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Explanation of Significant Differences
Montana Pole and Treating Plant Site
October 2019

1.0 INTRODUCTION AND STATEMENT OF PURPOSE

This Explanation of Significant Differences (ESD) describes significant changes to the remedy identified in the September 1993 Record of Decision (ROD) for the Montana Pole and Treating Plant (MPTP) site (the Site). The MPTP site is located at 220 West Greenwood Avenue, on the western edge of Butte, Montana (see Figure 1). This ESD is a cooperative effort of both the Montana Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) Region 8, led by DEQ with support from EPA.

This ESD is issued in accordance with Section 117(c) of CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP") 40 C.F.R. § 300.435(c)(2)(i). In accordance with these provisions and the July 1999 EPA guidance titled *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*", an ESD is published when significant (but not fundamental) changes with respect to scope, performance, and cost are made to a previously selected remedy.

The changes to the remedy identified in this ESD address soil-related items that pertain to the forthcoming final offload of treated soils from the Land Treatment Unit (LTU). Offloading is the action of removing surface soils from the LTU, which have met PCP and PAH cleanup standards set in the ROD for the Site, and placing them back on-Site in the areas from which they were excavated. The changes specifically address the following:

- Soil cleanup standards for human exposure;
- Dioxin[1] in treated soil from LTU offloads;
- Management of soils in a corrective action management unit (CAMU) to mitigate potential leaching of pentachlorophenol (PCP) from soil to groundwater;
- Clarification regarding future land use; and
- Engineering and institutional controls for soil.

These are significant changes to the remedy identified in the 1993 ROD to address site-specific conditions and issues identified in the *Fourth Five-Year Review (FYR) Report for the Montana Pole and Treating Plant Site (April 2017)*, but these changes do not fundamentally alter the basic features of the remedy selected in the 1993 ROD.
A notice of availability and a brief description of the ESD, and a public comment period will be published in local newspapers, as required by Code of Federal Regulations 40, Section 300.435(c)(2)(i)(B). This ESD and supporting documents referenced herein will become a part of the MPTP Site Administrative Record file and information repository as required by CFR 40, Section 300.435(c)(2)(i)(A) and 300.825(a)(2). The administrative record is available for review at:

[1] Polychlorinated dibenzo-p-dioxins (dioxin) and polychlorinated dibenzofurans (furans) are collectively referred to as "dioxin" in this document.

- Montana Tech Library (1300 West Park Street, Butte, MT 5970);
- Montana DEQ Waste Management and Remediation Division (1225 Cedar Street, Helena, Montana 59601); and
- EPA Region 8 Montana Office (Federal Building, Suite 3200, 10 West 15th Street, Helena, Montana 59626).

2.0 SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

2.1 Prior to the September 1993 ROD

The MPTP site operated as a wood treating facility from 1946 to 1984. During most of this period, a solution of about five percent 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.

Uncontrolled releases of contamination occurred throughout the Site during its active operation. Soil, groundwater, and sediments were contaminated by the former wood treating operations. PCP is the primary contaminant of concern (COC); dioxin and some polycyclic aromatic hydrocarbon (PAH) compounds other than PCP are also present. The MPTP site is within the Silver Bow Creek/Butte Area Superfund Site, and the COCs are distinct between the two sites (i.e. organics including PCP at the MPTP site versus metals from mine tailings associated with the adjacent Superfund site).

Contamination was first investigated by Montana Department of Health and Environmental Services (MDHES), which is now the DEQ, after a citizen filed a complaint in March 1983 concerning oil seeping into Silver Bow Creek near the MPTP facility. MDHES and EPA subsequently completed a preliminary assessment and site inspection followed by a Hazard Ranking Score in July 1985. The MPTP was included on the National Priorities List (NPL) of Superfund sites on July 22, 1987 (Fed. Reg. Vol. 52, 140 Pg. 17623).

In July 1985, the EPA Emergency Response Branch began conducting a removal action on the Site to minimize impacts to Silver Bow Creek and to stabilize the Site. EPA excavated approximately 6,000 cubic yards of highly contaminated soils, bagged them, and placed them in storage buildings (pole barns) constructed on-site. Tanks, retorts, pipes, and other hardware were dismantled and stored on-site in a former sawmill building. Two groundwater interception/oil recovery systems were installed to reduce oil seepage into the creek. Contaminated areas of the Site and features of the groundwater recovery system were fenced to restrict public access.

In October 1989, EPA granted MDHES the initial enforcement funding to implement potentially responsible party (PRP) notices and to negotiate and issue administrative orders. In April 1990, MDHES signed an administrative order on consent (AOC) with Atlantic Richfield Company (AR), under which AR agreed to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Site. The RI defined the nature and extent of contamination and provided information to complete the baseline human health and ecological risk assessments. The FS included the development,

screening, and evaluation of potential Site remedies.

In June 1992, the EPA proposed an additional removal action to control and recover light non-aqueous phase liquid (LNAPL) (floating oils) identified during the RI. The action included the installation of 890 feet of sheet piling approximately 50 feet south of Silver Bow Creek. Ten recovery wells were installed on-site. Eight of the wells were located south of Silver Bow Creek in a north/south line running perpendicular to the creek. Two of the wells were installed parallel to the creek (one on each end of the sheet piling). The wells were approximately 25 feet deep. Each well had two pumps: one to collect free-floating oil and pump it to an on-Site storage tank and another to pump contaminated groundwater to an on-site granular activated carbon (GAC) treatment facility built by EPA. The water treatment facility went into operation January 22, 1993. At that time, the system installed in 1985 was shut down.

In 1991, the United States filed suit against responsible parties in federal district court for a liability determination and the recovery of response costs. Court ordered settlement negotiations resulted in a "cash out" Consent Decree entered on July 16, 1996. EPA recovered some of its past costs and made provisions for the recovery of other costs. Also, the responsible parties provided approximately $35 million, to be placed in an interest-bearing account, for EPA and DEQ to conduct the Site cleanup. DEQ, with assistance from EPA, is conducting the cleanup at the Site under the terms of the consent decree and an EPA/DEQ Site-Specific Superfund Memorandum of Agreement, using funds from the MPTP Settlement Fund.

