-04[a] (µg/L)	MW-B-98 (µg/L)	MW-D-96 (µg/L)	MW-E-01 (µg/L)	MW-L-96 (µg/L)	MW-U-01 (µg/L)	MW-V-01 (µg/L)	NWW (µg/L)	ROD Cleanup Level (µg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83E-06	--	--	--	7.70E-08	2.10E-08	--	--	--	3.00E-05
8/12/2002	--	--	--	--	--	--	--	--	2.00E-07	--	--	--	2.10E-07	1.70E-07	--	--	--	3.00E-05
8/4/2003	--	--	--	--	--	--	--	--	4.90E-08	--	--	--	1.10E-07	0	--	--	--	3.00E-05
8/2/2004	--	--	--	--	--	--	--	--	7.00E-07	--	--	--	**4.35E-05**	0	--	--	--	3.00E-05
8/1/2005	--	--	--	--	--	--	--	--	9.20E-08	--	--	--	2.70E-06	5.30E-07	--	--	--	3.00E-05
8/21/2006	--	--	--	7.90E-08	--	--	1.29E-05	0	7.20E-08	--	7.80E-08	9.20E-08	**5.96E-05**	0	--	--	--	3.00E-05
8/27/2007	--	--	--	2.80E-07	--	--	6.90E-07	7.00E-08	0.00E+00	--	0	0	1.00E-07	0	--	--	--	3.00E-05
8/25/2008	--	--	--	0	--	--	1.26E-05	8.00E-08	0.00E+00	--	0	6.50E-07	1.30E-07	0	--	--	--	3.00E-05
8/10/2009	--	--	--	--	0	--	1.40E-07	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/16/2010	--	--	--	--	0	--	**4.50E-05**	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/15/2011	--	--	--	--	1.05E-06	--	4.09E-06	--	--	--	9.30E-09	--	--	--	--	2.82E-08	1.70E-08	3.00E-05
8/13/2012	--	--	--	--	1.18E-07	--	2.75E-05	--	--	--	1.04E-07	--	--	--	--	3.30E-08	7.40E-08	3.00E-05
8/13/2013	4.50E-08	8.81E-08	1.12E-07	--	6.70E-07	8.04E-08	5.59E-06	--	--	9.91E-06	--	--	--	--	--	--	--	3.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(pg/L)

Sample Date	10-12 (pg/L)	BMW-01A (pg/L)	BMW-01B (pg/L)	GW-12 (pg/L)	GW-14R-98 (pg/L)	HCA-21 (pg/L)	INF-04 (pg/L)	INF-05 (pg/L)	INF-06 (pg/L)	MW-11-04[a] (pg/L)	MW-B-98 (pg/L)	MW-D-96 (pg/L)	MW-E-01 (pg/L)	MW-L-96 (pg/L)	MW-U-01 (pg/L)	MW-V-01 (pg/L)	NWW (pg/L)	ROD Cleanup Level (pg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83	--	--	--	0.077	0.021	--	--	--	30.00
8/12/2002	--	--	--	--	--	--	--	--	0.20	--	--	--	0.21	0.17	--	--	--	30.00
8/4/2003	--	--	--	--	--	--	--	--	0.049	--	--	--	0.11	0.00	--	--	--	30.00
8/2/2004	--	--	--	--	--	--	--	--	0.70	--	--	--	**43.45**	0.00	--	--	--	30.00
8/1/2005	--	--	--	--	--	--	--	--	0.092	--	--	--	2.695	0.53	--	--	--	30.00
8/21/2006	--	--	--	0.079	--	--	12.92	0	0.072	--	0.078	0.092	**59.63**	0.00	--	--	--	30.00
8/26/2007	--	--	--	0.28	--	--	0.69	0.07	0	--	0	0	0.10	0	--	--	--	30.00
8/25/2008	--	--	--	0	--	--	12.64	0.08	0	--	0	0.650	0.13	0	--	--	--	30.00
8/10/2009	--	--	--	--	0	--	0.14	--	--	--	0	--	--	--	0	--	--	30.00
8/16/2010	--	--	--	--	0	--	**45.0**	--	--	--	0	--	--	--	0	--	--	30.00
8/15/2011	--	--	--	--	1.05	--	4.09	--	--	--	0.009	--	--	--	--	0.028	0.017	30.00
8/13/2012	--	--	--	--	0.12	--	27.50	--	--	--	0.104	--	--	--	--	0.033	0.074	30.00
8/12/2013	0.05	0.09	0.11	--	0.67	0.08	5.59	--	--	9.91	--	--	--	--	--	--	--	30.00

Notes:

a	There was insufficient water in monitoring well MW-11-04 to fully bail well prior to collecting sample on 8/12/2013; concentration is likely biased high
0	Dioxin cogeners were below the reporting limit and set to 0 for the calculation of TEQ, resulting in a TEQ equal to 0.
--	Monitoring well did not exist or was not sampled on this date
µg/L	Micrograms per liter
Bold	Concentration exceeds the ROD groundwater cleanup level
pg/L	Picograms per liter
ROD	Record of Decision
TEQ	Toxicity equivalent quotient

TABLE 4.5
HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(µg/L)

Sample Date	10-12 (µg/L)	BMW-01A (µg/L)	BMW-01B (µg/L)	GW-12 (µg/L)	GW-14R-98 (µg/L)	HCA-21 (µg/L)	INF-04 (µg/L)	INF-05 (µg/L)	INF-06 (µg/L)	MW-11-04[a] (µg/L)	MW-B-98 (µg/L)	MW-D-96 (µg/L)	MW-E-01 (µg/L)	MW-L-96 (µg/L)	MW-U-01 (µg/L)	MW-V-01 (µg/L)	NWW (µg/L)	ROD Cleanup Level (µg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83E-06	--	--	--	7.70E-08	2.10E-08	--	--	--	3.00E-05
8/12/2002	--	--	--	--	--	--	--	--	2.00E-07	--	--	--	2.10E-07	1.70E-07	--	--	--	3.00E-05
8/4/2003	--	--	--	--	--	--	--	--	4.90E-08	--	--	--	1.10E-07	0	--	--	--	3.00E-05
8/2/2004	--	--	--	--	--	--	--	--	7.00E-07	--	--	--	**4.35E-05**	0	--	--	--	3.00E-05
8/1/2005	--	--	--	--	--	--	--	--	9.20E-08	--	--	--	2.70E-06	5.30E-07	--	--	--	3.00E-05
8/21/2006	--	--	--	7.90E-08	--	--	1.29E-05	0	7.20E-08	--	7.80E-08	9.20E-08	**5.96E-05**	0	--	--	--	3.00E-05
8/27/2007	--	--	--	2.80E-07	--	--	6.90E-07	7.00E-08	0.00E+00	--	0	0	1.00E-07	0	--	--	--	3.00E-05
8/25/2008	--	--	--	0	--	--	1.26E-05	8.00E-08	0.00E+00	--	0	6.50E-07	1.30E-07	0	--	--	--	3.00E-05
8/10/2009	--	--	--	--	0	--	1.40E-07	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/16/2010	--	--	--	--	0	--	**4.50E-05**	--	--	--	0	--	--	--	0	--	--	3.00E-05
8/15/2011	--	--	--	--	1.05E-06	--	4.09E-06	--	--	--	9.30E-09	--	--	--	--	2.82E-08	1.70E-08	3.00E-05
8/13/2012	--	--	--	--	1.18E-07	--	2.75E-05	--	--	--	1.04E-07	--	--	--	--	3.30E-08	7.40E-08	3.00E-05
8/13/2013	4.50E-08	8.81E-08	1.12E-07	--	6.70E-07	8.04E-08	5.59E-06	--	--	9.91E-06	--	--	--	--	--	--	--	3.00E-05

HISTORICAL CONCENTRATIONS OF DIOXIN (TEQ) FOR GROUNDWATER SAMPLES
(pg/L)

Sample Date	10-12 (pg/L)	BMW-01A (pg/L)	BMW-01B (pg/L)	GW-12 (pg/L)	GW-14R-98 (pg/L)	HCA-21 (pg/L)	INF-04 (pg/L)	INF-05 (pg/L)	INF-06 (pg/L)	MW-11-04[a] (pg/L)	MW-B-98 (pg/L)	MW-D-96 (pg/L)	MW-E-01 (pg/L)	MW-L-96 (pg/L)	MW-U-01 (pg/L)	MW-V-01 (pg/L)	NWW (pg/L)	ROD Cleanup Level (pg/L)
8/13/2001	--	--	--	--	--	--	--	--	3.83	--	--	--	0.077	0.021	--	--	--	30.00
8/12/2002	--	--	--	--	--	--	--	--	0.20	--	--	--	0.21	0.17	--	--	--	30.00
8/4/2003	--	--	--	--	--	--	--	--	0.049	--	--	--	0.11	0.00	--	--	--	30.00
8/2/2004	--	--	--	--	--	--	--	--	0.70	--	--	--	**43.45**	0.00	--	--	--	30.00
8/1/2005	--	--	--	--	--	--	--	--	0.092	--	--	--	2.695	0.53	--	--	--	30.00
8/21/2006	--	--	--	0.079	--	--	12.92	0	0.072	--	0.078	0.092	**59.63**	0.00	--	--	--	30.00
8/26/2007	--	--	--	0.28	--	--	0.69	0.07	0	--	0	0	0.10	0	--	--	--	30.00
8/25/2008	--	--	--	0	--	--	12.64	0.08	0	--	0	0.650	0.13	0	--	--	--	30.00
8/10/2009	--	--	--	--	0	--	0.14	--	--	--	0	--	--	--	0	--	--	30.00
8/16/2010	--	--	--	--	0	--	**45.0**	--	--	--	0	--	--	--	0	--	--	30.00
8/15/2011	--	--	--	--	1.05	--	4.09	--	--	--	0.009	--	--	--	--	0.028	0.017	30.00
8/13/2012	--	--	--	--	0.12	--	27.50	--	--	--	0.104	--	--	--	--	0.033	0.074	30.00
8/12/2013	0.05	0.09	0.11	--	0.67	0.08	5.59	--	--	9.91	--	--	--	--	--	--	--	30.00

Notes:

a	There was insufficient water in monitoring well MW-11-04 to fully bail well prior to collecting sample on 8/12/2013; concentration is likely biased high
0	Dioxin cogeners were below the reporting limit and set to 0 for the calculation of TEQ, resulting in a TEQ equal to 0.
--	Monitoring well did not exist or was not sampled on this date
µg/L	Micrograms per liter
Bold	Concentration exceeds the ROD groundwater cleanup level
pg/L	Picograms per liter
ROD	Record of Decision
TEQ	Toxicity equivalent quotient

TABLE 4.6
CONCENTRATIONS OF PAH AND CHLOROPHENOLS FOR GROUNDWATER SAMPLES

Monitoring Well:	10-12	BMW-01A	BMW-01B	GW-14R-98	HCA-21	INF-04	MW-11-04	ROD Cleanup Level (µg/L)
Sample Date:	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	8/12/2013	
Laboratory:	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	MBMG	
Units:	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	
ANALYTE								
PAH (EPA Method 8270)								
ACENAPHTHENE	1U	1U	1U	1U	1U	1U	6.4S	-
ACENAPHTHYLENE	1U	1U	1U	1U	1U	1U	2.1S	-
ANTHRACENE	1U	1U	1U	1U	1U	1U	1US	-
BENZO(A)ANTHRACENE	1U	1U	1U	1U	1U	1U	1US	1
BENZO(A)PYRENE	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1US	0.2/0.05[a]
BENZO(B)FLUORANTHENE	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2US	0.2
BENZO(G,H,I)PERYLENE	1U	1U	1U	1U	1U	1U	1US	1
BENZO(K)FLUORANTHENE	1U	1U	1U	1U	1U	1U	1US	1
CHRYSENE	1U	1U	1U	1U	1U	1U	1US	1
DIBENZO(A,H)ANTHRACENE	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2US	0.2
FLUORANTHENE	1U	1U	1U	1U	1U	1U	1US	-
FLUORENE	1U	1U	1US	1U	1US	1U	2.4	-
INDENO(1,2,3-CD)PYRENE	1U	1U	1U	1U	1U	1U	1US	1
NAPHTHALENE	1U	1U	1U	1U	1U	1U	17.1S	-
PHENANTHRENE	1U	1U	1U	1U	1U	1U	4.4S	-
PYRENE	1U	1U	1U	1U	1U	1U	1US	-
Total D PAH	1U	1U	1U	1U	1U	1U	32.4	360
CHLOROPHENOLS (EPA Method 8270)								
2,3,4,6-TETRACHLOROPHENOL	1U	1U	1U	1U	1U	1.5	21.1D	-
2,3,5,6-TETRACHLOROPHENOL	1U	1U	1U	1U	1U	1U	2	267
2,4,6-TRICHLOROPHENOL	1U	1U	1U	1U	1U	1U	1.5	6.5
2,4-DICHLOROPHENOL	1U	1U	1U	1U	1U	1U	6.6	27
2-CHLOROPHENOL	1U	1U	1U	1U	1U	1U	7	45
PENTACHLOROPHENOL (EPA Method 528)	0.213	0.2U	0.2U	0.297	0.49	**43.2**	**7,400**[b]	1

Notes:
- No cleanup level specified in ROD
µg/L Micrograms per liter
a The water quality standard for benzo(a)pyrene outlined in Circular DEQ-7 is lower than the cleanup levels specified in the ROD tables; therefore, the lower DEQ-7 standard (in parentheses) currently takes precedence over the ROD cleanup level for this COC. The DEQ-7 standard for benzo(a)pyrene is 0.05 ug/L
b Insufficient water to fully bail well prior to collecting sample; concentration is likely biased high
Bold Concentration exceeds ROD groundwater cleanup level
D Result obtained from analysis of diluted sample
DEQ Montana Department of Environmental Quality
EPA U.S. Environmental Protection Agency
MBMG Montana Bureau of Mines and Geology
PAH Polycyclic aromatic hydrocarbons
ROD Record of Decision
S Peak saturated
U Analyte not detected

TABLE 4.7
QUALITY CONTROL - SOURCE WATER BLANKS

Date Sampled	Sample ID	Analyte	EPA Method	Concentration	Q	Units
PENTACHLOROPHENOL (EPA Method 528)						
1/14/2013	OPOQVS011413	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/11/2013	OPOQVS021113	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/11/2013	OPOQVS031113	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/25/2013	OPOQVS032513	PENTACHLOROPHENOL	528	0.2	U	µg/L
4/22/2013	OPOQVS042213	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/20/2013	OPOQVS052013	PENTACHLOROPHENOL	528	0.2	U	µg/L
6/17/2013	OPOQVS061713	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/5/2013	OPOQVS080513	PENTACHLOROPHENOL	528	0.2	U	µg/L
9/16/2013	OPOQVS091613	PENTACHLOROPHENOL	528	0.2	U	µg/L
10/14/2013	OPOQVS101413	PENTACHLOROPHENOL	528	0.2	U	µg/L
10/28/2013	OPOQVS102813	PENTACHLOROPHENOL	528	0.2	U	µg/L
11/11/2013	OPOQVS111113	PENTACHLOROPHENOL	528	0.2	U	µg/L
11/25/2013	OPOQVS112513	PENTACHLOROPHENOL	528	0.2	U	µg/L
1/28/2013	WTPVS012813	PENTACHLOROPHENOL	528	0.2	U	µg/L
3/4/2013	WTPVS030413	PENTACHLOROPHENOL	528	0.2	U	µg/L
4/15/2013	WTPVS041513	PENTACHLOROPHENOL	528	0.2	U	µg/L
5/13/2013	WTPVS051313	PENTACHLOROPHENOL	528	0.2	U	µg/L
6/10/2013	WTPVS061013	PENTACHLOROPHENOL	528	0.2	U	µg/L
7/8/2013	WTPVS070813	PENTACHLOROPHENOL	528	0.2	U	µg/L
7/22/2013	WTPVS072213	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/26/2013	WTPVS082613	PENTACHLOROPHENOL	528	0.2	U	µg/L
9/9/2013	WTPVS090913	PENTACHLOROPHENOL	528	0.2	U	µg/L
10/7/2013	WTPVS100713	PENTACHLOROPHENOL	528	0.2	U	µg/L
12/16/2013	WTPVS121613	PENTACHLOROPHENOL	528	0.2	U	µg/L
12/30/2013	WTPVS123013	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/7/2013	MW-19020713	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/8/2013	MW-19080813	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/6/2013	MW-21020613	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/7/2013	MW-21080713	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/5/2013	MW-E-98020513	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/6/2013	MW-E-98080613	PENTACHLOROPHENOL	528	0.2	U	µg/L
2/4/2013	SW-07020413	PENTACHLOROPHENOL	528	0.2	U	µg/L
8/12/2013	SW-07081213	PENTACHLOROPHENOL	528	0.2	U	µg/L
SVOC (EPA Method 8270)						
8/12/2013	SW-07081213	2,3,4,6-TETRACHLOROPHENOL	8270	1	U	µg/L
8/12/2013	SW-07081213	2,3,5,6-TETRACHLOROPHENOL	8270	1	U	µg/L
8/12/2013	SW-07081213	2,4,5-TRICHLOROPHENOL	8270	1	U	µg/L
8/12/2013	SW-07081213	2,4,6-TRICHLOROPHENOL	8270	1	U	µg/L
8/12/2013	SW-07081213	2,4-DICHLOROPHENOL	8270	1	U	µg/L
8/12/2013	SW-07081213	2-CHLOROPHENOL	8270	1	U	µg/L
8/12/2013	SW-07081213	4-CHLORO-3-METHYLPHENOL	8270	1	U	µg/L

TABLE 4.7
QUALITY CONTROL - SOURCE WATER BLANKS

Date Sampled	Sample ID	Analyte	EPA Method	Concentration	Q	Units
PAH (EPA Method 8270)						
8/12/2013	SW-07081213	ACENAPHTHENE	8270	1	U	µg/L
8/12/2013	SW-07081213	ACENAPHTHYLENE	8270	1	U	µg/L
8/12/2013	SW-07081213	ANTHRACENE	8270	1	U	µg/L
8/12/2013	SW-07081213	BENZO(A)ANTHRACENE	8270	1	U	µg/L
8/12/2013	SW-07081213	BENZO(A)PYRENE	8270	0.1	U	µg/L
8/12/2013	SW-07081213	BENZO(B)FLUORANTHENE	8270	0.2	U	µg/L
8/12/2013	SW-07081213	BENZO(G,H,I)PERYLENE	8270	1	U	µg/L
8/12/2013	SW-07081213	BENZO(K)FLUORANTHENE	8270	1	U	µg/L
8/12/2013	SW-07081213	CHRYSENE	8270	1	U	µg/L
8/12/2013	SW-07081213	DIBENZO(A,H)ANTHRACENE	8270	0.2	U	µg/L
8/12/2013	SW-07081213	FLUORANTHENE	8270	1	U	µg/L
8/12/2013	SW-07081213	FLUORENE	8270	1	U	µg/L
8/12/2013	SW-07081213	INDENO(1,2,3-CD)PYRENE	8270	1	U	µg/L
8/12/2013	SW-07081213	NAPHTHALENE	8270	1	U	µg/L
8/12/2013	SW-07081213	PHENANTHRENE	8270	1	U	µg/L
8/12/2013	SW-07081213	PYRENE	8270	1	U	µg/L
DIOXIN (TEQ) (EPA Method 8290)						
8/12/2013	SW-07081213	DIOXIN (TEQ)	8290	**0.039**	BJ	pg/L
ANIONS (EPA Method 300.1)						
8/12/2013	SW-07081213	CHLORIDE	300.1	0.1	U	mg/L
8/12/2013	SW-07081213	FLUORIDE	300.1	0.01	U	mg/L
8/12/2013	SW-07081213	NITRATE	300.1	0.01	U	mg/L
8/12/2013	SW-07081213	NITRITE	300.1	0.01	U	mg/L
8/12/2013	SW-07081213	ORTHOPHOSPHATE	300.1	0.02	U	mg/L
METALS - TOTAL (EPA Method 200.8)						
8/12/2013	SW-07081213	ARSENIC	200.8	0.25	U	µg/L
8/12/2013	SW-07081213	CADMIUM	200.8	0.25	U	µg/L
8/12/2013	SW-07081213	CHROMIUM	200.8	**0.8**	J	µg/L
8/12/2013	SW-07081213	COPPER	200.8	0.1	U	µg/L
8/12/2013	SW-07081213	LEAD	200.8	0.15	U	µg/L
8/12/2013	SW-07081213	ZINC	200.8	0.13	U	µg/L

Notes

µg/L	Micrograms per liter
Bold	Analyte detected in source water blank
BJ	Estimated value - less than 10 times higher than method blank level
Dioxin	Polychlorinated dibenzo-p-dioxins
EPA	U.S. Environmental Protection Agency
ID	Identification
J	Estimated
mg/L	Milligrams per liter
PAH	Polycyclic aromatic hydrocarbon
pg/L	Picograms per liter
Q	Laboratory data qualifier
SVOC	Semi-volatile organic compound
TEQ	Toxicity equivalence quotient
U	Undetected

TABLE 4.8
QUALITY CONTROL - FIELD DUPLICATES

Sample Date	Original Sample ID	Analyte	Original Concentration	Q	Original Sample RL	Duplicate Sample ID	Duplicate Concentration	Q	Duplicate Sample RL	Units	RPD[a]
PENTACHLOROPHENOL (EPA Method 528)											
1/7/2013	NCRTEFF010713	PENTACHLOROPHENOL	4.05		0.2	WTPVS010713	3.98		0.2	µg/L	1.7
1/21/2013	BABB012113	PENTACHLOROPHENOL	0.677		0.2	OPOQVS012113	0.495		0.2	µg/L	31.1
2/4/2013	SS-06A020413	PENTACHLOROPHENOL	0.214		0.2	MW-20020413	0.2	U	0.2	µg/L	6.8
2/5/2013	GS-18-R020513	PENTACHLOROPHENOL	14.4		0.2	MW-18020513	14.6		0.2	µg/L	1.4
2/6/2013	MW-S-01020613	PENTACHLOROPHENOL	457	D	0.2	MW-C-99020613	363	D	0.2	µg/L	22.9
2/7/2013	INF-13-20713	PENTACHLOROPHENOL	231	D	0.2	MW-G-98020713	229	D	0.2	µg/L	0.9
2/18/2013	IN021813	PENTACHLOROPHENOL	93	D	0.2	WTPVS021813	90.4	D	0.2	µg/L	2.8
2/25/2013	BABB022513	PENTACHLOROPHENOL	0.577		0.2	OPOQVS022513	0.497		0.2	µg/L	14.9
3/18/2013	BABB031813	PENTACHLOROPHENOL	0.879		0.2	WTPVS031813	0.89		0.2	µg/L	1.2
4/8/2013	EFF040813	PENTACHLOROPHENOL	0.332		0.2	OPOQVS040813	0.312		0.2	µg/L	6.2
4/29/2013	EFF042913	PENTACHLOROPHENOL	0.32		0.2	WTPVS042913	0.335		0.2	µg/L	4.6
5/22/2013	SW-06052213	PENTACHLOROPHENOL	1.07		0.2	SW-07052213	1.1		0.2	µg/L	2.8
6/3/2013	MW-S-01060313	PENTACHLOROPHENOL	94.7	D	0.2	OPOQVS060313	96.6	D	0.2	µg/L	2.0
6/24/2013	IN062413	PENTACHLOROPHENOL	56.9	D	0.2	WTPVS062413	54.5	D	0.2	µg/L	4.3
7/1/2013	NCRTEFF070113	PENTACHLOROPHENOL	4.3		0.2	OPOQVS070113	4.36		0.2	µg/L	1.4
7/15/2013	BABB071513	PENTACHLOROPHENOL	0.583		0.2	OPOQVS071513	0.455		0.2	µg/L	24.7
8/5/2013	MW-11-02080513	PENTACHLOROPHENOL	608	D	0.2	WTPVS080513	694	D	0.2	µg/L	13.2
8/5/2013	MW-11-02080513	PENTACHLOROPHENOL	608	D	1	WTPVS080513	694	D	0.2	µg/L	13.2
8/6/2013	BMW-9A080613	PENTACHLOROPHENOL	0.436		0.2	MW-18080613	0.414		0.2	µg/L	5.2
8/7/2013	GW-21080713	PENTACHLOROPHENOL	0.46		0.2	MW-C-99080713	0.386		0.2	µg/L	17.5
8/8/2013	PZ-N5-03080813	PENTACHLOROPHENOL	25		0.2	MW-G-98080813	27.3		0.2	µg/L	8.8
8/12/2013	EFF081213	PENTACHLOROPHENOL	0.448		1	MW-20081213B	0.426		1	µg/L	5.0
8/12/2013	EFF081213	PENTACHLOROPHENOL	0.448		1	MW-20081213B	0.426		0.2	µg/L	5.0
8/12/2013	EFF081213	PENTACHLOROPHENOL	0.448		0.2	MW-20081213B	0.426		1	µg/L	5.0
8/12/2013	EFF081213	PENTACHLOROPHENOL	0.448		0.2	MW-20081213B	0.426		0.2	µg/L	5.0
8/19/2013	BABB081913	PENTACHLOROPHENOL	0.2	U	0.2	OPOQVS081913	0.2	U	0.2	µg/L	0.0
9/3/2013	NHRTEFF090313	PENTACHLOROPHENOL	149	D	0.2	OPOQVS090313	156	D	0.2	µg/L	4.6
9/23/2013	IN092313	PENTACHLOROPHENOL	89.1	D	0.2	WTPVS092313	86.4	D	0.2	µg/L	3.1
9/30/2013	EFF093013	PENTACHLOROPHENOL	5.1		0.2	OPOQVS093013	5.01		0.2	µg/L	1.8
10/14/2013	BABB101413	PENTACHLOROPHENOL	9.74		0.2	WTPVS101413	11.8		0.2	µg/L	19.1
11/4/2013	IN110413	PENTACHLOROPHENOL	66.3	D	0.2	WTPVS110413	66.6	D	0.2	µg/L	0.5
11/18/2013	EFF111813	PENTACHLOROPHENOL	0.2	U	0.2	WTPVS111813	0.2	U	0.2	µg/L	0.0
12/2/2013	NCRTEFF120213	PENTACHLOROPHENOL	6.34		0.2	WTPVS120213	5.47		0.2	µg/L	14.7
12/9/2013	BABB120913	PENTACHLOROPHENOL	0.2	U	0.2	OPOQVS120913	0.2	U	0.2	µg/L	0.0
12/30/2013	IN123013	PENTACHLOROPHENOL	59	D	0.2	OPOQVS122313	63.1	D	0.2	µg/L	6.7
SVOC (EPA Method 8270)											
8/12/2013	EFF081213	2,3,4,6-TETRACHLOROPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	2,3,5,6-TETRACHLOROPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	2,4,5-TRICHLOROPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	2,4,6-TRICHLOROPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	2,4-DICHLOROPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	2-CHLOROPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	4-CHLORO-3-METHYLPHENOL	1	U	1	MW-20081213B	1	U	1	µg/L	0.0

TABLE 4.8
QUALITY CONTROL - FIELD DUPLICATES

Sample Date	Original Sample ID	Analyte	Original Concentration	Q	Original Sample RL	Duplicate Sample ID	Duplicate Concentration	Q	Duplicate Sample RL	Units	RPD[a]
PAH (EPA Method 8270)											
8/12/2013	EFF081213	ACENAPHTHENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	ACENAPHTHYLENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	ANTHRACENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	BENZO(A)ANTHRACENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	BENZO(A)PYRENE	0.1	U	0.1	MW-20081213B	0.1	U	0.1	µg/L	0.0
8/12/2013	EFF081213	BENZO(B)FLUORANTHENE	0.2	U	0.2	MW-20081213B	0.2	U	0.2	µg/L	0.0
8/12/2013	EFF081213	BENZO(G,H,I)PERYLENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	BENZO(K)FLUORANTHENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	CHRYSENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	DIBENZO(A,H)ANTHRACENE	0.2	U	0.2	MW-20081213B	0.2	U	0.2	µg/L	0.0
8/12/2013	EFF081213	FLUORANTHENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	FLUORENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	INDENO(1,2,3-CD)PYRENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	NAPHTHALENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	PHENANTHRENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
8/12/2013	EFF081213	PYRENE	1	U	1	MW-20081213B	1	U	1	µg/L	0.0
ANIONS (EPA Method 300.1)											
8/12/2013	EFF081213	CHLORIDE	55.28		1	MW-20081213B	55.78		0.1	mg/L	0.9
8/12/2013	EFF081213	FLUORIDE	0.45		0.01	MW-20081213B	0.46		0.01	mg/L	2.2
8/12/2013	EFF081213	NITRATE	4.72		0.01	MW-20081213B	4.77		0.01	mg/L	1.1
8/12/2013	EFF081213	NITRITE	0.01	U	0.01	MW-20081213B	0.01	U	0.01	mg/L	0.0
8/12/2013	EFF081213	ORTHOPHOSPHATE	0.02	J	0.02	MW-20081213B	0.03	J	0.02	mg/L	40.0
METALS - TOTAL (EPA Method 200.8)											
8/12/2013	EFF081213	ARSENIC	2.54		0.25	MW-20081213B	2.56		0.25	µg/L	0.8
8/12/2013	EFF081213	CADMIUM	0.25	U	0.25	MW-20081213B	0.25	U	0.25	µg/L	0.0
8/12/2013	EFF081213	CHROMIUM	0.59	J	0.25	MW-20081213B	0.59	J	0.25	µg/L	0.0
8/12/2013	EFF081213	COPPER	1.16	J	0.1	MW-20081213B	1.13	J	0.1	µg/L	2.6
8/12/2013	EFF081213	LEAD	0.15	U	0.15	MW-20081213B	0.15	U	0.15	µg/L	0.0
8/12/2013	EFF081213	ZINC	17.07		0.13	MW-20081213B	15.44		0.13	µg/L	10.0
										Average RPD:	**4.6**

Notes:

µg/L	Micrograms per liter
a	If one concentration is "U" and the other is detected, then the RL is used as the value for the "U" result
Bold	RPD exceeds the 35% project goal for precision
D	Dilution
EPA	U.S. Environmental Protection Agency
ID	Identification
J	Estimated
mg/L	Milligrams per liter
PAH	Polycyclic aromatic hydrocarbon
Q	Laboratory data qualifier
RL	Laboratory reporting limit
RPD	Relative percent difference
SVOC	Semi-volatile organice compound
U	Undetected

TABLE 4.9
DATA EVALUATION AND PROGRESS OF REMEDIATION

Criterion Number	Criterion	Type of Analysis	Results from Analysis	Documentation of Results (refer to)	Comments	Compliance with ROD?
1	The WTP effluent (station EFF) must meet the 1 µg/L discharge to surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).	Comparisons of the concentrations of constituents at WTP station EFF to the ROD discharge to surface water cleanup levels.	Results from 48 of 52 weekly PCP analyses were below the 1.0 µg/L cleanup level. Exceptions included samples collected between September 16, 2013 and October 7, 2013. The concentrations of dioxins, PAH, and chlorophenols were below the respective ROD discharge to surface water cleanup levels.	Table 2.3 (PCP) Table 2.6 (dioxins) Table 2.7 (PAH and chlorophenols) Appendix A	Elevated PCP results related to condition of primary carbon vessel prior to November 13, 2013 GAC change-out. See Section 2.3.5 for details.	**Almost always (92% of year)**
2	Surface water in Silver Bow Creek (stations SW-05, SS-06A, and SW-09) must meet the 1 µg/L surface water cleanup level for PCP (and specified cleanup levels for other contaminants listed in the ROD).	Comparisons of the concentrations of constituents at surface water stations SW-05, SS-06A, and SW-09 to the ROD surface water cleanup levels.	The concentrations of PCP, dioxins, PAH, and chlorophenols were below the respective ROD surface water cleanup levels.	Table 4.1 (PCP) Table 4.2 (dioxins) Table 4.3 (PAH and chlorophenols) Appendix A	-	**Yes**
3	The PCP plume must remain on site. This criterion is met if the concentration of PCP in groundwater in downgradient sentinel monitoring wells (stations BMW-01A, BMW-01B, and 10-12) continue to meet the 1 µg/L groundwater cleanup level for PCP.	Comparisons of the concentrations of constituents at groundwater stations BMW-01A, BMW-01B, 10-12 to the ROD groundwater cleanup levels.	The concentrations of PCP were below the ROD groundwater cleanup levels.	Table 4.4 (PCP) Appendix A	-	**Yes**
4	The concentrations of PCP in groundwater from representative monitoring wells along the south bank of Silver Bow Creek within the plume footprint (stations GW-14R-98, and HCA-21) must indicate that the trend in the concentration of PCP over time is decreasing, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.	Mann-Kendall Statistical Test for Trends (90 percent confidence interval)	The trends in the concentration of PCP over time in monitoring wells GW-14R-98 and HCA-21 are decreasing at the 90 percent confidence level. In August 2013, the concentration of PCP in monitoring wells HCA-21 (0.49 µg/L) and GW-14R-98 (0.297 µg/L) were below 1 µg/L, suggesting that groundwater quality will eventually meet the 1 µg/L groundwater cleanup level for PCP.	Appendices A and G	-	**Yes**
5	The concentrations of dioxins, PAH, and chlorophenols in groundwater at representative monitoring wells along Silver Bow Creek (stations BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21) must meet the specified cleanup levels listed in the ROD).	Comparisons of the concentrations of constituents at groundwater stations BMW-01A, BMW-01B, 10-12, GW-14R-98, and HCA-21 to the ROD groundwater cleanup levels.	The concentrations of dioxins, PAH, and chlorophenols were below the respective cleanup levels.	Table 4.5 (dioxins) Table 4.6 (PAH and chlorophenols) Appendix A	-	**Yes**
6	The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (short-term trend - previous 5 years).	Mann-Kendall Statistical Test for Trends (90 percent confidence interval)	Over the past 5 years, the trend in the total area of the PCP plume on the south side of Silver Bow Creek (based on the 1 µg/L isocontour line) has been stable at the 90 percent confidence interval.	Appendices F and G	-	**Yes**
7	The overall PCP plume area must be stable or shrinking, showing that ongoing remedial action is effectively preventing the spread of contamination (long-term trend - since ROD was singed [20 years]).	Direct comparison of PCP plume area after the ROD was signed (1993) to the current area of the PCP plume (2013).	Over the past 21 years, the total area of the PCP plume on the south side of Silver Bow Creek (based on the 1 µg/L isocontour line) has decreased from 41.7 acres in 1993 to 17.5 acres in August, 2013. This decrease represents a 58 percent reduction in the area of the PCP plume.	Appendix F and Figure 4.10	-	**Yes**

Notes:

-	No comment
µg/L	Micrograms per liter
Data	2012 sampling results provided in Appendix B
Dioxins	Polychlorinated dibenzo-p-dioxins
EFF	WTP effluent station EFF
GAC	Granulated activated carbon
MPTP	Montana Pole and Treating Plant
MK Tests	Mann-Kendall statistical tests for trends
PAH	Polycyclic aromatic hydrocarbons
PCP	Pentachlorophenol
ROD	Record of Decision
WTP	MPTP water treatment plant

TABLE 4.10
HISTORICAL VOLUME OF NAPL RECOVERED

Year	NAPL Recovered (gallons)
2000	967
2001	1,367
2002	2,104
2003	570
2004	523
2005	511
2006	461
2007	3
2008	46
2009	6
2010	0
2011	0
2012	0
2013	0
Total	6,558