2.2 Selected Remedy in September 1993 ROD

A ROD for the Site was issued by EPA and DEQ in September 1993, and identified the following elements for the selected remedy:

1. Excavation of contaminated soils from accessible areas of the Site, to the extent practicable;

2. Treatment of excavated soils and previously removed soils by above ground biological treatment;

3. In-place biological treatment of contaminated soils below the depth of excavation before backfilling;

4. Backfill of excavated and treated soils into excavated areas if possible, surface grading and revegetation;

5. Soil flushing of inaccessible soils areas (principally underlying Interstate 15/90) in order to recover hazardous substances;

6. Containment of contaminated groundwater and LNAPL using physical and/or hydraulic barriers (as determined during remedial design) in order to prevent the spread of contaminated groundwater and LNAPL and to limit releases of contamination into Silver Bow Creek;

7. Treatment of extracted groundwater using the existing EPA water treatment plant (oil/water separation followed by granulated activated carbon treatment), with potential for adding biological treatment or ultraviolet oxidation (UV/oxidation) to maximize cost effectiveness of the treatment system. Treatment will meet standards for discharge or reinjection, as appropriate;

8. Discharge of extracted, treated groundwater into Silver Bow Creek and/or reinjection of extracted, treated groundwater into the aquifer (as determined during remedial design);

9. Enhanced in-situ biological treatment of contaminated groundwater, inaccessible contaminated soils areas and contaminated soils not recovered by excavation;

10. Treatment of contaminated Site debris and equipment by decontamination followed by disposal of these materials m a licensed off-site landfill;

11. Treatment of contaminated oils and sludges in a licensed off-site incinerator;

12. Additional institutional controls (ICs) preventing access to contaminated soils and groundwater; and

13. Groundwater monitoring to determine movement of contaminants and compliance with remedial action requirements.

The 1993 ROD describes the general remedial action objectives, as summarized below.

- Soils and Sediments. Treatment so that the contaminant concentration levels pose no unacceptable risk to human health or the environment. Excavated soils and sediments would be treated to cleanup levels. Depth of soil excavation, particularly at and below the groundwater table, would be based on field judgment and technical practicability. Additionally, LNAPLs at the groundwater table would be recovered to the maximum extent practicable. Soils below the depth of excavation with contaminant levels above cleanup levels would be bioremediated in place. Surface grading and revegetation or covering would be performed with suitable material compatible with existing or future land uses. Remediation of inaccessible contaminated soils (consisting primarily of those soils underlying Interstate 1-15/90 and any soils under the EPA water treatment plant) would be initially addressed by LNAPL recovery and soil flushing (via extraction wells and recovery trenches associated with the groundwater remedy) and subsequently by in-situ bioremediation implemented under the groundwater actions.
- Groundwater. Minimize migration of contaminants with the groundwater to effectively prevent the spread of contaminated groundwater and LNAPL and limit releases of contamination into Silver Bow Creek. Attaining cleanup levels at groundwater points of compliance (defined in the ROD as the southern bank of Silver Bow Creek[2]) would be protective of human health and the environment and ensure that uncontaminated aquifers

[2] The ROD reference to the bank of Silver Bow Creek refers to the location of the Creek at the time of the ROD. Silver Bow Creek was subsequently reconstructed in a different location, causing a need to clarify the groundwater points of compliance (which will be addressed in a future ESD pertaining to groundwater and surface water).

and adjacent surface waters are protected for potential beneficial uses.

- Surface Water. Achieve instream contaminant concentrations at or below the higher of the identified cleanup levels or one-half of the mean instream concentrations immediately upstream of the Site. This takes into account that other sources of contaminants may be present upstream of the Site. However, as all sources of contaminants are reduced or eliminated, instream contaminant levels from the MPTP site sources will approach the cleanup levels.
- Treated Water Discharged to Silver Bow Creek. Achieve cleanup levels for treated water discharged to Silver Bow Creek. Additionally, any runoff from the Site to Silver Bow Creek (for example, from precipitation or snow melt) must meet the same standards identified for treated water discharge or otherwise be treated.
- Supplemental Engineering and Institutional Controls. 1) Prevent unauthorized access to contaminated media or to remedial action areas; 2) Include adequate zoning restrictions, conservation easements, and other controls to prevent any future residential use of the Site; and 3) Prevent any water well drilling in the contaminated groundwater plume and adjacent areas to prevent additional receptors of contaminated groundwater or an expansion of the plume.

Cleanup levels and corresponding risks identified in the 1993 ROD are presented in the following tables[3] in Attachment A:

- Table A-1: Soil Cleanup Levels and Corresponding Risks (ROD Table 23)
- Table A-2: Pathway Risk Estimates Corresponding to Soil Cleanup Levels (ROD Table 24)
- Table A-3: Groundwater Cleanup Levels and Corresponding Risks (ROD Table 25)
- Table A-4: Surface Water Cleanup Levels and Corresponding Risks (ROD Table 26)
- Table A-5: Discharge to Surface Water Cleanup Levels and Corresponding Risks (ROD Table 27)

Soil cleanup levels in the 1993 ROD were based on a 1×10^{-6} cancer risk level for recreational land use[4] at the Site, for each COC, for the most susceptible exposure pathway.

2.3 Remedy Implementation and Status

The MPTP cleanup has been implemented in six phases. The design for Phase 1 of the remedial action was finalized in June 1996 and construction occurred from May 1996 to November 1997.

[3] In the ROD cleanup level tables, "B2 PAHs" refer to PAHs that are probable carcinogens, "Total D PAHs" refer to PAHs that are not classifiable with respect to cancer impacts, and "Dioxin TCDD" refers to 2,3,7,8-tetrachlorophenol dibenzo-p-dioxin. Units on the tables in Attachment A are in micrograms per kilogram (µg/kg) and micrograms per liter (µg/L).