Note:
NAPL Non-aqueous phase liquid

TABLE 5.1

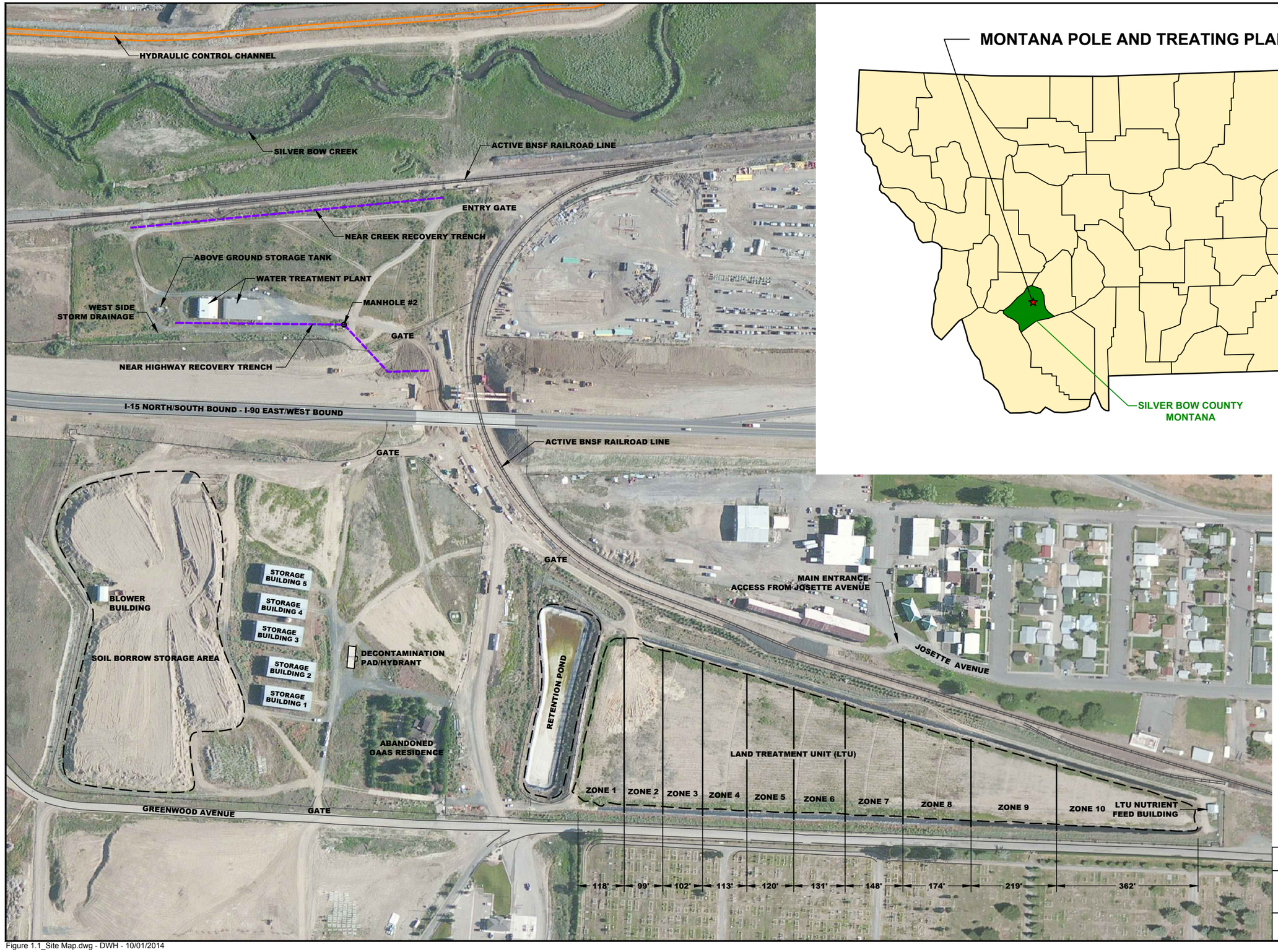
HISTORICAL CONCENTRATIONS OF PCP FOR RESIDENTIAL WELL SAMPLES

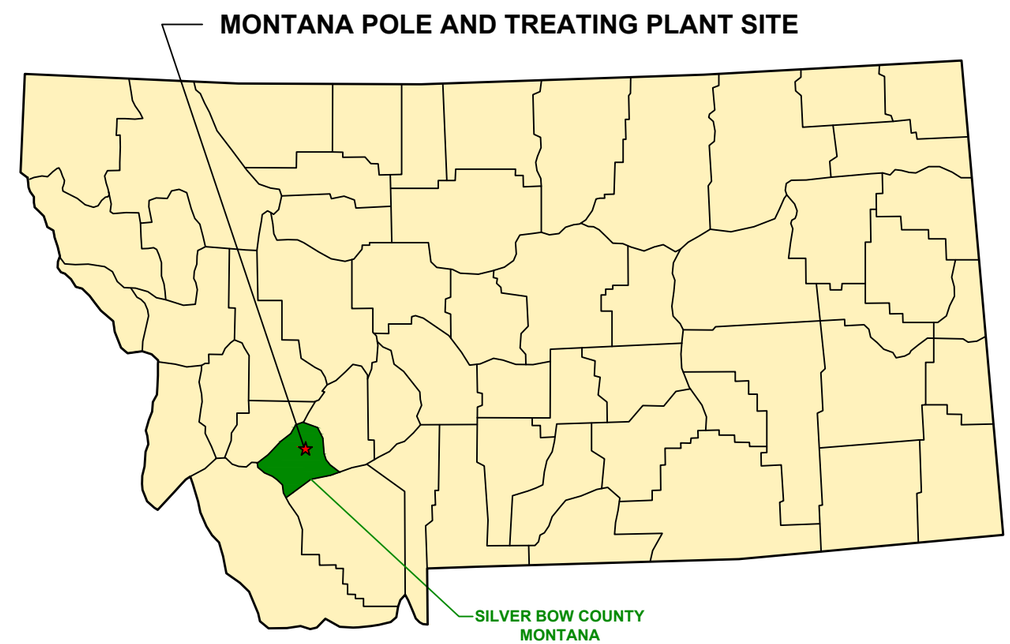
		Domestic Well Name:	**Wayrynen**	**Town Pump #1**	**Bowler**	**Hendrickson**	**Dixon (Rongstad)**	**ROD Cleanup Level (µg/L)**
		Location:	**Upgradient Business Well - South of Contaminant Plume**	**Upgradient Business Well - East of Land Treatment Unit**	**Domestic Irrigation Well - North of Contaminant Plume**	**Domestic Potable Water well - South East of Contaminant Plume**	**Domestic Irrigation Well - North of Land Treatment Unit**	
		Analyte:	**PCP**	**PCP**	**PCP**	**PCP**	**PCP**	
		Units:	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	
Year	**Laboratory**	**EPA Method**						
2001	Energy	8151A	0.13	0.14	0.12	0.11	0.1	1.0
2002	Energy	E515.1	0.2U	0.2U	0.2U	0.2U	0.2U	1.0
2002	Energy	E515.1	0.1U	0.1U	0.1U	0.1U	0.1U	1.0
2003	Energy	E515.1	0.040U	0.040U	0.040U	0.040U	0.071	1.0
2004	Energy	E515.1	0.040U	0.040U	0.040U	0.040U	0.040U	1.0
2005	Energy	E515.1	0.040U	0.040U	0.040U	0.040U	0.040U	1.0
2006	MBMG	8041A	0.1U	0.1U	0.1U	0.1U	0.1U	1.0
2007	MBMG	8041A	0.101	0.057	0.467	0.056	0.096	1.0
2008	MBMG	8041A	0.131	0.073	0.083	0.102	0.115	1.0
2009	MBMG	8041A	--	--	0.2	--	--	1.0
2010	MBMG	528	--	--	--	--	--	1.0
2011	MBMG	528	--	--	--	--	--	1.0
2012	MBMG	528	--	--	--	--	--	1.0
2013	MBMG	528	--	--	--	--	--	1.0

Notes:

--	Not sampled
µg/L	Micrograms per liter
Bold	Concentration exceeds ROD groundwater cleanup level
Energy	Energy Laboratories Inc.
EPA	U.S. Environmental Protection Agency
MBMG	Montana Bureau of Mines and Geology
PCP	Pentachlorophenol
ROD	Record of Decision
U	Analyte not detected

FIGURES





AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

120 0 120 240

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 1.1
SITE MAP

TETRA TECH

Figure 1.1_Site Map.dwg - DWH - 10/01/2014

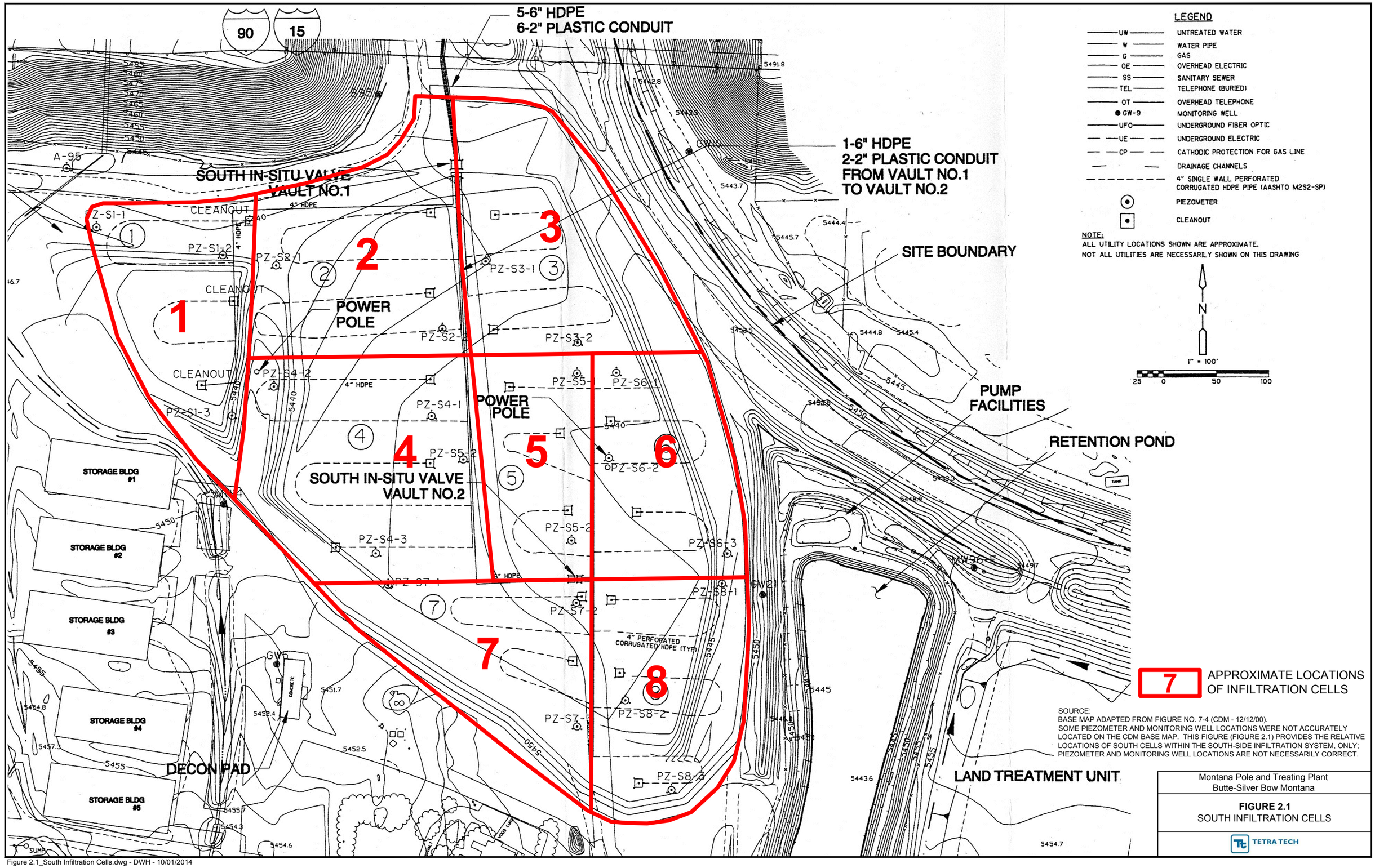
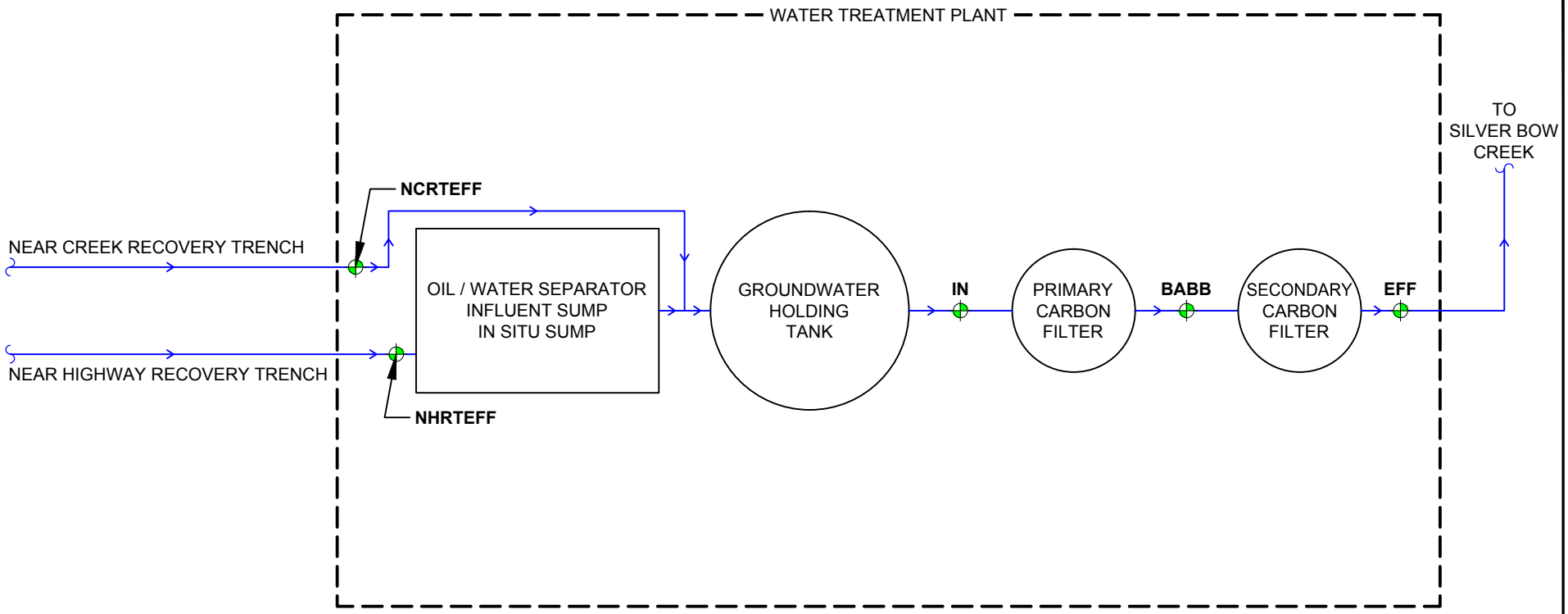


Figure 2.1_South Infiltration Cells.dwg - DWH - 10/01/2014



LEGEND

MPTP WATER TREATMENT PLANT SAMPLE STATION

PIPING

MPTP MONTANA POLE AND TREATING PLANT

NO SCALE

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 2.2
LOCATION OF
MPTP WATER TREATMENT PLANT
SAMPLE STATIONS

TETRA TECH

Figure 2.2_Plant Sample Stations.dwg - DWH - 10/01/2014

LEGEND

SURFACE WATER STATION

HYDRAULIC CONTROL CHANNEL

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

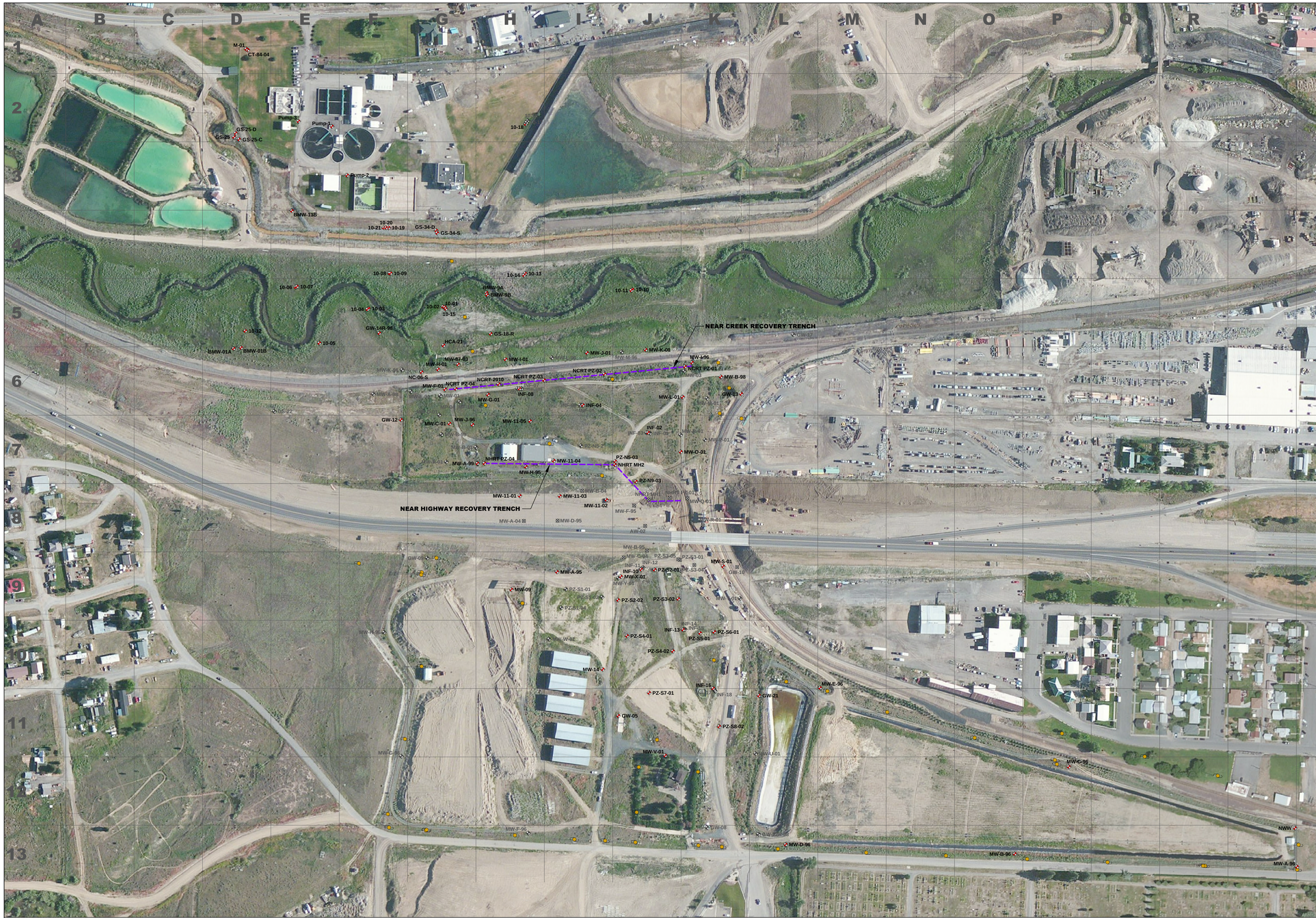
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.1
LOCATION OF SURFACE WATER STATIONS

TETRA TECH

Figure 4.1_Surface Water Stations.dwg - DWH - 10/01/2014



MONITORING WELL	APPROXIMATE SCREENED INTERVAL	CURRENT STATUS	MAP GRID
10-01	Deep	Existing	5G
10-02	Shallow	Existing	5G
10-03	Deep	Existing	5F
10-04	Shallow	Existing	5F
10-05	Shallow	Existing	5E
10-06	Deep	Existing	5E
10-07	Shallow	Existing	5E
10-08	Deep	Existing	4F
10-09	Shallow	Existing	4F
10-10	Deep	Existing	5J
10-11	Shallow	Existing	5J
10-12	Shallow	Existing	5D
10-13	Deep	Existing	4H
10-14	Shallow	Existing	4H
10-15	Intermediate	Existing	5G
10-16	Deep	Existing	2H
10-17	Intermediate	Existing	2H
10-18	Shallow	Existing	2H
10-19	Deep	Existing	4F
10-20	Intermediate	Existing	4F
10-21	Shallow	Existing	4F
AW-02	Shallow	Abandoned	8J
BMW-01A	Deep	Existing	6D
BMW-01B	Deep	Existing	6D
BMW-13B	Deep	Existing (ARCO)	3E
BMW-9A	Shallow	Existing (ARCO)	5H
BMW-9B	Deep	Existing (ARCO)	5H
CT-84-04	Shallow	Existing (ARCO)	1D
GS-18-R	Deep	Existing	3H
GS-22	Shallow	Existing	6E
GS-25	Shallow	Existing (ARCO)	2D
GS-25-C	Deep	Existing (ARCO)	2D
GS-25-D	Deep	Existing (ARCO)	2D
GS-34-D	Deep	Existing (ARCO)	4G
GS-34-S	Shallow	Existing (ARCO)	4G
GW-05	Shallow	Existing	11J
GW-08	Deep	Existing	13K
GW-09	Shallow	Existing	9G
GW-10	Shallow	Destroyed	9K
GW-12	Deep	Existing	7F
GW-13	Deep	Existing	6K
GW-14R-98	Shallow	Existing	5F
GW-17	Shallow	Existing	5L
GW-21	Shallow	Existing	11L
GW-22R-98	Shallow	Existing	13L
HCA-21	Shallow	Existing	5G
INF-01	Intermediate	Existing	7J
INF-02	Shallow	Existing	7J
INF-03	Deep	Existing	7J
INF-04	Shallow	Existing	6I
INF-05	Intermediate	Existing	6I
INF-06	Deep	Existing	6I
INF-07	Deep	Existing	6H
INF-08	Intermediate	Existing	6H
INF-09	Shallow	Existing	6H
INF-10	Shallow	Existing	9J
INF-11	Intermediate	Existing	9J
INF-12	Deep	Existing	9J
INF-13	Shallow	Existing	10K
INF-14	Intermediate	Existing	10K
INF-15	Deep	Existing	10K
INF-16	Shallow	Existing	10K
INF-17	Intermediate	Existing	11K
INF-18	Deep	Existing	11K
M-01	Shallow	Existing (ARCO)	1D
MF-04 (MF-14)	Deep	Existing	6G
MW-01	Shallow	Existing	6G
MW-03	Shallow	Existing	6K
MW-09	Shallow	Existing	9H
MW-11-01	Shallow	Existing	8H
MW-11-02	Shallow	Existing	8I
MW-11-03	Shallow	Existing	8I
MW-11-04	Shallow	Existing	7I
MW-11-05	Shallow	Existing	7H
MW-14	Shallow	Existing	1D
MW-87-03	Shallow	Existing	6G
MW-A-01	Shallow	Existing	7G
MW-A-04	Shallow	Abandoned	8H
MW-A-95	Shallow	Existing	9I
MW-A-96	Shallow	Existing	13T
MW-A-98	Shallow	Existing	6F
MW-A-99	Shallow	Existing	7H
MW-B-01	Shallow	Existing	7G
MW-B-04	Shallow	Abandoned	8I
MW-B-95	Shallow	Abandoned	8J
MW-B-96	Shallow	Existing	13O
MW-B-98	Shallow	Existing	6K
MW-B-99	Shallow	Existing	7G
MW-C-01	Shallow	Existing	7G
MW-C-04	Shallow	Abandoned	9J
MW-C-96	Shallow	Existing	12P
MW-D-01	Shallow	Existing	6G
MW-D-95	Shallow	Abandoned	8I
MW-D-96	Shallow	Existing	13L
MW-E-01	Shallow	Existing	6G
MW-E-96	Shallow	Existing	10M
MW-F-01	Shallow	Existing	6G
MW-F-95	Shallow	Abandoned	8J
MW-F-96	Shallow	Existing	13H
MW-G-01	Shallow	Existing	6H
MW-G-96	Shallow	Existing	11F
MW-H-01	Shallow	Existing	6G
MW-H-95	Shallow	Existing	7H
MW-H-96	Shallow	Existing	10F
MW-I-01	Shallow	Existing	6H
MW-I-96	Shallow/Intermediate	Existing	6K
MW-J-01	Shallow	Existing	6I
MW-J-96	Intermediate/Deep	Existing	7G
MW-K-01	Shallow	Existing	6J
MW-K-96	Deep	Existing	6F
MW-L-01	Shallow	Existing	6K
MW-L-96	Deep	Existing	6I
MW-M-01	Shallow	Existing	6K
MW-M-96	Deep	Existing	6J
MW-N-01	Shallow	Existing	7J
MW-O-01	Shallow	Existing	7J
MW-P-01	Shallow	Existing	7K
MW-Q-01	Shallow	Abandoned	8K
MW-R-01	Shallow	Abandoned	8K
MW-S-01	Shallow	Existing	9K
MW-T-01	Shallow	Existing	9K
MW-U-01	Shallow	Existing	11L
MW-V-01	Shallow	Existing	11J
MW-W-01	Shallow	Existing	10J
MW-X-01	Shallow	Existing	9J
MW-Y-01	Shallow	Existing	9J
NC-06-S	Shallow	Existing	6G
NCRT PZ-01	In Trench	Existing	6K
NCRT PZ-02	In Trench	Existing	6I
NCRT PZ-03	Shallow	Existing	6H
NCRT PZ-04	In Trench	Existing	6G
NCRT-2010	Shallow	Existing	6H
NHRT MH1	In Trench	Abandoned	8J
NHRT MH2	In Trench	Existing	7J
NHRT PZ-01	Shallow	Abandoned	8J
NHRT PZ-04	In Trench	Existing	7H
NWW	Deep	Existing	13S
Pump-1	Manhole	WWTP	2E
Pump-2	Manhole	WWTP	3F
Pump-3	West Sump	WWTP	2E
PZ-N5-03	Shallow	Existing	7J
PZ-N5-2	Shallow	Existing	7I
PZ-N9-03	Shallow	Existing	7J
PZ-S1-01	Shallow	Existing	9I
PZ-S1-02	Shallow	Existing	9I
PZ-S1-04	Shallow	Existing	9I
PZ-S2-01	Shallow	Existing	9J
PZ-S2-02	Shallow	Existing	9J
PZ-S3-01	Shallow	Abandoned	9J
PZ-S3-02	Shallow	Existing	9J
PZ-S3-04	Shallow	Abandoned	9K
PZ-S3-05	Shallow	Abandoned	9J
PZ-S4-01	Shallow	Existing	10J
PZ-S4-02	Shallow	Existing	10J
PZ-S5-01	Shallow	Existing	10K
PZ-S6-01	Shallow	Existing	10K
PZ-S7-01	Shallow	Existing	11J
PZ-S8-02	Shallow	Existing	11K

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

LEGEND

- GROUNDWATER MONITORING WELL (TO BE RETAINED FOR SAMPLING)
- GROUNDWATER MONITORING WELL (NOT TO BE SAMPLED)
- GROUNDWATER MONITORING WELL (ABANDONED OR DESTROYED)
- UTILITY POLE

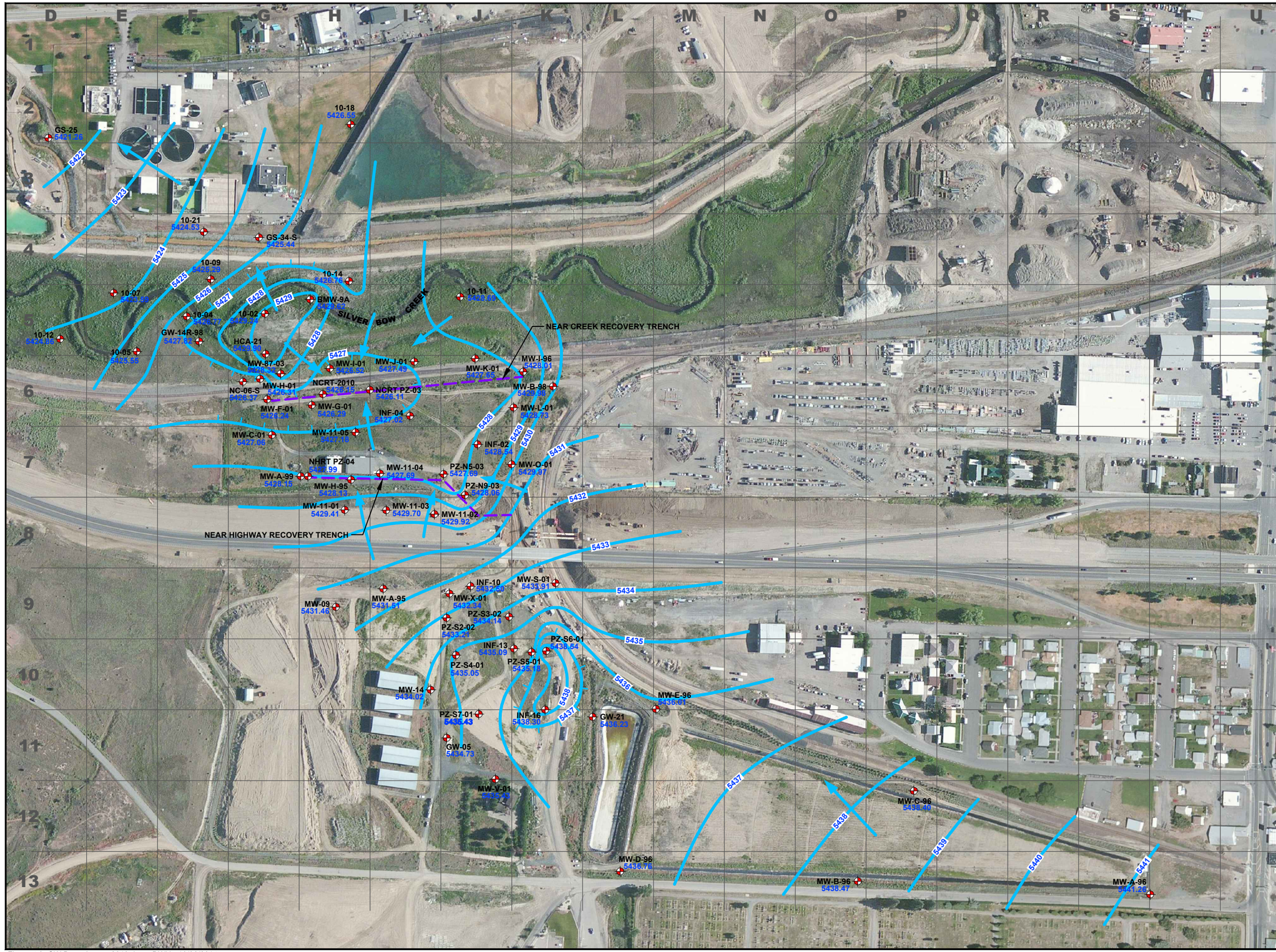
N

70 0 70 140
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana
FIGURE 4.2
LOCATION OF ALL
MONTANA POLE AND TREATING PLANT
MONITORING WELLS

TETRA TECH

Figure 4.2_Location of All MPTP Monitoring Wells.dwg - DWH - 10/02/2014



LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- GROUNDWATER SINK
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTE:
1) THIS FIGURE PROVIDES ONE INTERPRETATION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

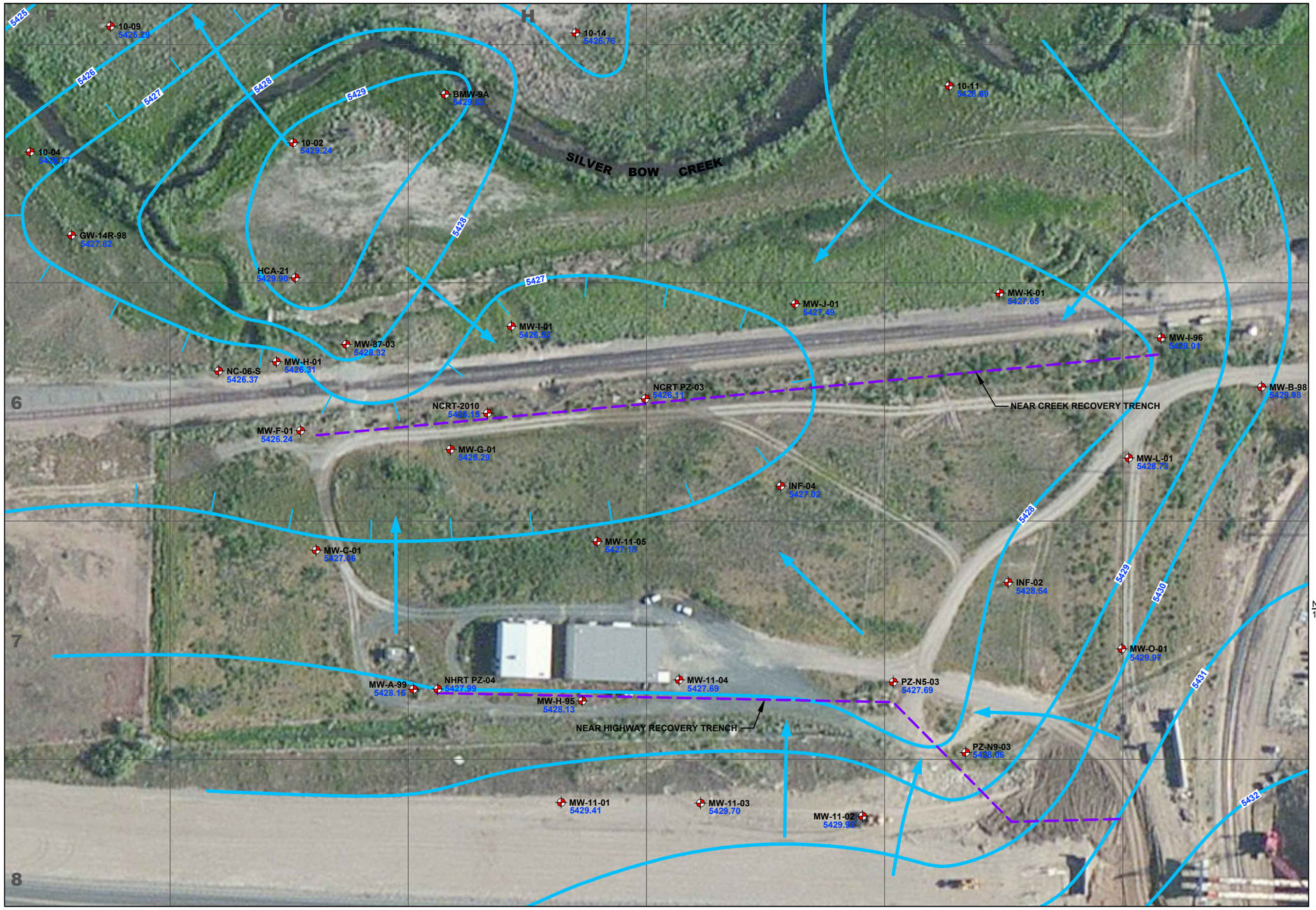
SCALE IN FEET

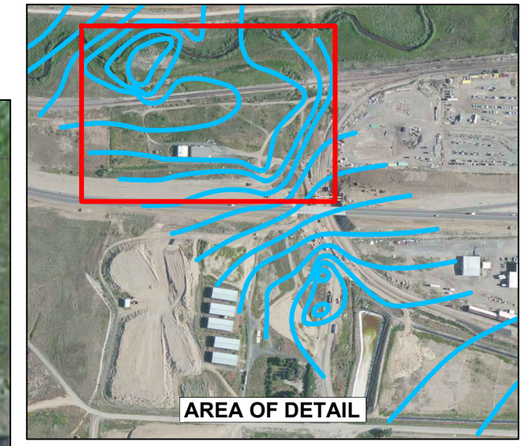
Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.3
GROUNDWATER LEVEL DATA - AUGUST 2, 2013

TETRA TECH

Figure 4.3_GW Data_August 2013.dwg - DWH - 10/06/2014





LEGEND

- MONITORING WELL
- GROUNDWATER CONTOUR - 1' INTERVAL
- GROUNDWATER MOUND
- GROUNDWATER SINK
- INTERPRETED DIRECTION OF GROUNDWATER FLOW

NOTE:
1) THIS FIGURE PROVIDES ONE INTERPRETATION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

100 0 50 100

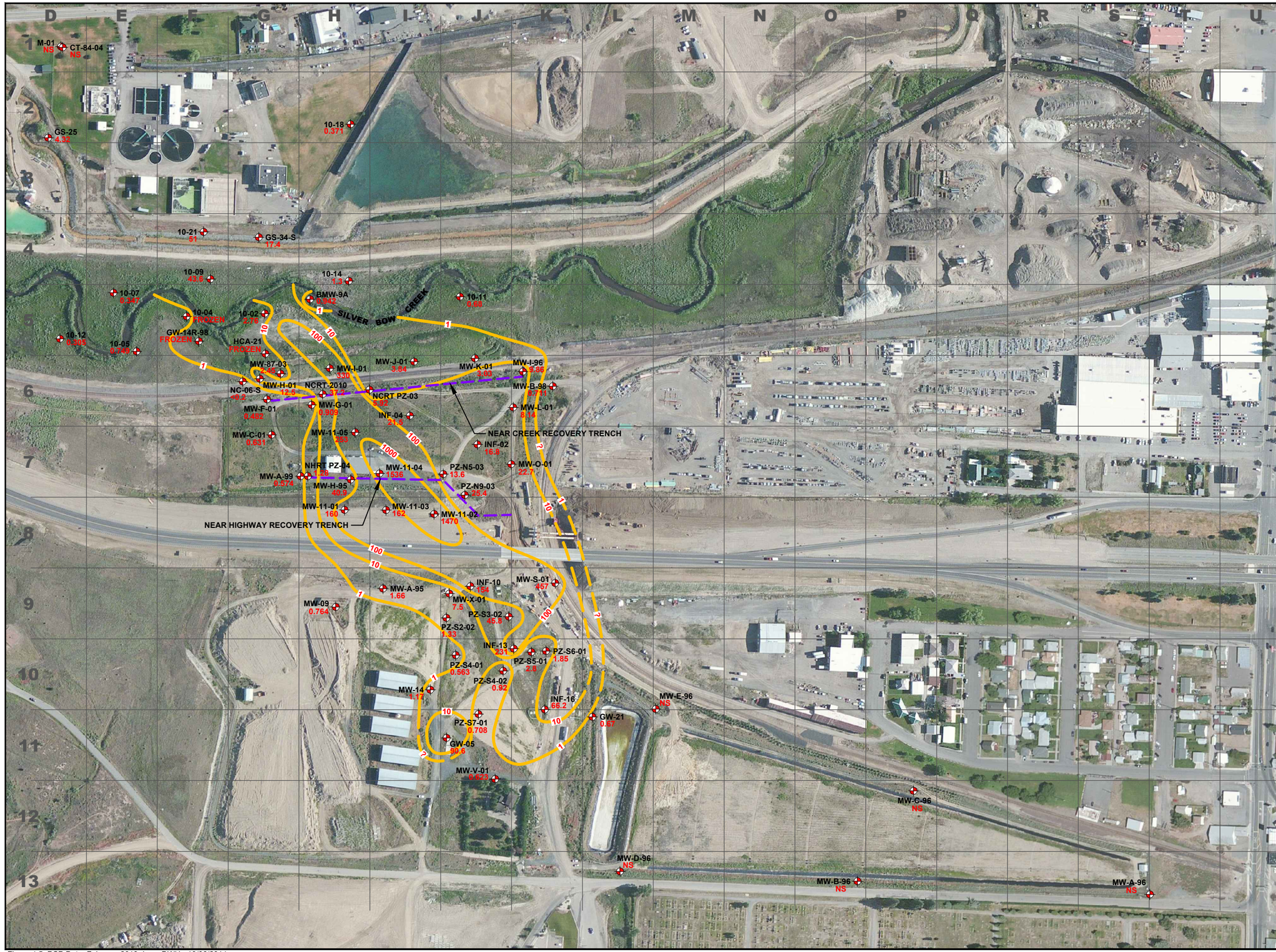
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.4
ON-SITE GROUNDWATER LEVEL DATA - AUGUST 2, 2013

TETRA TECH

Figure 4.4_On-Site GW Data_August 2013.dwg - DWH - 10/06/2014



LEGEND

- MONITORING WELL
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN (µg/L)
- < LESS THAN
- µg/L MICROGRAMS PER LITER
- NS NOT SAMPLED

NOTES:

1) PENTACHLOROPHENOL (PCP) ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) THE PCP PLUME IS NOT INTERPRETED TO FLOW THROUGH THE NEAR CREEK RECOVERY TRENCH (NCRT). RATHER, CONTAMINATED GROUNDWATER SOUTH OF SILVER BOW CREEK IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 22.98 ACRES