[4] The 1993 ROD identified that residential use would be the likely future land use, and that other uses such as residential use may be restricted, and that soil cleanup levels (which were based on recreational land use at a 1×10^{-6} cancer risk) would correspond to a total cancer risk of approximately 2.0×10^{-5} for potential industrial land use.

The primary components of the remedy completed during Phase 1 consisted of construction of the LTU and 13 soil staging and pretreatment piles (SSPs), building an addition to the previous WTP, construction of two groundwater recovery trenches that form the current remedy extraction system (the NHRT and the 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 and construction occurred from March 1999 to May 1999.

Phase 3 consisted of excavating the south-side contaminated soils, offloading 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 and 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 highway embankment. The north side infiltration system has not been used since 2002.

Phase 4 is ongoing and involves continued capture and treatment of contaminated groundwater and the biological treatment of contaminated soils. This phase includes offloading the LTU as lifts of surface soil are remediated to below the action limits set for the site in the ROD for certain contaminants of concern. The remaining LTU soils are scheduled to be offloaded in 2018. A data gaps investigation addressing site-wide concentrations of contaminants in soil was completed in mid-2017, a final report presenting the results of this investigation was issued in November 2017.

Phase 5 addresses the contaminated soils beneath the interstate that divides the site. Two technology evaluations were undertaken to evaluate addressing these soils. Further evaluation of these technologies was temporarily put on hold because of complications associated with the Butte-Silver Bow (BSB) Wastewater Treatment Plant (WWTP) construction dewatering conducted in 2014, 2015, and 2016. These technologies will be evaluated again when conditions at the site are relatively stable compared with previous years when WWTP construction dewatering was occurring, and after the final LTU offload is complete.

Phase 6 is currently in the planning state and will consist of removal and disposal of the soil treatment facilities on the south side of the site, final engineering controls, re-vegetation of all disturbed areas, and implementation of appropriate institutional controls to maintain protectiveness of the remedy.

3.0 BASIS FOR AND DESCRIPTION OF SIGNIFICANT DIFFERENCES

The *Fourth FYR Report* for the Montana Pole Site (April 2017) indicates the remedy has generally functioned as intended, but identified a need for a decision document to update and clarify aspects of the selected remedy in the 1993 ROD. This ESD addresses significant changes with respect to soil-related items related to the forthcoming final offload of treated soils from the LTU, including the following:

- Soil cleanup standards for human exposure;
- Dioxin in treated soil from LTU offloads;
- Management of soils to mitigate potential leaching of PCP from soil to groundwater;
- Clarification regarding future land use; and
- Engineering and institutional controls for soil.

These items are discussed below. A separate ESD or ROD Amendment is anticipated to address other items identified in the *Fourth FYR Report* that pertain to groundwater and surface water.

3.1 Significant Difference #1 – Soil Cleanup Standards for Human Exposure

DEQ internally evaluated potential updates to the site-specific cleanup levels (SSCLs) for human exposure to soil at the MPTP site in October 2017. DEQ used the updated exposure parameters and toxicity criteria included in Attachment B (summary memorandum). DEQ calculated the updated SSCLs for three exposure scenarios: recreational, industrial and construction. Residential exposures were not included in the evaluation because residential use of the Site is or will be restricted per the 1993 ROD. Consistent with the ROD, all carcinogenic SSCLs were based upon a target risk of 1×10^{-6}. Non-carcinogenic SSCLs for dioxins/furans and PCP were calculated using a target hazard quotient of 1, based upon critical reproductive effects and liver effects, respectively. All SSCLs were ultimately based upon carcinogenic risks because those SSCLs were the more protective of the potential SSCLs (carcinogenic and non-carcinogenic). A construction worker scenario was included to demonstrate that cleanup levels for recreational and industrial exposures would also be protective for construction workers that may come to the Site to perform construction work in the future. Although all contaminate SSCLs were updated, this ESD proposes using the most protective soil cleanup levels in each instance.

The updated SSCLs for human exposure developed by DEQ are provided in Attachment B and compared to the September 1993 ROD RGs in Table 1. The 1993 ROD based soil cleanup levels for human exposure on recreational use PRGs[5], and not on industrial use PRGs, which would have resulted in lower soil cleanup levels.

This ESD updates soil cleanup levels for human exposure based on the updated SSCLs for recreational and industrial exposure. Use of the recreational and industrial exposure scenario at 1×10^{-6} cancer risk is consistent with the approach in the 1993 ROD, and is protective with respect to ROD remedial action objectives when implemented in conjunction with a clarification that future industrial land use will be restricted to areas of the Site where it is demonstrated that the lower SSCLs for industrial exposure at the 1×10^{-6} cancer risk level are also met for surficial soils (see Section 3.4 – Significant Difference #4).

Table 1 compares the ESD soil cleanup levels for human exposure to the 1993 ROD cleanup levels.

[5] The 1993 ROD PRG for carcinogenic PAHs was 4,000 µg/kg for the recreational exposure scenario (ROD Table 2), but the soil cleanup level in 1993 ROD was 4,200 µg/kg (ROD Table 23). For other constituents, the 1993 ROD cleanup levels for soil were the same as the ROD PRGs for recreational use.

Table 1 – Comparison of 1993 ROD and 2017 ESD Soil Cleanup Levels for Human Exposure

Chemical	1993 ROD Cleanup Level	ESD Cleanup Levels (Bold)	Basis for Cleanup Level[c] (1993 ROD and ESD)
	Concentration (µg/kg)		
Pentachlorophenol	34,000	34,000	Recreational exposure scenario (1×10^{-6} carcinogenic risk)
	9,000	7,000	Industrial exposure scenario (1×10^{-6} carcinogenic risk)
	None	**2,000[e]**	Leaching to groundwater[d] (1×10^{-6} carcinogenic risk)
Dioxins/Furans (TEQ)[a]	0.2	0.1	Recreational exposure scenario (1×10^{-6} carcinogenic risk)
	0.03	**0.03[e]**	Industrial exposure scenario (1×10^{-6} carcinogenic risk)
Carcinogenic PAHs (TEQ)[b]	4,200	4,200	Recreational exposure scenario (1×10^{-6} carcinogenic risk)
	700	**700[e]**	Industrial exposure scenario (1×10^{-6} carcinogenic risk)

Notes: ESD = explanation of significant differences; µg/kg = microgram/kilogram; PAH = polycyclic aromatic hydrocarbon; ROD = record of decision; SSCL = site-specific cleanup level; TEQ = toxicity equivalency quotient.

a Sum of individual chlorinated dibenzo-p-dioxins and –dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEFs).

b Sum of individual B2 PAH (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) concentrations multiplied by their corresponding toxicity equivalence factor (TEFs).

c Use of the recreational and industrial exposure scenarios at 1×10^{-6} cancer risk is consistent with the approach in the 1993 ROD, and is protective with respect to ROD objectives when implemented in conjunction with a clarification that future industrial land use will be restricted to areas of the Site where it is demonstrated that the SSCLs for industrial exposure at the 1×10^{-6} cancer risk level are also met (see Section 3.3 – Significant Difference #3).

d Calculated as a concentration to prevent leaching to groundwater that would cause groundwater concentrations greater than 1.0 µg/L, which is the ROD PCP groundwater cleanup level calculated as the MCL with a 1.7×10^{-6} excess cancer risk for drinking water.

e **Bold =** Cleanup levels that will determine soil management in CAMU

For PCP and PAHs, the updated soil cleanup levels do not represent a significant change to the remedy because the cleanup levels for human exposure remain the same or decrease slightly. For dioxin, the updated soil cleanup level for human exposure represents a significant change, because some surficial soils (within two feet of ground surface) have dioxin concentrations below the 1993 ROD cleanup level but above the updated cleanup level. This change may increase the amount of soil that must be managed (in the CAMU– see Significant Differences #5) to prevent human exposure to dioxin.

3.2 Significant Difference #2 – Dioxin in Treated Soils from LTU Offloads

Soil excavated during the remedy has been treated at the LTU. Figure two shows the locations where treated soil from previous LTU offloads was placed. Currently, additional soil within the LTU remains to be offloaded.

The September 1993 ROD states (page 30) "Biological land treatment is not expected to achieve the degree of treatment provided by incineration; however, it is anticipated that allowable final contaminant levels will be achieved. Design studies would be utilized to determine achievable treatment efficiencies and identify any additional remedial actions which may be necessary in conjunction with biological land treatment." Based on data collected during remedy implementation, the ESD cleanup level of 0.03 microgram/kilogram (µg/kg) for dioxin TEQ in soil (Table 2) has not been achieved with biological treatment at the LTU. The *Fourth FYR Report* (April 2017) indicates that the average dioxin TEQ concentrations associated with treated soils from the LTU range from 0.7 to 2.8 µg/kg.

The ROD did not identify specific actions to be taken should cleanup levels for treated soils for any parameter not be achieved. The ARARs identification section of the 1993 ROD did discuss additional ARARs that may be invoked should treatment not meet cleanup standards, indicating anticipation by the agencies of this circumstance.

While the dioxin concentrations in the treated soils exceed the ESD cleanup level of 0.03 µg/kg, considerable reduction in dioxin levels has been achieved, and this soil can be classified as low level threat waste in terms of toxicity and mobility. Per EPA's *Fact Sheet on the Management of Dioxin Contaminated Soils* (EPA, May 2011), dioxin-contaminated soils may be managed either on-site or off-site, in accordance with CERCLA, the NCP, and Superfund guidance. Incineration was not supported by the community during the development of the September 1993 ROD, which stated "on-site incineration may not be acceptable to the local community and off-site incineration can be difficult to implement because off-site incinerator operators are reluctant to accept wastes containing dioxin." Additionally, two MDEQ Memorandum titled "More Consideration and Evaluation of Alternatives for Dioxin Remediation at Montana Pole" (April 2, 2018); and "Palmer letter Re: Montana Pole and Treating Plant – More Consideration and Evaluation of Alternatives" (April 2, 2018) evaluated other potential options for handling of the remaining waste and indicate other treatment or similar methods for addressing the low level dioxin waste are not practicable or implementable.

Per EPA's *Fact Sheet on the Management of Dioxin Contaminated Soils* (EPA, May 2011), the contaminated Site soil has been excavated and managed in an on-site area of contamination after the effective date for Land Disposal Restrictions for F032 waste (May 12, 1999), thus the excavated soil is considered to be generated, and Land Disposal Restrictions (LDRs) do apply if the soil is managed on-Site. Managing low level threat waste, that is dioxin-impacted soil on-site, with engineering controls to eliminate potential exposure pathways, is compliant with CERCLA, the NCP, and the EPA Presumptive Remedies: Technology Selection Guide for Wood Treater Sites {OSWER 9360.0-46FS}, and is an established remedy used to manage soils that are impacted with dioxin. Therefore, the treated soils will be placed in a CAMU for active management.

This ESD updates the 1993 ROD by indicating that soil cleanup levels for dioxin were not achieved for soil treated at the LTU, and that soil offloaded from the LTU (previously offloaded and remaining to be offloaded) containing dioxin above cleanup levels will be managed on-site in a CAMU. It will also provide for removal and management of those site soils containing dioxin above cleanup levels that were identified in the data gaps investigation (Tetra Tech, 2017). These additional soils will be removed and combined with treated soil with dioxin concentrations above cleanup levels which together will be consolidated in the CAMU. Protectiveness with respect to such soil will be maintained via capping, other engineering controls and ICs. Placing the soils that still contain dioxins/furans on-Site, so that such soils will always be outside of the 100-year floodplain and above the historic high groundwater level, and implementing engineering controls and ICs, are expected to render the potential exposure pathways incomplete. Therefore, the remedy will be protective of human health. It will also decrease the Area of Contamination by 4 acres. Capping, engineering and ICs are addressed in Section 3.5 – Significant Difference #5. The justification for managing previously unaddressed site soils containing dioxin with concentrations above cleanup levels in a CAMU is in Attachment E of this document.