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

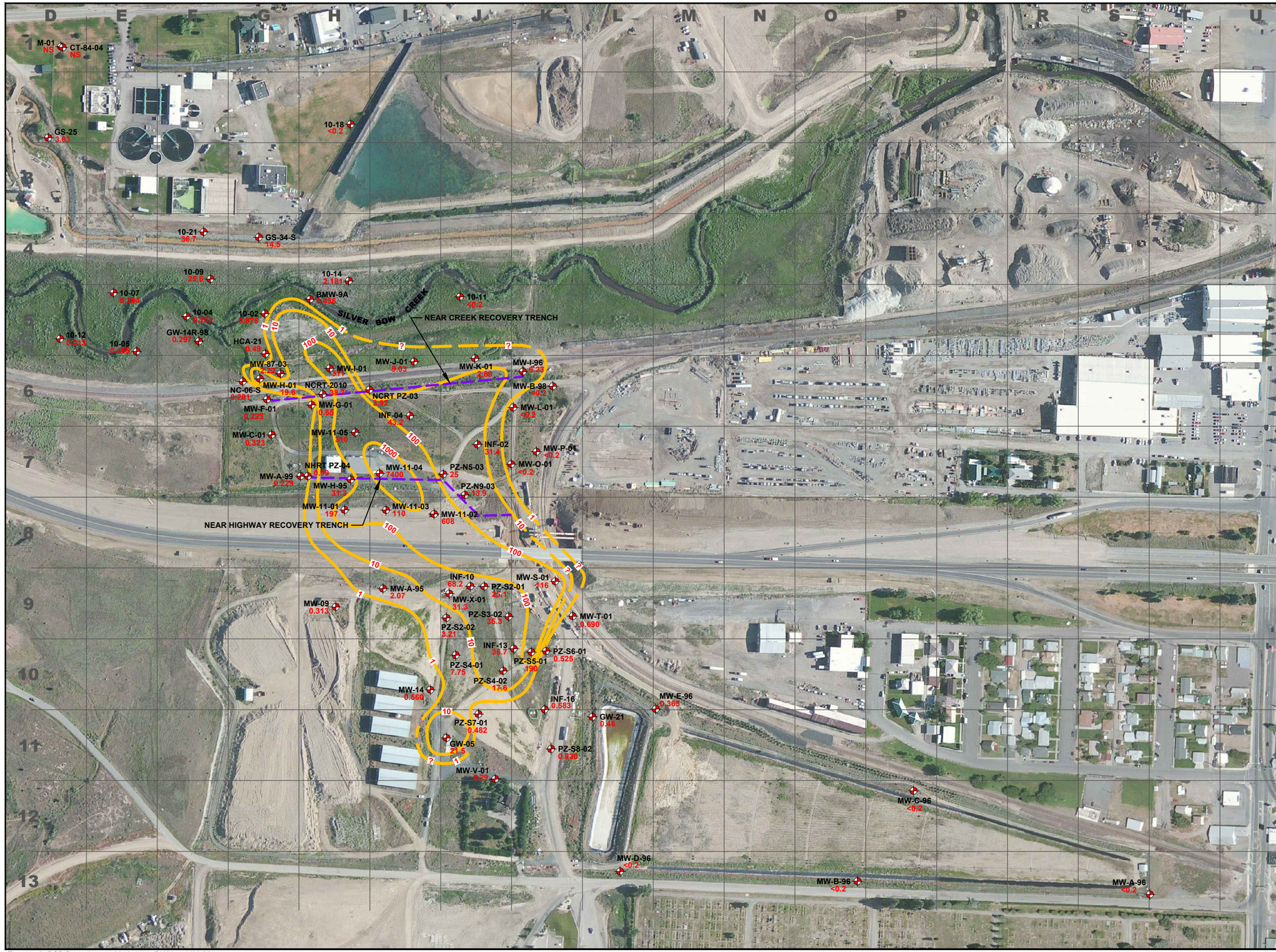
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.5
PCP DATA - FEBRUARY 4, 2013

TETRA TECH

Figure 4.5_PCP Data_February 2013.dwg - DWH - 10/06/2014



LEGEND

- MONITORING WELL
- PCP ISOCONTOUR - DASHED WHERE INFERRED ? WHERE UNKNOWN (µg/L)
- < LESS THAN
- µg/L MICROGRAMS PER LITER
- NS NOT SAMPLED

NOTES:

1) PENTACHLOROPHENOL (PCP) ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) THE PCP PLUME IS NOT INTERPRETED TO FLOW THROUGH THE NEAR CREEK RECOVERY TRENCH (NCRT). RATHER, CONTAMINATED GROUNDWATER SOUTH OF SILVER BOW CREEK IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

3) PLUME AREA BASED ON 1 µg/L CONTOUR INTERVAL: 17.5 ACRES

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.6
PCP DATA - AUGUST 2, 2013

TETRA TECH

Figure 4.6_PCP Data_August 2013.dwg - DWH - 10/06/2014

LEGEND

- GROUNDWATER MONITORING WELL
- SURFACE WATER STATION
- WATER TREATMENT PLANT SAMPLE STATION
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN

µg/L MICROGAMS PER LITER

PCP PENTACHLOROPHENOL

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME OUTLINE INTERPRETED BASED ON AUGUST 2012 CONDITIONS.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

150 0 150 300

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.7
LOCATIONS OF
SELECTED MONITORING STATIONS

TETRA TECH

Figure 4.7_Selected Monitoring Stations Locations.dwg - DWH - 10/01/2014

LEGEND

- AUGUST 2013 PCP PLUME CONTOUR (1 µg/L)
- 1993 PCP PLUME CONTOUR (1 µg/L) FROM ROD
- EXTENSION OF 1993 PLUME CONTOUR (1 µg/L) TO CURRENT LOCATION OF SILVER BOW CREEK
- APPROXIMATE AUGUST 2013 PCP PLUME AREA (17.5 acres) - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- 1993 PCP PLUME AREA (41.70 acres) (INCLUDES AREA BETWEEN HISTORIC SILVER BOW CREEK (1993) AND CURRENT LOCATION OF SILVER BOW CREEK (2012))

PCP PENTACHLOROPHENOL

ROD RECORD OF DECISION

µg/L MICROGRAMS PER LITER

NOTES:

1) PCP ISOCONTOURS ARE INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.

2) THE PCP PLUME IS NOT INTERPRETED TO FLOW THROUGH THE NEAR CREEK RECOVERY TRENCH (NCRT). RATHER, CONTAMINATED GROUNDWATER NEAR THE HISTORIC SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

AERIAL PHOTO SOURCE: ESRI/BING MAPS (2010)

N

125 0 125 250

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE 4.8
COMPARISON OF PLUME AREAS
1993 VERSUS AUGUST 2, 2013

TETRA TECH

Figure 4.8_PCP Comparison_1993 vs 2013.dwg - DWH - 10/06/2014

APPENDIX A
Microsoft Access 2010 Database

(Separate CD)

APPENDIX B

2013 SAMPLING RESULTS

APPENDIX B-1

Water Treatment Plant – PCP

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
1/7/2013	Plant	BABB	BABB010713	0.503			
1/14/2013	Plant	BABB	BABB011413	0.467			
1/21/2013	Plant	BABB	BABB012113	0.677		0.495	
1/28/2013	Plant	BABB	BABB012813	3.29			
2/4/2013	Plant	BABB	BABB020413	1.22			
2/11/2013	Plant	BABB	BABB021113	0.653			
2/18/2013	Plant	BABB	BABB021813	4.79			
2/25/2013	Plant	BABB	BABB022513	0.577		0.497	
3/4/2013	Plant	BABB	BABB030413	0.72			
3/11/2013	Plant	BABB	BABB031113	0.677			
3/18/2013	Plant	BABB	BABB031813	0.879		0.89	
3/25/2013	Plant	BABB	BABB032513	0.576			
1/7/2013	Plant	EFF	EFF010713	0.306			
1/14/2013	Plant	EFF	EFF011413	0.332			
1/21/2013	Plant	EFF	EFF012113	0.347			
1/28/2013	Plant	EFF	EFF012813	0.702			
2/4/2013	Plant	EFF	EFF020413	0.532			
2/11/2013	Plant	EFF	EFF021113	0.408			
2/18/2013	Plant	EFF	EFF021813	0.449			
2/25/2013	Plant	EFF	EFF022513	0.33			
3/4/2013	Plant	EFF	EFF030413	0.394			
3/11/2013	Plant	EFF	EFF031113	0.371			
3/18/2013	Plant	EFF	EFF031813	0.472			
3/25/2013	Plant	EFF	EFF032513	0.318			
1/7/2013	Plant	IN	IN010713	68.5	D		
1/14/2013	Plant	IN	IN011413	67.8	D		
1/21/2013	Plant	IN	IN012113	91.2	D		
1/28/2013	Plant	IN	IN012813	108	D		
2/4/2013	Plant	IN	IN020413	176	D		
2/11/2013	Plant	IN	IN021113	101	D		
2/18/2013	Plant	IN	IN021813	93	D	90.4	D
2/25/2013	Plant	IN	IN022513	76.5	D		
3/4/2013	Plant	IN	IN030413	97.9	D		
3/11/2013	Plant	IN	IN031113	72.8	D		
3/18/2013	Plant	IN	IN031813	128	D		
3/25/2013	Plant	IN	IN032513	94.5	D		
1/7/2013	Plant	NCRTEFF	NCRTEFF010713	4.05		3.98	
2/4/2013	Plant	NCRTEFF	NCRTEFF020413	6.42			

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
3/4/2013	Plant	NCRTEFF	NCRTEFF030413	6.23			
1/7/2013	Plant	NHRTEFF	NHRTEFF010713	317	D		
2/4/2013	Plant	NHRTEFF	NHRTEFF020413	204	D		
3/4/2013	Plant	NHRTEFF	NHRTEFF030413	345	D		
1/14/2013	QC-Field blank	OPOQVS	OPOQVS011413	0.2	U		
2/11/2013	QC-Field blank	OPOQVS	OPOQVS021113	0.2	U		
3/11/2013	QC-Field blank	OPOQVS	OPOQVS031113	0.2	U		
3/25/2013	QC-Field blank	OPOQVS	OPOQVS032513	0.2	U		
1/28/2013	QC-Field blank	WTPVS	WTPVS012813	0.2	U		
3/4/2013	QC-Field blank	WTPVS	WTPVS030413	0.2	U		

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

BABB	Between two activated carbon tanks
EFF	Effluent
IN	Influent
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
LTUDIS	Land Treatment Unit (LTU) Discharge water into the LTU Retention Pond
RETPOND	Retention Pond at LTU
QC	Quality Control
OPOQVC	Placeholder name only for QC Sample
WRPVS	Placeholder name only for QC Sample
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
4/1/2013	Plant	BABB	BABB040113	0.656			
4/8/2013	Plant	BABB	BABB040813	0.564			
4/15/2013	Plant	BABB	BABB041513	0.918			
4/22/2013	Plant	BABB	BABB042213	0.545			
4/29/2013	Plant	BABB	BABB042913	0.646			
5/6/2013	Plant	BABB	BABB050613	0.644			
5/13/2013	Plant	BABB	BABB051313	0.837			
5/20/2013	Plant	BABB	BABB052013	0.526			
5/28/2013	Plant	BABB	BABB052813	0.574			
6/3/2013	Plant	BABB	BABB060313	0.715			
6/10/2013	Plant	BABB	BABB061013	0.945			
6/17/2013	Plant	BABB	BABB061713	0.515			
6/24/2013	Plant	BABB	BABB062413	0.676			
4/1/2013	Plant	EFF	EFF040113	0.306			
4/8/2013	Plant	EFF	EFF040813	0.332		0.312	
4/15/2013	Plant	EFF	EFF041513	0.318			
4/22/2013	Plant	EFF	EFF042213	0.328			
4/29/2013	Plant	EFF	EFF042913	0.32		0.335	
5/6/2013	Plant	EFF	EFF050613	0.333			
5/13/2013	Plant	EFF	EFF051313	0.362			
5/20/2013	Plant	EFF	EFF052013	0.384			
5/28/2013	Plant	EFF	EFF052813	0.36			
6/3/2013	Plant	EFF	EFF060313	0.52			
6/10/2013	Plant	EFF	EFF061013	0.367			
6/17/2013	Plant	EFF	EFF061713	0.274			
6/24/2013	Plant	EFF	EFF062413	0.268			
4/1/2013	Plant	IN	IN040113	100	D		
4/8/2013	Plant	IN	IN040813	84.9	D		
4/15/2013	Plant	IN	IN041513	95.8	D		
4/22/2013	Plant	IN	IN042213	81.2	D		
4/29/2013	Plant	IN	IN042913	81.1	D		
5/6/2013	Plant	IN	IN050613	96.5	D		
5/13/2013	Plant	IN	IN051313	85.4	D		
5/20/2013	Plant	IN	IN052013	58.2	D		
5/28/2013	Plant	IN	IN052813	53.4	D		
6/3/2013	Plant	IN	IN060313	40.2	D		
6/10/2013	Plant	IN	IN061013	47.6			
6/17/2013	Plant	IN	IN061713	50.8	D		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
6/24/2013	Plant	IN	IN062413	56.9	D	54.5	D
4/1/2013	Plant	NCRTEFF	NCTREFF040113	5.32			
5/6/2013	Plant	NCRTEFF	NCRTEFF050613	4.92			
6/3/2013	Plant	NCRTEFF	NCRTEFF060313	2.54			
4/1/2013	Plant	NHRTEFF	NHRTEFF040113	294	D		
5/6/2013	Plant	NHRTEFF	NHRTEFF050613	238	D		
6/3/2013	Plant	NHRTEFF	NHRTEFF060313	174	D		
4/22/2013	QC-Field blank	OPOQVS	OPOQVS042213	0.2	U		
5/20/2013	QC-Field blank	OPOQVS	OPOQVS052013	0.2	U		
6/17/2013	QC-Field blank	OPOQVS	OPOQVS061713	0.2	U		
4/15/2013	QC-Field blank	WTPVS	WTPVS041513	0.2	U		
5/13/2013	QC-Field blank	WTPVS	WTPVS051313	0.2	U		
6/10/2013	QC-Field blank	WTPVS	WTPVS061013	0.2	U		

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

BABB	Between two activated carbon tanks
EFF	Effluent
IN	Influent
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
LTUDIS	Land Treatment Unit (LTU) Discharge water into the LTU Retention Pond
RETPOND	Retention Pond at LTU
QC	Quality Control
OPOQVC	Placeholder name only for QC Sample
WRPVS	Placeholder name only for QC Sample
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
7/1/2013	Plant	BABB	BABB070113	0.63			
7/8/2013	Plant	BABB	BABB070813	0.702			
7/15/2013	Plant	BABB	BABB071513	0.583		0.455	
7/22/2013	Plant	BABB	BABB072213	1.13			
7/29/2013	Plant	BABB	BABB072913	0.549			
8/5/2013	Plant	BABB	BABB080513	0.77			
8/12/2013	Plant	BABB	BABB081213	0.704			
8/19/2013	Plant	BABB	BABB081913	0.2	U	0.2	U
8/26/2013	Plant	BABB	BABB082613	0.2	U		
9/3/2013	Plant	BABB	BABB090313	0.2	U		
9/9/2013	Plant	BABB	BABB090913	1.47			
9/16/2013	Plant	BABB	BABB091613	22.8			
9/23/2013	Plant	BABB	BABB092313	31.1			
9/30/2013	Plant	BABB	BABB093013	22.2			
7/1/2013	Plant	EFF	EFF070113	0.32			
7/8/2013	Plant	EFF	EFF070813	0.328			
7/15/2013	Plant	EFF	EFF071513	0.344			
7/22/2013	Plant	EFF	EFF072213	0.29			
7/29/2013	Plant	EFF	EFF072913	0.359			
8/5/2013	Plant	EFF	EFF080513	0.327			
8/12/2013	Plant	EFF	EFF081213	0.448		0.426	
8/12/2013	Plant	EFF	EFF081213	0.448		0.426	
8/12/2013	Plant	EFF	EFF081213	0.448		0.426	
8/12/2013	Plant	EFF	EFF081213	0.448		0.426	
8/19/2013	Plant	EFF	EFF081913	0.2	U		
8/26/2013	Plant	EFF	EFF082613	0.2	U		
9/3/2013	Plant	EFF	EFF090313	0.2	U		
9/9/2013	Plant	EFF	EFF090913	0.69			
9/16/2013	Plant	EFF	EFF091613	**11.1**			
9/23/2013	Plant	EFF	EFF092313	**10.2**			
9/30/2013	Plant	EFF	EFF093013	**5.1**		**5.01**	
7/1/2013	Plant	IN	IN070113	46.4	D		
7/8/2013	Plant	IN	IN070813	49.7	D		
7/15/2013	Plant	IN	IN071513	50.6	D		
7/22/2013	Plant	IN	IN072213	60.6	D		
7/29/2013	Plant	IN	IN072913	34.4	D		
8/5/2013	Plant	IN	IN080513	56.3	D		
8/12/2013	Plant	IN	IN081213	63.8	D		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
8/12/2013	Plant	IN	IN081213	63.8	D		
8/19/2013	Plant	IN	IN081913	0.852			
8/26/2013	Plant	IN	IN082613	50.2	D		
9/3/2013	Plant	IN	IN090313	49.8	D		
9/9/2013	Plant	IN	IN090913	62.7	D		
9/16/2013	Plant	IN	IN091613	61.1	D		
9/23/2013	Plant	IN	IN092313	89.1	D	86.4	D
9/30/2013	Plant	IN	IN093013	80.7	D		
8/12/2013	Plant	LTUDIS	LTUDIS081213	679	D		
7/1/2013	Plant	NCRTEFF	NCRTEFF070113	4.3		4.36	
8/12/2013	Plant	NCRTEFF	NCRTEFF081213	6.08			
8/12/2013	Plant	NCRTEFF	NCRTEFF081213	6.08			
9/3/2013	Plant	NCRTEFF	NCRTEFF090313	6.53			
7/1/2013	Plant	NHRTEFF	NHRTEFF070113	156	D		
8/12/2013	Plant	NHRTEFF	NHRTEFF081213	169			
8/12/2013	Plant	NHRTEFF	NHRTEFF081213	169	D		
9/3/2013	Plant	NHRTEFF	NHRTEFF090313	149	D	156	D
8/12/2013	Surface Water	RETPOND	RetPond081213	16.1	D		
8/5/2013	QC-Field blank	OPOQVS	OPOQVS080513	0.2	U		
9/16/2013	QC-Field blank	OPOQVS	OPOQVS091613	0.2	U		
7/8/2013	QC-Field blank	WTPVS	WTPVS070813	0.2	U		
7/22/2013	QC-Field blank	WTPVS	WTPVS072213	0.2	U		
8/26/2013	QC-Field blank	WTPVS	WTPVS082613	0.2	U		
9/9/2013	QC-Field blank	WTPVS	WTPVS090913	0.2	U		

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier

Notes:

Effluent concentration bolded if greater than Record of Decision (ROD) cleanup level of 1 ug/L

Units reported as micrograms per liter (ug/L)

BABB	Between two activated carbon tanks
EFF	Effluent
IN	Influent
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
LTUDIS	Land Treatment Unit (LTU) Discharge water into the LTU Retention Pond
RETPOND	Retention Pond at LTU
QC	Quality Control
OPOQVC	Placeholder name only for QC Sample
WRPVS	Placeholder name only for QC Sample
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
10/7/2013	Plant	BABB	BABB100713	30			
10/14/2013	Plant	BABB	BABB101413	9.74		11.8	
10/21/2013	Plant	BABB	BABB102113	14.6			
10/28/2013	Plant	BABB	BABB102813	0.398			
11/4/2013	Plant	BABB	BABB110413	20.3			
11/11/2013	Plant	BABB	BABB111113	20.3			
11/18/2013	Plant	BABB	BABB111813	7.2			
11/25/2013	Plant	BABB	BABB112513	0.325			
12/2/2013	Plant	BABB	BABB120213	0.2	U		
12/9/2013	Plant	BABB	BABB120913	0.2	U	0.2	U
12/16/2013	Plant	BABB	BABB121613	0.2	U		
12/23/2013	Plant	BABB	BABB122313	0.213			
12/30/2013	Plant	BABB	BABB123013	0.254			
10/7/2013	Plant	EFF	EFF100713	**3.79**			
10/14/2013	Plant	EFF	EFF101413	0.299			
10/21/2013	Plant	EFF	EFF102113	0.23			
10/28/2013	Plant	EFF	EFF102813	0.291			
11/4/2013	Plant	EFF	EFF110413	0.21			
11/11/2013	Plant	EFF	EFF111113	0.2	U		
11/18/2013	Plant	EFF	EFF111813	0.2	U	0.2	U
11/25/2013	Plant	EFF	EFF112513	0.2	U		
12/2/2013	Plant	EFF	EFF120213	0.2	U		
12/9/2013	Plant	EFF	EFF120913	0.2	U		
12/16/2013	Plant	EFF	EFF121613	0.2	U		
12/23/2013	Plant	EFF	EFF122313	0.2	U		
12/30/2013	Plant	EFF	EFF123013	0.2	U		
10/7/2013	Plant	IN	IN100713	83.8	D		
10/14/2013	Plant	IN	IN101413	71.7	D		
10/21/2013	Plant	IN	IN102113	71.6	D		
10/28/2013	Plant	IN	IN102813	38.9	D		
11/4/2013	Plant	IN	IN110413	66.3	D	66.6	D
11/11/2013	Plant	IN	IN111113	59.7	D		
11/18/2013	Plant	IN	IN111813	57.1	D		
11/25/2013	Plant	IN	IN112513	37.8	D		
12/2/2013	Plant	IN	IN120213	53.8	D		
12/9/2013	Plant	IN	IN120913	34.7	D		
12/16/2013	Plant	IN	IN121613	7.2			

MONTANA POLE TREATMENT PLANT RESULTS FOR WATER TREATMENT PLANT SAMPLES

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration	Qualifier	Duplicate Result	Duplicate Qualifier
12/23/2013	Plant	IN	IN122313	61.5	D		
12/30/2013	Plant	IN	IN123013	59	D	63.1	D
10/7/2013	Plant	NCRTEFF	NCRTEFF100713	8.71			
11/4/2013	Plant	NCRTEFF	NCRTEFF110413	7.21			
12/2/2013	Plant	NCRTEFF	NCRTEFF120213	6.34		5.47	
10/7/2013	Plant	NHRTEFF	NHRTEFF100713	180	D		
11/4/2013	Plant	NHRTEFF	NHRTEFF110413	159	D		
12/2/2013	Plant	NHRTEFF	NHRTEFF120213	126	D		
10/14/2013	QC-Field blank	OPOQVS	OPOQVS101413	0.2	U		
10/28/2013	QC-Field blank	OPOQVS	OPOQVS102813	0.2	U		
11/11/2013	QC-Field blank	OPOQVS	OPOQVS111113	0.2	U		
11/25/2013	QC-Field blank	OPOQVS	OPOQVS112513	0.2	U		
10/7/2013	QC-Field blank	WTPVS	WTPVS100713	0.2	U		
12/16/2013	QC-Field blank	WTPVS	WTPVS121613	0.2	U		
12/30/2013	QC-Field blank	WTPVS	WTPVS123013	0.2	U		

Notes:

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BABB	Between two activated carbon tanks
EFF	Effluent
IN	Influent
NCRT	Near Creek Recovery Trench
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RETPOND	Retention Pond at LTU
QC	Quality Control
OPOQVC	Placeholder name only for QC Sample
WRPVS	Placeholder name only for QC Sample
PCP	Pentachlorophenol
Plant	Water Treatment Plant

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

APPENDIX B-2

Groundwater and Surface Water – PCP

MPTP 2013Q1 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/5/2013	Groundwater	10-01	10-01020513	36.1	D			µg/L
2/5/2013	Groundwater	10-02	10-02020513	2.76				µg/L
2/5/2013	Groundwater	10-05	10-05020513	0.749				µg/L
2/5/2013	Groundwater	10-07	10-07020513	0.347				µg/L
2/5/2013	Groundwater	10-09	10-09020513	43.6	D			µg/L
2/6/2013	Groundwater	10-11	10-11020613	0.68				µg/L
2/4/2013	Groundwater	10-12	10-12020413	0.305				µg/L
2/5/2013	Groundwater	10-13	10-13020513	4.59				µg/L
2/5/2013	Groundwater	10-14	10-14020513	1.3				µg/L
2/5/2013	Groundwater	10-15	10-15020513	156	D			µg/L
2/5/2013	Groundwater	10-18	10-18020513	0.371				µg/L
2/5/2013	Groundwater	10-19	10-19020513	21.4				µg/L
2/5/2013	Groundwater	10-20	10-20020513	38.6	D			µg/L
2/5/2013	Groundwater	10-21	10-21020513	51	D			µg/L
2/5/2013	Groundwater	BMW-9A	BMW-9A020513	0.942				µg/L
2/5/2013	Groundwater	BMW-9B	BMW-9B020513	3.52				µg/L
2/5/2013	Groundwater	GS-18-R	GS-18-R020513	14.4		14.6		µg/L
2/5/2013	Groundwater	GS-25	GS-25020513	4.32				µg/L
2/5/2013	Groundwater	GS-34-D	GS-34-D020513	2.5				µg/L
2/5/2013	Groundwater	GS-34-S	GS-34-S020513	17.4				µg/L
2/7/2013	Groundwater	GW-05	GW-05020713	90.6	D			µg/L
2/6/2013	Groundwater	GW-21	GW-21020613	0.67				µg/L
2/7/2013	Groundwater	INF-02	INF-02020713	16.8				µg/L
2/7/2013	Groundwater	INF-04	INF-04020713	21.5				µg/L
2/7/2013	Groundwater	INF-08	INF-08020713	200	D			µg/L
2/7/2013	Groundwater	INF-10	INF-10020713	154	D			µg/L
2/7/2013	Groundwater	INF-13	INF-13-20713	231	D	229	D	µg/L
2/7/2013	Groundwater	INF-16	INF-16020713	66.2	D			µg/L
2/6/2013	Groundwater	MW-09	MW-09020613	0.764				µg/L
2/4/2013	Groundwater	MW-11-01	MW-11-01020413	160	D			µg/L
2/4/2013	Groundwater	MW-11-02	MW-11-02020413	1470	D			µg/L
2/4/2013	Groundwater	MW-11-03	MW-11-03020413	162	D			µg/L
2/7/2013	Groundwater	MW-11-04	MW-11-04020713	1536				µg/L
2/7/2013	Groundwater	MW-11-05	MW-11-05020713	253	D			µg/L
2/6/2013	Groundwater	MW-14	MW-14020613	1.17				µg/L
2/4/2013	Groundwater	MW-87-03	MW-87-03020413	2.45				µg/L
2/6/2013	Groundwater	MW-A-95	MW-A-95020613	1.66				µg/L

MPTP 2013Q1 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/6/2013	Groundwater	MW-A-99	MW-A-99020613	0.574				µg/L
2/6/2013	Groundwater	MW-B-98	MW-B-98020613	0.711				µg/L
2/6/2013	Groundwater	MW-C-01	MW-C-01020613	0.631				µg/L
2/6/2013	Groundwater	MW-F-01	MW-F-01020613	0.482				µg/L
2/6/2013	Groundwater	MW-G-01	MW-G-01020613	0.909				µg/L
2/4/2013	Groundwater	MW-H-01	MW-H-01020413	12.5				µg/L
2/7/2013	Groundwater	MW-H-95	MW-H-95020713	40.9	D			µg/L
2/4/2013	Groundwater	MW-I-01	MW-I-01020413	330	D			µg/L
2/6/2013	Groundwater	MW-I-96	MW-I-96020613	9.86				µg/L
2/4/2013	Groundwater	MW-J-01	MW-J-01020413	3.84				µg/L
2/6/2013	Groundwater	MW-J-96	MW-J-96020613	0.956				µg/L
2/4/2013	Groundwater	MW-K-01	MW-K-01020413	3.03				µg/L
2/6/2013	Groundwater	MW-L-01	MW-L-01020613	8.14				µg/L
2/6/2013	Groundwater	MW-O-01	MW-O-01020613	22.7				µg/L
2/6/2013	Groundwater	MW-S-01	MW-S-01020613	457	D	363	D	µg/L
2/6/2013	Groundwater	MW-V-01	MW-V-01020613	0.623				µg/L
2/7/2013	Groundwater	MW-X-01	MW-X-01020713	7.5				µg/L
2/6/2013	Groundwater	NC-06-S	NC-06-S02020613	0.2	U			µg/L
2/7/2013	Groundwater	NCRT PZ-03	NCRTPZ-03020713	5.92				µg/L
2/7/2013	Groundwater	NCRT-2010	NCRT-2010020713	37.2	D			µg/L
2/7/2013	Groundwater	NHRT PZ-04	NHRTPZ-04020713	1.28				µg/L
2/7/2013	Groundwater	PZ-N5-03	PZ-N5-03020713	13.6				µg/L
2/7/2013	Groundwater	PZ-N9-03	PZ-N9-03020713	25.4				µg/L
2/6/2013	Groundwater	PZ-S2-02	PZ-S2-02020613	1.33				µg/L
2/7/2013	Groundwater	PZ-S3-02	PZ-S3-02020713	45.8	D			µg/L
2/6/2013	Groundwater	PZ-S4-01	PZ-S4-01020613	0.563				µg/L
2/7/2013	Groundwater	PZ-S4-02	PZ-S4-02020713	0.92				µg/L
2/7/2013	Groundwater	PZ-S5-01	PZ-S5-01020713	2.8				µg/L
2/7/2013	Groundwater	PZ-S6-01	PZ-S6-01020713	1.85				µg/L
2/6/2013	Groundwater	PZ-S7-01	PZ-S7-01020613	0.708				µg/L
2/4/2013	Surface Water	SS-06A	SS-06A020413	0.214		0.2	U	µg/L
2/4/2013	Surface Water	SW-05	SW-05020413	0.2	U			µg/L
2/4/2013	Surface Water	SW-09	SW-09020413	0.2	U			µg/L
2/7/2013	QC-Field blank	MW-19	MW-19020713	0.2	U			µg/L

MPTP 2013Q1 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
2/6/2013	QC-Field blank	MW-21	MW-21020613	0.2	U			µg/L
2/5/2013	QC-Field blank	MW-E-98	MW-E-98020513	0.2	U			µg/L
2/4/2013	QC-Field blank	SW-07	SW-07020413	0.2	U			µg/L

Notes:

a	Cleanup concentration for PCP in groundwater is 1 µg/L (ppb)
e	Extraction holding time for sample was exceeded (internal qualifier)
a	Analysis holding time for sample was exceeded (internal qualifier)
SW	surface water
GW	groundwater
QC	Quality Control
µg/L	micrograms per liter
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
NC	Near Creek
SS	Surface Station
PZ	piezometer

The Station Name for each QC sample is a placeholder name only and is not associated with any specific monitoring well.
All samples analyzed by Method 528

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

MPTP 2013Q3 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/6/2013	Groundwater	10-01	10-01080613	6.33				µg/L
8/6/2013	Groundwater	10-02	10-02080613	0.975				µg/L
8/7/2013	Groundwater	10-04	10-04080713	0.206				µg/L
8/7/2013	Groundwater	10-05	10-05080713	0.485				µg/L
8/6/2013	Groundwater	10-07	10-07080613	0.364				µg/L
8/6/2013	Groundwater	10-09	10-09080613	25.6				µg/L
8/7/2013	Groundwater	10-11	10-11080713	0.2	U			µg/L
8/12/2013	Groundwater	10-12	10-12081213	0.213				µg/L
8/12/2013	Groundwater	10-12	10-12081213	0.213				µg/L
8/6/2013	Groundwater	10-13	10-13080613	1.99				µg/L
8/6/2013	Groundwater	10-14	10-14080613	2.181				µg/L
8/6/2013	Groundwater	10-15	10-15080613	81.9	D			µg/L
8/6/2013	Groundwater	10-18	10-18080613	0.2	U			µg/L
8/6/2013	Groundwater	10-19	10-19080613	19				µg/L
8/6/2013	Groundwater	10-20	10-20080613	24.5				µg/L
8/6/2013	Groundwater	10-21	10-21080613	36.7	D			µg/L
8/6/2013	Groundwater	BMW-9A	BMW-9A080613	0.436		0.414		µg/L
8/6/2013	Groundwater	BMW-9B	BMW-9B080613	3.02				µg/L
8/6/2013	Groundwater	GS-18-R	GS-18-R080613	19.4				µg/L
8/6/2013	Groundwater	GS-25	GS-25080613	3.63				µg/L
8/6/2013	Groundwater	GS-34-D	GS-34D080613	1.26				µg/L
8/6/2013	Groundwater	GS-34-S	GS-34S080613	14.5				µg/L
8/8/2013	Groundwater	GW-05	GW-05080813	21.5				µg/L
8/6/2013	Groundwater	GW-13	GW-13080613	0.22				µg/L
8/12/2013	Groundwater	GW-14R-98	GW-14R-98081213	0.297				µg/L
8/12/2013	Groundwater	GW-14R-98	GW-14R-98081213	0.297				µg/L
8/7/2013	Groundwater	GW-21	GW-21080713	0.46		0.386		µg/L
8/12/2013	Groundwater	HCA-21	HCA-21081213	0.49				µg/L
8/12/2013	Groundwater	HCA-21	HCA-21081213	0.49				µg/L
8/8/2013	Groundwater	INF-02	INF-02080813	31.4				µg/L
8/12/2013	Groundwater	INF-04	INF-04081213	43.2	D			µg/L
8/12/2013	Groundwater	INF-04	INF-04081213	43.2	D			µg/L
8/8/2013	Groundwater	INF-08	INF-08080813	156	D			µg/L
8/8/2013	Groundwater	INF-10	INF-10080813	68.2	D			µg/L
8/8/2013	Groundwater	INF-10	INF-10080813	68.2	D			µg/L
8/8/2013	Groundwater	INF-13	INF-13080813	36.7	D			µg/L
8/8/2013	Groundwater	INF-16	INF-16080813	0.583				µg/L

MPTP 2013Q3 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration[a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/7/2013	Groundwater	MW-09	MW-09080713	0.313				µg/L
8/5/2013	Groundwater	MW-11-01	MW-11-01080513	197				µg/L
8/5/2013	Groundwater	MW-11-01	MW-11-01080513	197	D			µg/L
8/5/2013	Groundwater	MW-11-02	MW-11-02080513	608	D	694	D	µg/L
8/5/2013	Groundwater	MW-11-02	MW-11-02080513	608	D	694	D	µg/L
8/5/2013	Groundwater	MW-11-03	MW-11-03080513	110	D			µg/L
8/5/2013	Groundwater	MW-11-03	MW-11-03080513	110	D			µg/L
8/12/2013	Groundwater	MW-11-04	MW-11-04081213	7400	D			µg/L
8/12/2013	Groundwater	MW-11-04	MW-11-04081213	7400	D			µg/L
8/8/2013	Groundwater	MW-11-05	MW-11-05080813	310	D			µg/L
8/7/2013	Groundwater	MW-14	MW-14080713	0.56				µg/L
8/5/2013	Groundwater	MW-87-03	MW-87-03080513	2.22				µg/L
8/7/2013	Groundwater	MW-A-95	MW-A-95080713	2.07				µg/L
8/5/2013	Groundwater	MW-A-96	MW-A-96080513	0.2	U			µg/L
8/7/2013	Groundwater	MW-A-99	MW-A-99080713	0.229				µg/L
8/5/2013	Groundwater	MW-B-96	MW-B-96080513	0.2	U			µg/L
8/6/2013	Groundwater	MW-B-98	MW-B-98080613	0.2	U			µg/L
8/7/2013	Groundwater	MW-C-01	MW-C-01080713	0.323				µg/L
8/5/2013	Groundwater	MW-C-96	MW-C-96080513	0.2	U			µg/L
8/5/2013	Groundwater	MW-D-96	MW-D-96080513	0.2	U			µg/L
8/5/2013	Groundwater	MW-E-96	MW-E-96080513	0.365				µg/L
8/7/2013	Groundwater	MW-F-01	MW-F-01080713	0.223				µg/L
8/8/2013	Groundwater	MW-G-01	MW-G-01080813	0.55				µg/L
8/7/2013	Groundwater	MW-H-01	MW-H-01080713	19.6				µg/L
8/8/2013	Groundwater	MW-H-95	MW-H-95080813	31.3				µg/L
8/5/2013	Groundwater	MW-I-01	MW-I-01080513	311				µg/L
8/8/2013	Groundwater	MW-I-96	MW-I-96080813	6.23				µg/L
8/5/2013	Groundwater	MW-J-01	MW-J-01080513	9.03				µg/L
8/7/2013	Groundwater	MW-J-96	MW-J-96080713	0.242				µg/L
8/5/2013	Groundwater	MW-K-01	MW-K-01080513	2.88				µg/L
8/7/2013	Groundwater	MW-L-01	MW-L-01080713	0.2	U			µg/L
8/7/2013	Groundwater	MW-O-01	MW-O-01080713	0.2	U			µg/L
8/6/2013	Groundwater	MW-P-01	MW-P-01080613	0.2	U			µg/L
8/7/2013	Groundwater	MW-S-01	MW-S-01080713	116	D			µg/L
8/12/2013	Groundwater	MW-T-01	MW-T-01081213	0.69				µg/L
8/7/2013	Groundwater	MW-V-01	MW-V-01080713	0.29				µg/L
8/8/2013	Groundwater	MW-X-01	MW-X-01080813	31.3				µg/L
8/7/2013	Groundwater	NC-06-S	NC-06-S080713	0.201				µg/L

MPTP 2013Q3 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units
8/8/2013	Groundwater	NCRT PZ-03	NCRTPZ-03080813	3.92				µg/L
8/8/2013	Groundwater	NCRT-2010	NCRT-2010080813	38.7	D			µg/L
8/8/2013	Groundwater	NHRT PZ-04	NHRTPZ-04080813	0.99				µg/L
8/8/2013	Groundwater	PZ-N5-03	PZ-N5-03080813	25		27.3		µg/L
8/8/2013	Groundwater	PZ-N9-03	PZ-N9-03080813	13.9				µg/L
8/7/2013	Groundwater	PZ-S2-02	PZ-S202080713	3.21				µg/L
8/8/2013	Groundwater	PZ-S3-02	PZ-S3-02080813	35.3				µg/L
8/7/2013	Groundwater	PZ-S4-01	PZ-S401080713	7.75				µg/L
8/8/2013	Groundwater	PZ-S4-02	PZ-S4-02080813	17.6				µg/L
8/8/2013	Groundwater	PZ-S5-01	PZ-S5-01080813	190	D			µg/L
8/8/2013	Groundwater	PZ-S6-01	PZ-S6-01080813	0.525				µg/L
8/7/2013	Groundwater	PZ-S7-01	PZ-S7-01080713	0.482				µg/L
8/12/2013	Surface Water	SS-06A	SS-06A081213	0.2	D			µg/L
8/12/2013	Surface Water	SS-06A	SS-06A081213	0.2	U			µg/L
8/12/2013	Surface Water	SW-05	SW-05081213	0.2	U			µg/L
8/12/2013	Surface Water	SW-05	SW-05081213	0.2	U			µg/L
8/12/2013	Surface Water	SW-09	SW-09081213	0.2	U			µg/L
8/12/2013	Surface Water	SW-09	SW-09081213	0.2	U			µg/L
8/8/2013	QC-Field blank	MW-19	MW-19080813	0.2	U			µg/L
8/7/2013	QC-Field blank	MW-21	MW-21080713	0.2	U			µg/L
8/6/2013	QC-Field blank	MW-E-98	MW-E-98080613	0.2	U			µg/L
8/12/2013	QC-Field blank	SW-07	SW-07081213	0.2	U			µg/L
8/12/2013	QC-Field blank	SW-07	SW-07081213	0.2	U			µg/L