This represents a significant change because the 1993 ROD anticipated that soil treated at the LTU might not meet soil cleanup levels. However, this change will not fundamentally alter the approach or cost of managing soils. This is because the ROD included contingencies in case all cleanup levels were not achieved making on-site capping necessary. The ROD had already incorporated a component of surface grading and revegetation and the contingency of covering treated soils with suitable material. Adding a CAMU for treated soil management is consistent with this approach. Cost increases incurred by adding the CAMU are unlikely to make the remedy exceed five percent of the costs estimated in the ROD.

3.3 Significant Difference #3 – Management of Soils to Mitigate Potential Leaching of PCP from Soil to Groundwater

The 1993 ROD did not address management of soils at or near the ground surface containing concentrations of PCP that are below the cleanup level for human exposure, but high enough to potentially impact groundwater via leaching of PCP. This includes soils offloaded from the LTU in the past, and soils in the LTU remaining to be offloaded. The groundwater cleanup level for PCP in the 1993 ROD is 1 µg/L, which is equal to the current Montana DEQ-7 groundwater standard of 1 µg/L for PCP.

The analysis provided in Attachment C indicates that PCP concentrations of less than 2,000 µg/kg in soil are not expected to cause impacts to groundwater above the groundwater cleanup standard due to leaching from infiltration. This is lower than the updated SSCL for human exposure for the industrial use scenario (7,000 µg/kg). Therefore, if soil with a PCP concentration above 2,000 µg/kg is covered in a manner that mitigates leaching from infiltration, it will adequately address potential future impacts to groundwater, and at the same time will also address potential human exposure impacts for PCP for the industrial exposure scenario (and also for the recreational exposure scenario which has a higher SSCL of 36,000 µg/kg). All treated and unaddressed surface soils containing PCP above cleanup levels will be managed on-site in the CAMU.

This ESD changes the 1993 ROD by indicating that soils at or near the ground surface, with PCP concentrations greater than 2,000 µg/kg, will be placed and managed in a CAMU in a manner that mitigates leaching from infiltration. This is a significant change because the 1993 ROD did not address management of soil with potential to impact groundwater due to leaching of PCP (such as soil offloaded from the LTU). However, this change will not fundamentally alter the approach or cost of managing soils because the ROD already incorporated a component of surface grading and revegetation or covering with suitable material, which is the approach that will be used to address potential leaching from infiltration. Additionally, soil sampling at the Site in 2017 indicated that, other than LTU offload areas, there are a limited number of locations where PCP concentration exceeds 2,000 µg/kg in soils at or near the surface. These soils will be consolidated with the LTU soil and capped.

3.4 Significant Difference #4 – Clarification Regarding Future Land Use

The 1993 ROD indicated residential use would be restricted, anticipated recreational use as the likely future land use, and used recreational exposure at a 1×10^{-6} cancer risk level as the basis for soil cleanup levels. The 1993 ROD also indicated that the soil cleanup levels would be protective for industrial use exposure (2×10^{-5} cancer risk level), and did not restrict industrial use at those soil concentrations despite the slightly higher cancer risk level.

Industrial use of the facility by the future landowners is now a possible future land use for the site. This ESD clarifies that future land use will be restricted to prevent residential use (consistent with the original ROD), and explicitly allows industrial use in locations where it is demonstrated that soil at or near the surface meets the updated SSCLs for industrial exposure at the 1×10^{-6} cancer risk level (see Table 1). This requirement can be met via engineered controls by moving impacted soils to the CAMU for management and replacing the soil with clean fill.

This is a significant change because it clarifies that recreational and industrial use must meet the SSCLs for industrial exposure for cancer risk of 1×10^{-6}, whereas the 1993 ROD allowed for industrial use at a lower cancer risk level of 2×10^{-5}. However, this change does not fundamentally alter the remedy approach or cost, because it still allows for future recreational and industrial use at the Site once the appropriate cleanup levels are achieved.

3.5 Significant Difference #5 – Capping, Engineering, and Institutional Controls for Soil

The September 1993 ROD discusses soil cover and engineering controls as part of the selected remedy, as follows: 1) "Backfill of excavated and treated soils into excavated areas if possible… surface grading, and revegetation or covering with suitable material compatible with existing or future land use"; and 2) "Fencing and posting of areas where active remediation is occurring will be required to prevent unauthorized access to contaminated media or to remedial action areas." Updated Site-wide storm water run-on and run-off controls are being incorporated into a final CAMU design for LTU offload and soil cover.

Clarifications regarding engineering and institutional controls for soil in this ESD include the following:

a. Whereas the 1993 ROD indicated "surface grading and revegetation or suitable cover" for areas where treated soil from the LTU was backfilled, this ESD clarifies that an ARAR compliant CAMU[6] will be constructed to manage the following:

   - All treated soil offloaded from the LTU (past and future), to address dioxin remaining in offloaded soil;
   - Where sampling indicates surficial soil contains concentrations above the industrial soil cleanup levels in Table 2, to mitigate human exposure; and/or
   - Where PCP concentration in soil exceeds 2,000 µg/kg, to mitigate potential impacts to groundwater due to PCP leaching from soil.

   Surficial soil may be relocated to the CAMU, and replaced by clean fill, to address these requirements.

b. Implementation of the activities listed below will be subject to a design process, and will not be implemented until the design is completed, documented, and approved by both DEQ and EPA. The activities include:

   - Final offload of soils from the LTU to the CAMU;
   - Final disposition of the LTU and associated retention pond (collectively referred to as the LTU area);
   - Final cover, grading, vegetation, storm water control, and fencing site-wide; and
   - Planning and implementing institutional controls that will likely include deed restrictions designed to restrict future residential use of the entire Site and restrict future industrial use for portions of the Site where surficial soils do not meet the updated SSCLs for industrial exposure at the 1×10^{-6} cancer risk level (Table 1).

   The design will address the following concerns: 1) ARAR compliance; 2) prevent exposure to soil left on-Site containing dioxin above soil cleanup standards; 3) prevent soil containing dioxin above soil cleanup standards from being mobilized by water or wind to locations beyond those addressed by engineering and institutional controls; and 4) reduce infiltration to mitigate potential leaching of COCs to groundwater at concentrations sufficient to negatively impact groundwater quality above groundwater cleanup levels. The design should attempt to minimize (to the extent practical) limitations that cover and grading might cause with respect to possible future efforts to remediate impacted soil in inaccessible areas, such as beneath the treatment building and beneath the interstate highway (these inaccessible areas will be addressed in a future ESD or ROD Amendment).

[6] The 1993 ROD identified certain RCRA ARARs that are applicable to capped waste, if capping became necessary because of the inability to meet all cleanup levels in treated soils. Attachment D and E to this ESD updates and more specifically identifies the RCRA ARARs that will be followed in the construction of the CAMU.

c. This ESD clarifies that an operations and maintenance (O&M) plan for maintenance and monitoring of the CAMU, engineering and institutional controls should be completed, documented, approved by both DEQ and EPA, and implemented within six months of the final offload. The O&M plan will address maintenance procedures and include a monitoring program for the engineering controls and institutional controls that provides information in sufficient detail and frequency to allow an updated assessment of the adequacy of these engineering controls during each FYR.

These are significant changes because requirements are added to those specified in the 1993 ROD. However, these changes do not fundamentally alter the scope or cost of the selected remedy in the 1993 ROD which included engineering controls (grading and revegetation or covering with suitable material) and institutional controls to prevent access to contaminated soil.

3.6 Summary of Significant Differences

A summary of significant differences identified in this ESD is provided in Table 2. Associated ARARs are identified in Attachment D.

Table 2 – Summary of Significant Differences Identified in this ESD

Significant Difference Number	Description of Change	Impact on Remedy Scope, Performance and Cost
1	Soil cleanup levels for human exposure are updated based on updated SSCLs for recreational and industrial exposure. In each case the most protective soil cleanup level is selected. Use of the recreational and industrial exposure scenarios at 1×10^{-6} cancer risk is consistent with the approach in the 1993 ROD, and is protective with respect to ROD objectives when implemented in conjunction with a clarification that future industrial land use will be restricted to areas of the Site where it is demonstrated that the lower SSCLs for industrial exposure are also met for surficial soils (see Section 3.4 - Significant Difference #4).	For PCP and PAHs, no change to scope or cost. Performance is improved to accommodate industrial reuse because the cleanup level for human exposure has decreased. For dioxin, this change will increase the amount of soil that must be managed (placed under suitable cover – see Significant Difference #5) to prevent human exposure to dioxin. This increase will not fundamentally alter the approach or cost of managing soils, since CAMU will be used to manage soils with dioxin above cleanup levels.
2	Updates the 1993 ROD by indicating that soil cleanup levels for dioxin were not achieved for soil treated at the LTU, and soil containing dioxin above cleanup levels will be managed on-site. Protectiveness with respect to such soils will be maintained via management of soils in a ARAR-compliant CAMU, engineering controls and ICs. Engineering and institutional controls are addressed in Significant Difference #5.	This change will not fundamentally alter the approach, performance, or cost of managing soils because the ROD already incorporated a component of surface grading and revegetation or covering with suitable material, which is the approach that will be used to address remaining impacts from dioxin in soil. The revised approach, which includes management of soils in a CAMU, is generally consistent with the existing ROD language, which identified the potential for capping waste on-site if treatment levels were not achieved and identified potential ARARs that would apply to capping implementation. This ESD adds additional specificity to those ARARs by identifying specific RCRA-compliant CAMU criteria.
3	The 1993 ROD is updated to indicate that soils at or near the ground surface, with PCP concentrations greater than 2,000 µg/kg, will be placed in the CAMU to mitigate leaching from infiltration. The 1993 ROD did not address management of soil with potential to impact groundwater due to leaching of PCP (such as soil offloaded from the LTU).	This change will improve performance by further prevention of leaching of COCs to groundwater. It will not fundamentally alter the approach or cost of managing soils because the ROD already incorporated a component of surface grading and revegetation or covering with suitable material, which is the approach that will be used to address these potential impacts.

Significant Difference Number	Description of Change	Impact on Remedy Scope, Performance and Cost
4	Clarifies that future land use will be restricted to prevent residential use (consistent with the ROD), and will allow recreational or industrial use in locations where it is demonstrated that soil at or near the surface meets the updated SSCLs for recreational or industrial exposure at the 1×10^{-6} cancer risk level (see Table 1). The 1993 ROD allowed for industrial use at a lower cancer risk level of 2×10^{-5}, however this ESD updates it to the $1x10^{-6}$ cancer risk level. This requirement can be met via placing soil above cleanup levels in the CAMU and other engineered controls such as adequate cover material.	This change improves performance by allowing for industrial reuse of the property instead of a mix of recreational and industrial. It does not fundamentally alter the remedy approach or cost.
5	The scope for engineering controls and institutional controls is updated to prevent exposure to soil, including: a. The following materials will be managed in an ARAR compliant CAMU: 1) treated soil offloaded from the LTU (past and future) to address dioxin remaining in offloaded soil; 2) where sampling indicates surficial soil contains concentrations above soil cleanup levels in Table 2, to mitigate human exposure; and/or 3) where the PCP concentration in soil exceeds 2,000 µg/kg, with a suitable cover designed to reduce infiltration to mitigate potential impacts to groundwater due to PCP leaching from soil. Surficial soil may be relocated to the CAMU to address these requirements. c. Implementation of LTU offload and final disposition of LTU area, as well as engineering controls and institutional controls, will be subject to a design process and will not be implemented until the design is completed, documented, and approved by both DEQ and EPA; and d. An O&M plan for maintenance and monitoring of the CAMU and engineering and institutional controls should be completed, documented, and approved by both DEQ and EPA and implemented within six months of the final offload.	These controls are expected to improve performance by further limiting exposure to receptors and leaching of COCs to groundwater. These changes alter the scope and cost of the selected remedy in the 1993 ROD which included engineering controls (grading and revegetation or covering with suitable material) and institutional controls to prevent access to contaminated soil and which included potential RCRA ARARs to be applied to the CAMU, should the treatment process not meet cleanup standards. This ESD adds additional specificity to those ARARs by identifying specific RCRA-compliant criteria of managing soil above cleanup levels in a CAMU.