MPTP 2013Q3 PCP SAMPLE RESULTS FOR GROUNDWATER AND SURFACE WATER

Date Sampled	SampleType	Station Name	Sample ID	PCP Concentration [a]	Qualifier	Duplicate Result	Duplicate Qualifier	Units

Notes:

a	Cleanup concentration for PCP in groundwater is 1 µg/L (ppb)
e	Extraction holding time for sample was exceeded (internal qualifier)
a	Analysis holding time for sample was exceeded (internal qualifier)
SW	surface water
GW	groundwater
QC	Quality Control
µg/L	micrograms per liter
NCRT	Near Creek Recovery Trench
NHRT	Near Highway Recovery Trench
NC	Near Creek
SS	Surface Station
PZ	piezometer

The Station Name for each QC sample is a placeholder name only and is not associated with any specific monitoring well.
All samples analyzed by Method 528

QUALIFIERS:

J	Detected above method detection limit (MDL) but less than method reporting limit (MRL)
U	Analyzed for but not detected above MDL
B	Compound found in sample and blank
D	Post extraction dilution
N	Duplicate out of compliance (±20%)
M	Matrix Spike recovery out of compliance (40-150%)
S	Surrogate recovery out of compliance (50-130%)
C	Calibration check out of compliance (70-130%)
CS	Surrogate Calibration Check out of Compliance

APPENDIX B-3

Groundwater Elevation Data

May 22, 2013 to June 4, 2013

APPENDIX B-3
DEPTH TO GROUNDWATER AND GROUNDWATER ELEVATION DATA

Monitoring Well	May 22, 2013		May 23, 2013		May 24, 2013		May 25, 2013		May 29, 2013		June 4, 2013	
	DTW (feet)	SWL (feet amsl)	DTW (feet)	SWL (feet amsl)	DTW (feet)	SWL (feet amsl)	DTW (feet)	SWL (feet amsl)	DTW (feet)	SWL (feet amsl)	DTW (feet)	SWL (feet amsl)
10-01	6.7	5425.86	7.03	5425.53	7.04	5425.52	7.8	5424.76	8.08	5424.48	8.4	5424.16
10-02	4.46	5427.44	2.92	5428.98	2.95	5428.95	3.53	5428.37	3.75	5428.15	4.19	5427.71
10-03	6.43	5424.97	6.63	5424.77	6.62	5424.78	7.61	5423.79	7.91	5423.49	8.27	5423.13
10-04	4.19	5426.75	3.77	5427.17	3.71	5427.23	3.88	5427.06	3.93	5427.01	4.22	5426.72
10-06	6.34	5424.69	6.43	5424.6	6.39	5424.64	7.39	5423.64	7.7	5423.33	8.04	5422.99
10-07	4.41	5426.46	3.85	5427.02	3.53	5427.34	3.56	5427.31	3.57	5427.3	3.87	5427
10-08	5.95	5425.31	6.12	5425.14	6.08	5425.18	7.31	5423.95	7.62	5423.64	7.99	5423.27
10-09	5.78	5425.51	5.95	5425.34	5.92	5425.37	7.16	5424.13	7.47	5423.82	7.87	5423.42
10-15	6.61	5425.87	6.94	5425.54	6.95	5425.53	7.7	5424.78	7.99	5424.49	8.3	5424.18
10-19	9.03	5424.84	9.09	5424.78	9.02	5424.85	11.54	5422.33	11.87	5422	12.32	5421.55
10-20	8.99	5424.83	9.03	5424.79	8.96	5424.86	11.48	5424.34	11.8	5422.02	12.24	5421.58
10-21	8.84	5424.76	8.87	5424.73	8.8	5424.8	11.39	5422.21	11.73	5421.87	12.2	5421.4
BMW-13B	4.64	5424.2	4.65	5424.19	4.58	5424.26	6.41	5422.43	6.74	5422.1	7.12	5421.72
BMW-9A	3.12	5429.21	2.95	5429.38	3.04	5429.29	3.06	5429.27	3.08	5429.25	3.23	5429.1
BMW-9B	5.57	5426.29	5.93	5425.93	5.97	5425.89	6.47	5425.39	6.71	5425.15	6.98	5424.88
GS-18-R	6.02	5426.15	6.62	5425.55	6.68	5425.49	7.02	5425.15	7.27	5424.9	7.51	5424.66
GS-34-D	8.81	5425.46	8.88	5425.39	8.83	5425.44	10.35	5423.92	10.7	5423.57	11.11	5423.16
GS-34-S	7.93	5425.5	7.98	5425.45	7.94	5425.49	9.34	5424.09	9.2	5423.73	10.1	5423.33
HCA-21	2.75	5428.56	1.7	5429.6	1.85	5429.46	2.5	5428.81	2.64	5428.67	3	5428.31
Manhole#2	16.35	5427.27	16.42	5427.23	16.42	5427.23	16.42	5427.23	16.45	5427.2	16.46	5427.19
MW-01	11.74	5426.43	12.37	5425.8	12.46	5425.71	12.67	5425.5	12.97	5425.2	13.21	5424.96
MW-87-03	9.65	5427.59	9.71	5427.56	9.89	5427.38	10.09	5427.18	10.33	5426.94	10.59	5426.68
MW-A-99	12.77	5428.18	12.85	5428.1	12.89	5428.06	12.93	5428.02	13.06	5427.89	13.17	5427.78
MW-F-01	11.81	5426.21	12.59	5425.43	12.67	5425.35	12.86	5425.16	13.14	5424.88	13.4	5424.62
MW-H-01	9.92	5426.3	10.54	5425.68	10.62	5425.6	10.88	5425.34	11.19	5425.03	11.44	5424.78
MW-I-01	6.93	5426.34	7.56	5425.71	7.63	5425.64	7.88	5425.39	8.14	5425.13	8.4	5424.87
MW-I-96	11.8	5427.71	12.2	5427.31	12.22	5427.29	12.33	5427.28	12.53	5426.98	12.73	5426.78
NCRT PZ-01	10.9	5427.01	11.42	5426.49	11.47	5426.44	11.61	5426.3	11.82	5426.09	12.02	5425.89
NCRT PZ-03	11.78	5425.97	12.89	5424.86	12.97	5424.78	13.18	5424.57	13.47	5424.28	13.72	5423.03
NCRT PZ-04	10.81	5425.99	11.85	5424.95	11.92	5424.88	12.15	5424.65	12.45	5424.35	12.7	5424.1
NCRT-2010	14.81	5426.03	15.87	5424.97	15.94	5424.9	16.17	5424.67	16.44	5424.4	16.7	5424.14
NHRT PZ-4	12.15	5427.94	12.22	5427.87	12.24	5427.85	12.25	5427.84	12.33	5427.76	12.38	5427.71

Notes:

DTW	Depth to water from measuring point
SWL	Static water level (water table elevation in feet amsl)
amsl	Above mean sea level

APPENDIX C

Photolog of NHRT Pump Failure

Fouled near highway recovery trench pump after initial cleaning

Closeup of fouled near highway recovery trench pump after initial cleaning

APPENDIX D

Photolog of Water Main Break

Surface flooding caused by water line break - December 16, 2013
(looking west)

Surface flooding caused by water line break - December 16, 2013
(looking northeast)

Lockmer Plumbing excavator preparing to locate water line break.

Point of pipe failure at a weld in the high-density polyethylene (HDPE) pipe. The blue locator wire can be seen, and water is flowing.

Break being cleaned and prepared for repair. The entire weld completely separated in the failure, leaving two open pipe ends.

Compression coupler employed to make the repair, as cold weather conditions precluded welding joint.

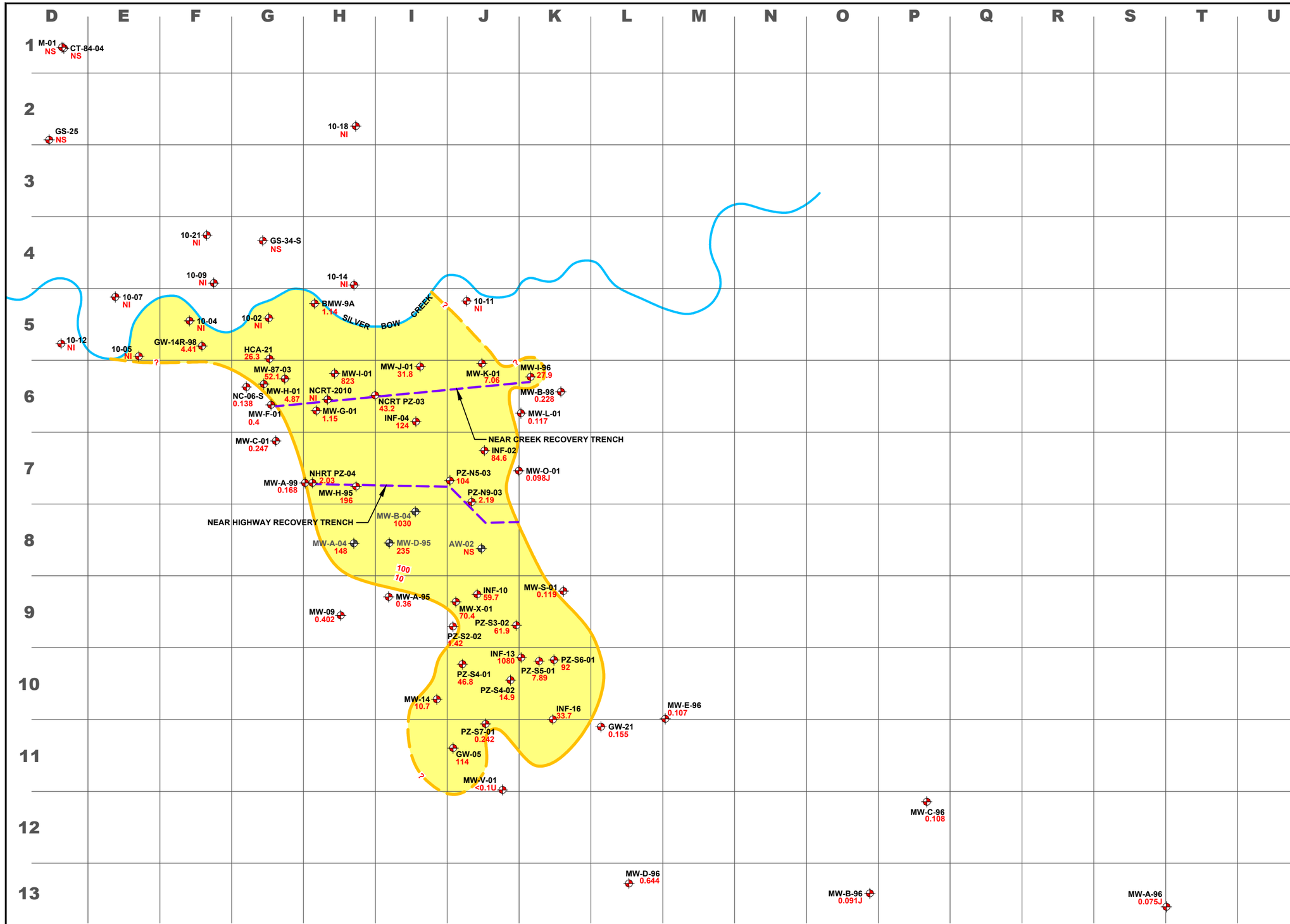
APPENDIX E

Photolog of LTU Sampling

Representative soil moisture conditions in some areas of LTU Zones 2, 3 and 4 during sampling conducted on October 1, 2013

APPENDIX F

Plume Area Maps



LEGEND

- MONITORING WELL
- MONITORING WELL (ABANDONED IN 2009)
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- J ESTIMATED VALUE
- NI NOT INSTALLED AT THE TIME OF SAMPLING
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- U NOT DETECTED AT LIMIT SHOWN
- < LESS THAN

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME AREA = 21.64 ACRES

N

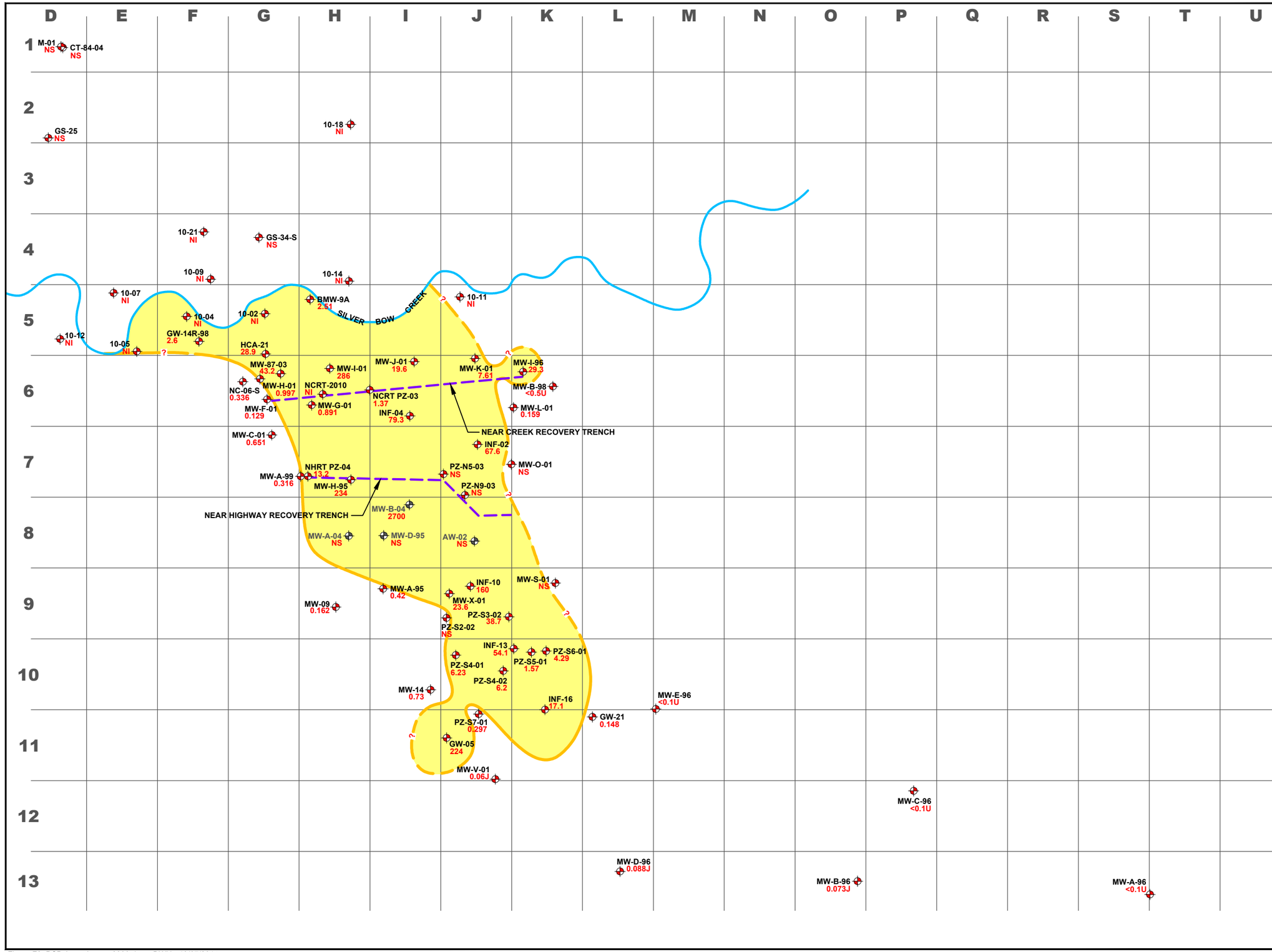
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE F1
PCP DATA - AUGUST 2008

TETRA TECH

Figure F1_PCP Area_August 2008.dwg - DWH - 10/07/2014



LEGEND

- MONITORING WELL
- MONITORING WELL (ABANDONED IN 2009)
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- J ESTIMATED VALUE
- NI NOT INSTALLED AT THE TIME OF SAMPLING
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- U NOT DETECTED AT LIMIT SHOWN
- < LESS THAN

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME AREA = 21.14 ACRES

N

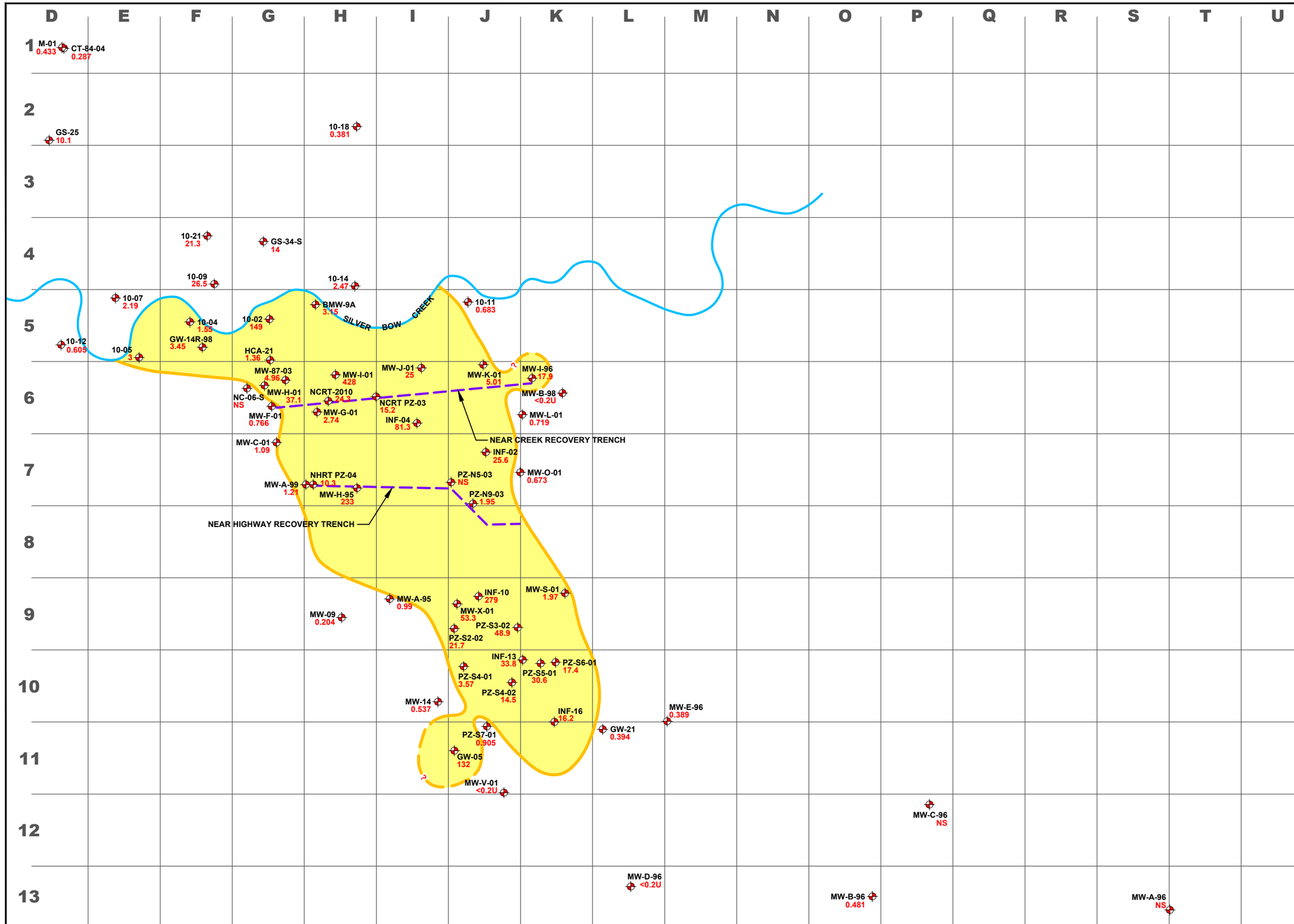
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE F2
PCP DATA - AUGUST 2009