4.0 Support Agency Comments

EPA Region 8, as the support agency, concurs with this ESD.

5.0 Statutory Determinations

DEQ and EPA have determined that the remedy, as amended by the changes documented herein, is protective of human health and the environment, complies with all federal and state requirements that are applicable or relevant and appropriate to this remedial action, meets the remedial action objectives, is cost effective, utilizes permanent solutions and alternative technologies to the extent practicable, and satisfies the requirements in Section 121 of CERCLA.

Because this amended remedy will result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure, statutory FYRs will continue to ensure that the remedy remains protective of human health and the environment.

6.0 Public Participation Process

A formal public comment period is not required for an ESD. However, there is significant community interest regarding the site and DEQ and EPA are planning a 30-day comment period to consider public input on the draft ESD. DEQ will publish a notice of availability of the draft document and a brief description of the ESD in the *Montana Standard* (as required by Code of Federal Regulation 40, Section 300.435(c)(2)(i)(B) and MCA 75-10-713. An Administrative Record file providing the basis for the decision will be made available to the community at a local repository. The community input obtained during the public comment period will be carefully considered before a final decision is made regarding the Site. Public comment will be recorded and responded to as required under CFR 40, Section 300.435(c)(2)(i)(F). DEQ will then publish a notice of availability for the amended ESD in the *Montana Standard*. This ESD and supporting documents will become a part of the MPTP site Administrative Record file and information repository as required by CFR 40, Section 300.435(c)(2)(i)(A) and 300.825(a)(2).

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Dated

_____
Betsy Smidinger
Director
Superfund and Emergency
Management Division (8SEM)

ATTACHMENT A

Cleanup Levels from the September 1993 ROD

Table A-1: ROD Table 23
(Soil Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/kg)	Basis	Cancer Risk (recreational use for soil)	Noncancer Health Hazard Quotient
Soils	Pentachlorophenol[a]	34,000	Risk	1.0×10^{-6}	<1
	B2 PAHs (TEF)[bc]	4,200	Risk	1.0×10^{-6}	<1
	Dioxin TCDD (TEF)[bd]	0.20	Risk	1.0×10^{-6}	<1

a Levels correspond to an excess cancer risk of 1 x 10-6 and are based on data for the dermal exposure pathway as presented in the Baseline Risk Assessment Report (Camp Dresser & McKee [CDM], 1993).

b Levels correspond to an excess cancer risk of 1 x 10-6 and are based on data for the soil ingestion exposure pathway as presented in the Baseline Risk Assessment Report (CDM, 1993).

c Sum of individual B2 PAH (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene) concentrations multiplied by their corresponding toxicity equivalence factor (TEFs) as shown on Table 28 of the ROD.

d Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

Table A-2: ROD Table 24
(Pathway Risk Estimates Corresponding to Soil Cleanup Levels)

Recreational Soil Pathway Cancer Risks

		Risk		
Chemical	Cleanup Level (µg/kg)	Ingestion	Dermal	Total COC
Pentachlorophenol	34,000	1.33×10^{-7}	1.00×10^{-6}	1.14×10^{-6}
Dioxins/Furans (TEFs)	0.2	9.83×10^{-7}	7.36×10^{-7}	1.72×10^{-6}
B2 PAH (TEFs)	4,200	1.00×10^{-6}		1.00×10^{-6}
Total Pathway		2.12×10^{-6}	1.74×10^{-6}	
			Total:	3.86×10^{-6}

Industrial Soil Pathway Cancer Risks

		Risk		
Chemical	Cleanup Level (µg/kg)	Ingestion	Dermal	Total COC
Pentachlorophenol	34,000	8.56×10^{-7}	3.58×10^{-6}	4.44×10^{-6}
Dioxins/Furans (TEFs)	0.2	6.29×10^{-6}	2.84×10^{-6}	9.13×10^{-6}
B2 PAH (TEFs)	4,200	6.42×10^{-6}		6.42×10^{-6}
Total Pathway		1.36×10^{-5}	6.42×10^{-6}	
			Total:	2.00×10^{-5}

Table A-3: ROD Table 25
(Groundwater Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/L)	Basis	Cancer Risk (drinking use for ground water)	Noncancer Health Hazard Quotient
Groundwater	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	NA
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene	1.0	risk	1.0×10^{-6}	NA
	Benzo(b)fluoranthene	0.2	risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	risk	1.0×10^{-6}	NA
	Chrysene	1.0	risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	risk	2.1×10^{-5}	NA
	lndeno(1,2,3-CD)pyrene	1.0	risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	3.0×10^{-5}	MCL	6.2×10^{-5}	<1
	2,4,6-trichlorophenol	6.5	risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

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Table A-4: ROD Table 26
(Surface Water Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/L)	Basis	Cancer Risk (drinking use for surface water)	Noncancer Health Hazard Quotient
Surface Water	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	<1
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene	1.0	Risk	1.0×10^{-6}	NA
	Benzo(b)fluoranthene	0.2	Risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	Risk	1.0×10^{-6}	NA
	Chrysene	1.0	Risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	Risk	2.1×10^{-5}	NA
	lndeno(1,2,3-CD)pyrene	1.0	Risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	Risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	1.0×10^{-5}	aquatic criteria	2.0×10^{-5}	<1
	2,4,6-trichlorophenol	6.5	Risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

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Table A-5: ROD Table 27
(Discharge to Surface Water Cleanup Levels and Corresponding Risks)