TETRA TECH

Figure F2_PCP Area_August 2009.dwg - DWH - 10/07/2014



LEGEND

- MONITORING WELL
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- U NOT DETECTED AT LIMIT SHOWN
- < LESS THAN

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME AREA = 22.27 ACRES

N

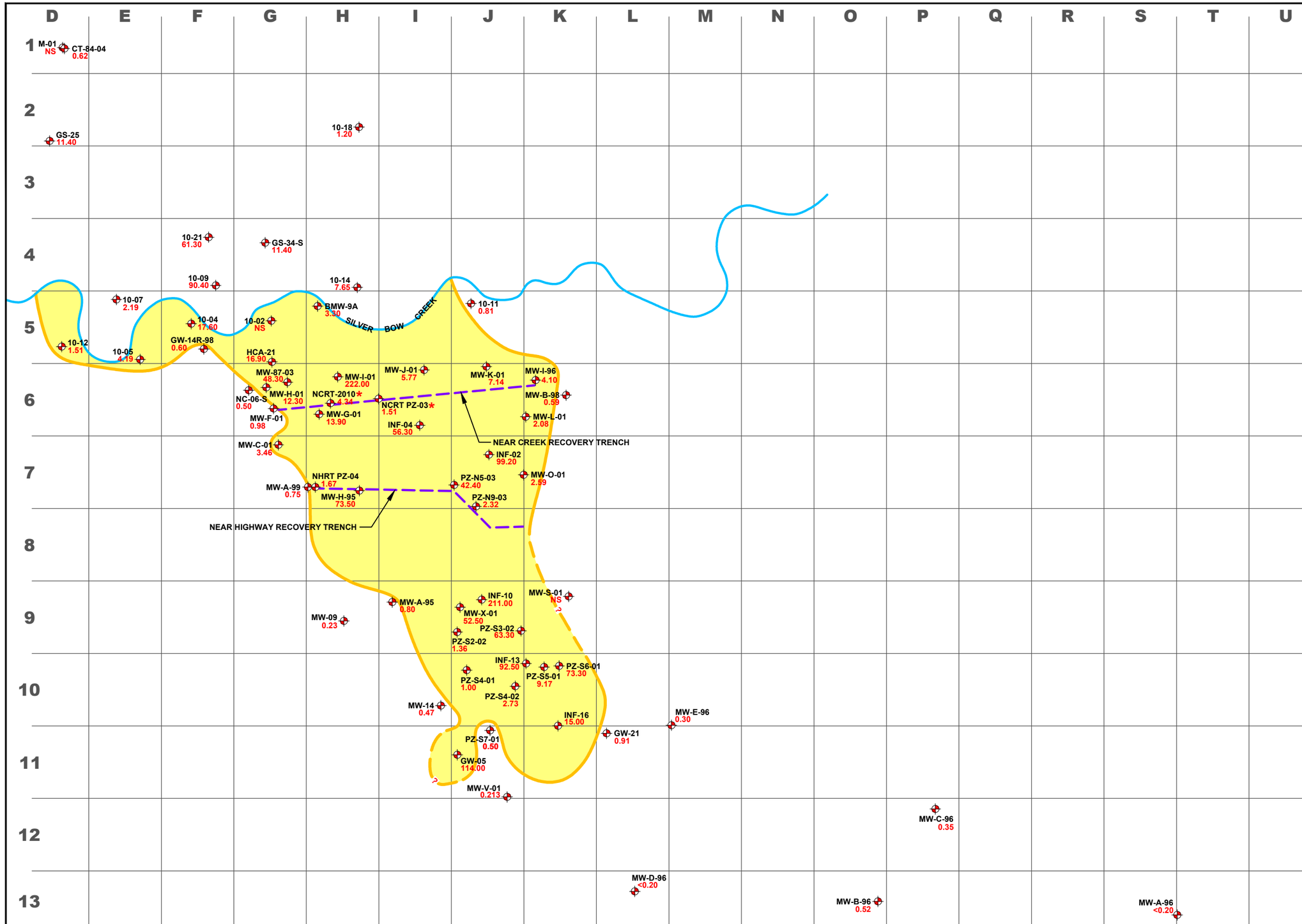
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE F3
PCP DATA - AUGUST 2010

TETRA TECH

Figure F3_PCP Area_August 2010.dwg - DWH - 10/07/2014



LEGEND

- MONITORING WELL
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- < LESS THAN

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME AREA = 23.48 ACRES

N

150 0 150 300

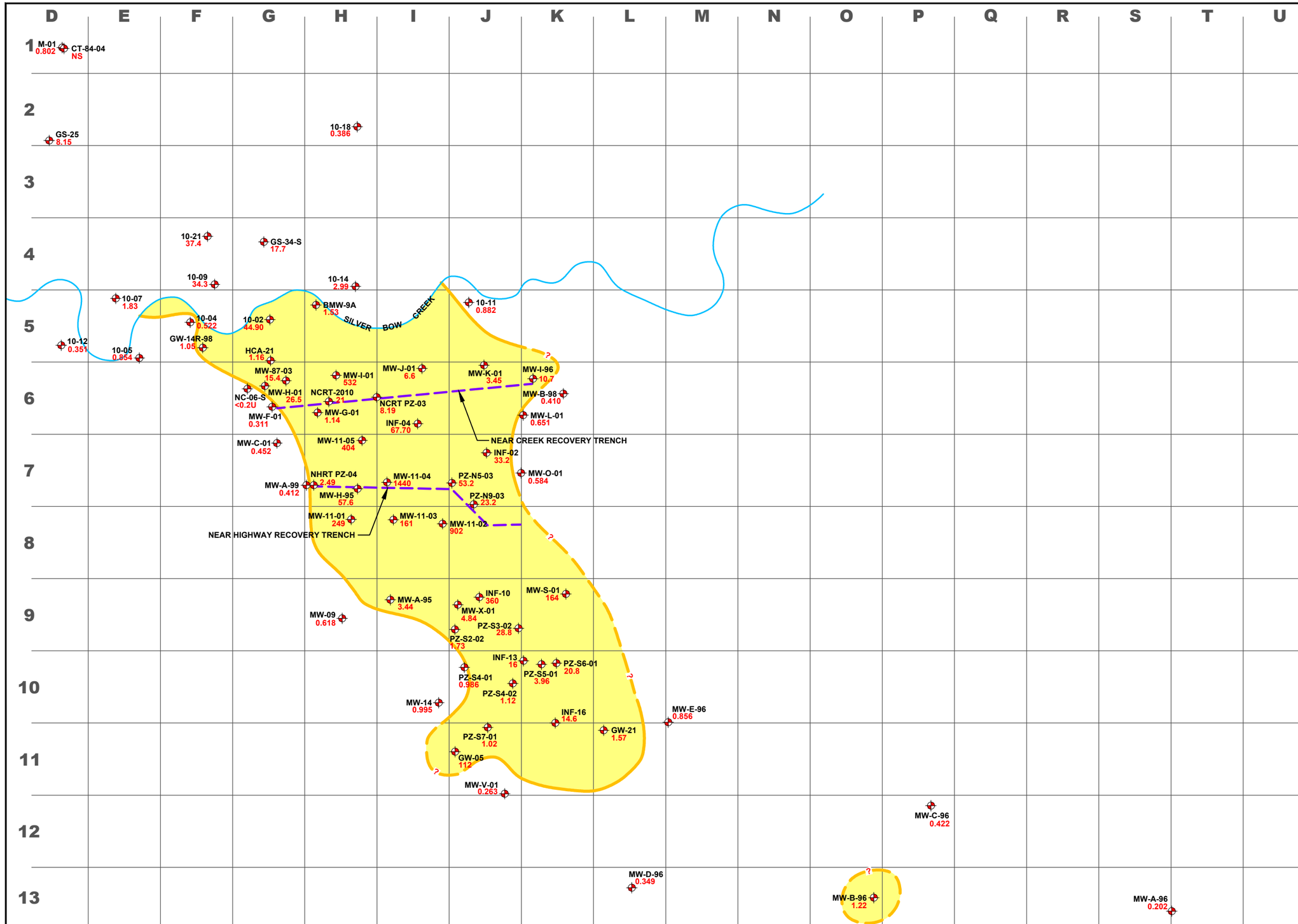
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE F4
PCP DATA - AUGUST 2011

TETRA TECH

Figure F4_PCP Area_August 2011.dwg - DWH - 10/07/2014



LEGEND

- MONITORING WELL
- APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
- µg/L MICROGAMS PER LITER
- NS NOT SAMPLED
- PCP PENTACHLOROPHENOL
- U NOT DETECTED AT LIMIT SHOWN
- < LESS THAN

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME AREA = 24.29 ACRES

N

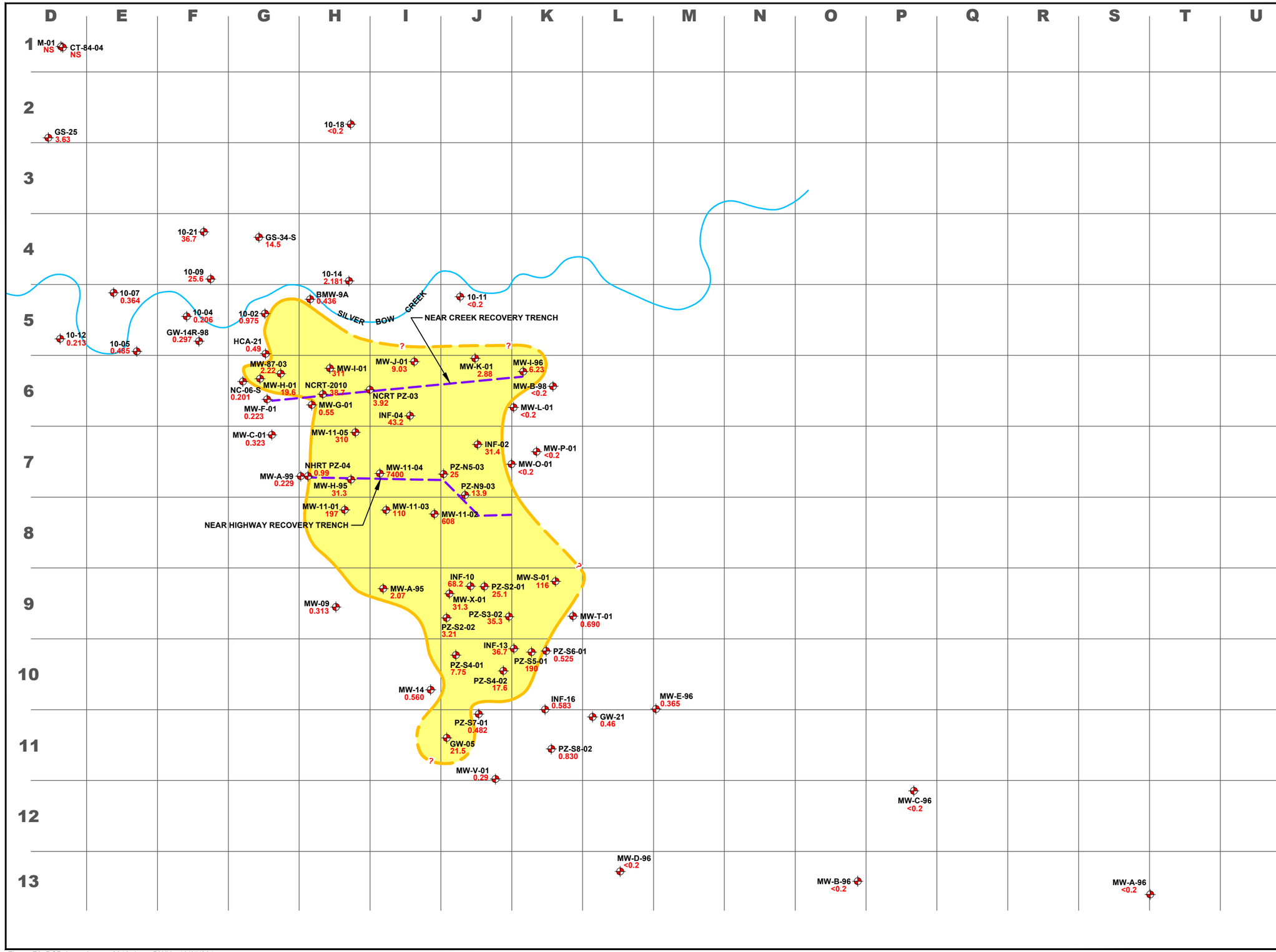
150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE F5
PCP DATA - AUGUST 2012

TETRA TECH

Figure F5_PCP Area_August 2012.dwg - DWH - 10/07/2014



LEGEND

⊕	MONITORING WELL
	APPROXIMATE AREA OF PLUME DEFINED BY 1 µg/L PCP ISOCONTOUR - DASHED WHERE INFERRED, ? WHERE UNKNOWN
µg/L	MICROGAMS PER LITER
NS	NOT SAMPLED
PCP	PENTACHLOROPHENOL
<	LESS THAN

NOTES:
1) PCP PLUME BOUNDARY IS INTERPRETED; OTHER INTERPRETATIONS ARE POSSIBLE.
2) PLUME AREA = 17.47 ACRES

N

150 0 150 300
SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE F6
PCP DATA - AUGUST 2013

TETRA TECH

Figure F6_PCP Area_August 2013.dwg - DWH - 10/07/2014

APPENDIX G

Mann-Kendall Tests

State of Wisconsin
Department of Natural Resources
Remediation and Redevelopment Program

Mann-Kendall Statistical Test
Form 4400-215 (2/2001)

Notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

Instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name :	Montana Pole and Treating Plant	BRRTS No. =		Well Number =	GW-14-R-98

	Compound ->	PCP					
Event Number	Sampling Date (most recent last)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	1-Aug-04	4.60					
2	1-Aug-05	57.00					
3	1-Aug-06	39.20					
4	1-Aug-07	20.60					
5	1-Aug-08	26.30					
6	1-Aug-09	28.90					
7	1-Aug-10	1.36					
8	1-Aug-11	16.90					
9	1-Aug-12	1.16					
10	1-Aug-13	0.49					
	Mann Kendall Statistic (S) =	-25.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	10	0	0	0	0	0
	Average =	19.65	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	18.813	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	0.957	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at			n<4	n<4	n<4	n<4	n<4
80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4

Data Entry By =	DB	Date =	19-Jul-12	Checked By =	DB

State of Wisconsin
Department of Natural Resources
Remediation and Redevelopment Program

Mann-Kendall Statistical Test
Form 4400-215 (2/2001)

Notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

Instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name :	Montana Pole and Treating Plant	BRRTS No. =		Well Number =	HCA-21

Event Number	Sampling Date (most recent last)	Compound -> PCP Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	1-Aug-04	84.00					
2	1-Aug-05	57.00					
3	1-Aug-06	26.04					
4	1-Aug-07	20.40					
5	1-Aug-08	20.00					
6	1-Aug-09	13.45					
7	1-Aug-10	3.35					
8	1-Aug-11	10.37					
9	1-Aug-12	5.26					
10	1-Aug-13	0.49					
	Mann Kendall Statistic (S) =	-41.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	10	0	0	0	0	0
	Average =	24.04	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	26.561	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	1.105	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		**DECREASING**	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at			n<4	n<4	n<4	n<4	n<4
80% Confidence Level		NA	n<4	n<4	n<4	n<4	n<4

Data Entry By =	DB	Date =	19-Jul-12	Checked By =	DB

State of Wisconsin
Department of Natural Resources
Remediation and Redevelopment Program

Mann-Kendall Statistical Test
Form 4400-215 (2/2001)

Notice: This form is the DNR supplied spreadsheet referenced in Appendices A of Comm 46 and NR 746, Wis. Adm. Code. It is provided to consultants as an optional tool for groundwater contaminant trend analysis to support site closure requests under s. Comm 46.07, Comm 46.08, NR 746.07, NR 746.08, Wis. Adm. Code. Use this form or a manual method when seeking case closure under those rules. Earlier versions of this form should not be used.

Instructions: Do not change formulas or other information in cells with a blue background, only cells with a yellow background are used for data entry. To use the spreadsheet, provide at least four rounds and not more than ten rounds of data that is not seasonally affected. Use consistent units. The spreadsheet contains several error checks, and a data entry error may cause "DATA ERR" or "DATE ERR" to be displayed. Dates that are not consecutive will show an error message and will not display the test results. The spreadsheet tests the data for both increasing and decreasing trends at both 80 percent and 90 percent confidence levels. If a declining trend is present at 80 percent but not at 90 percent, a site is still eligible for closure under Comm 46 and NR 746 provided that other conditions in those rules are met. If an increasing or decreasing trend is not present, an additional coefficient of variation test is used to test for stability, as proposed by Wiedemeier et al, 1999. For additional information, refer to the Interim Guidance on Natural Attenuation for Petroleum Releases, dated October 1999. Refer to the guidance for recommendations on data entry for non-detect values.

Site Name : Montana Pole and Treating Plant - Digitized Plume Areas | BRRTS No. = N/A | Well Number = Plume Area

Event Number	Sampling Date (most recent last)	Compound -> Area (Acres) Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)	Concentration (leave blank if no data)
1	1-Aug-08	21.64					
2	1-Aug-09	21.14					
3	1-Aug-10	22.27					
4	1-Aug-11	23.48					
5	1-Aug-12	24.29					
6	1-Aug-13	17.47					
7							
8							
9							
10							
	Mann Kendall Statistic (S) =	3.0	0.0	0.0	0.0	0.0	0.0
	Number of Rounds (n) =	6	0	0	0	0	0
	Average =	21.72	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Standard Deviation =	2.384	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
	Coefficient of Variation(CV)=	0.110	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Error Check, Blank if No Errors Detected			n<4	n<4	n<4	n<4	n<4
Trend ≥ 80% Confidence Level		No Trend	n<4	n<4	n<4	n<4	n<4
Trend ≥ 90% Confidence Level		No Trend	n<4	n<4	n<4	n<4	n<4
Stability Test, If No Trend Exists at		**CV <= 1**	n<4	n<4	n<4	n<4	n<4
80% Confidence Level		**STABLE**	n<4	n<4	n<4	n<4	n<4

Data Entry By = DB | Date = 26-Jul-12 | Checked By = DB

APPENDIX H

Photolog of Beaver Dam Removal

ARCO beaver dam removal on December 18, 2013 (looking northwest)

ARCO beaver dam removal on December 18, 2013 (looking north)

ARCO beaver dam removal on December 18, 2013 (looking northeast)

Displaced wildlife after beaver dam removal (looking west)