Media	Contaminant	Cleanup Level (µg/L)	Basis	Cancer Risk (drinking use for surface water)	Noncancer Health Hazard Quotient
Discharge to Surface Water	Pentachlorophenol	1.0	MCL	1.7×10^{-6}	<1
	Benzo(a)pyrene	0.2	MCL	2.1×10^{-5}	NA
	Benzo(a)anthracene[c]	1.0	Risk	1.0×10^{-6}	NA
	Benzo(b)fluoranthene	0.2	Risk	2.1×10^{-5}	NA
	Benzo(k)fluoranthene	1.0	Risk	1.0×10^{-6}	NA
	Chrysene	1.0	Risk	1.0×10^{-6}	NA
	Dibenzo(a,h)anthracene	0.2	Risk	2.1×10^{-5}	NA
	lndeno(1,2,3-CD)pyrene	1.0	Risk	1.0×10^{-6}	NA
	Benzo(g,h,i)perylene	1.0	Risk	1.0×10^{-6}	NA
	Total D PAHs[a]	360	hazard quotient	NA	0.9
	Dioxin TCDD (TEF)[b]	1.0×10^{-5}	aquatic criteria	2.0×10^{-5}	<1
	2,4,6-trichlorophenol	6.5	Risk	1.0×10^{-6}	NA
	2-chlorophenol	45	hazard quotient	NA	0.9
	2,4-dichlorophenol	27	hazard quotient	NA	0.9
	2,3,5,6-tetrachlorophenol	267	hazard quotient	NA	0.9
	Arsenic	48	aquatic criteria	NA	NA
	Cadmium	1.1	aquatic criteria	NA	NA
	Chromium[d]	11	aquatic criteria	NA	NA
	Copper	12	aquatic criteria	NA	NA
	Lead	3.2	aquatic criteria	NA	NA
	Zinc	110	aquatic criteria	NA	NA

a Sum of individual D PAH (acenaphthene, acenaphthylene, anthracene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene) concentrations.

b Sum of individual chlorinated dibenzo-p-dioxins and -dibenzofurans concentrations multiplied by their corresponding toxicity equivalence factor (TEF) as shown on Table 29 of the ROD.

c Cancer Risk for Benzo(a)anthracene listed in ROD as 1.0×10^{-7} but that is inconsistent with other tables and is assumed to be an error, the assumed value of 1.0×10^{-6} is presented here.

d The basis indicated for Chromium is "aquatic criteria"; however, the standard of 11 µg/L correlates to the DEQ-7 aquatic standard for Chromium VI, and there is no aquatic standard for Chromium. In practice, the analysis of effluent is performed for Chromium and the results are well below the 11 µg/L level. If values for Chromium higher than 11 µg/L are detected in the effluent (not the case to date), it would then be appropriate to analyze for the Chromium VI concentration and compare that to the standard of 11 µg/L.

ATTACHMENT B

DEQ Memo (10/3/17) Regarding Soil Cleanup Levels

Memorandum

To: David Bowers

From: Aimee Reynolds

Date: 5/31/16

Re: Montana Pole Direct Contact Cleanup Level 5-Year Review

At your request I recalculated the site-specific cleanup levels (SSCLs) for Montana Pole using updated exposure parameters and toxicity criteria as appropriate. The calculated cleanup levels are provided in the table below along with the preliminary remediation goals (PRGs) provided in Table 2 of the September 1993 Record of Decision (ROD). I did not include residential PRGs or recalculate SSCLs since I understand that this usage is not being considered for the site. All concentrations are in milligrams per kilogram (mg/kg). I added SSCLs for construction worker exposure to both surface and subsurface soil in case they were needed since they were not provided in the ROD. Based upon this analysis, offloading the land treatment unit soils that meet the pentachlorophenol and carcinogenic polynuclear aromatic hydrocarbons (cPAHs) PRGs and capping those soils would still be protective of the proposed uses from a direct contact standpoint. However, the leaching to groundwater analysis should still be completed to determine the appropriate cap design.

Chemical (mg/kg)	Recreational		Industrial		Construction	
	PRG	SSCL	PRG	SSCL	PRG	SSCL
Pentachlorophenol	34	36	9	7	NA	77
Dioxins/Furans (TEF)	0.0002	0.0001	0.00003	0.00004	NA	0.0004
Carcinogenic PAHs (TEF)	4	2	0.7	0.5	NA	5

The following is a parameter by parameter comparison between the PRG toxicity and risk criteria and exposure parameters and those used in the SSCL calculations.

Toxicity Criteria:
The most current toxicity criteria were used to calculate the SSCLs. I have provided the former values where they were available. Inhalation risks were not included in the PRG calculations likely due to the lack of inhalation toxicity criteria available at the time of the PRG calculations.

Dioxins/furans: Updated 2005 World Health Organization toxicity equivalence factors (TEFs) should be used when calculating toxicity equivalents (TEQs) for the data. The oral cancer slope

factor has been updated from 1.5E+05 to 1.3E+05 milligram per kilogram per day $(mg/kg\text{-}day)^{-1}$ based upon California Environmental Protection Agency (EPA) criteria accepted by the United States EPA and provided in the EPA Regional Screening Levels (RSL) table. Dioxins/furans now have an inhalation unit risk (IUR) of 38 microgram per cubic meter $(\mu g/m^3)^{-1}$ also developed by California EPA and provided in the RSL table. Dioxins/furans also now have an oral reference dose (RfD) of 7E-10 mg/kg-day found on the EPA Integrated Risk Information System (IRIS) and an inhalation reference concentration (RfC) of 4E-8 milligram per cubic meter (mg/m^3) developed by California EPA and provided in the RSL table. Inhalation risks were added for both carcinogenic and non-carcinogenic SSCLs and employed the current volatilization factor of 1.96E+06 m^3/kg and particulate emission factor (PEF) of 1.36E+09 m^3/kg as well as a trespasser/recreational exposure time of 2 hours based upon professional judgement.

Pentachlorophenol: The oral cancer slope factor found in IRIS has been updated from 0.12 $(mg/kg\text{-}day)^{-1}$ to 0.4 $(mg/kg\text{-}day)^{-1}$ and pentachlorophenol now has an IUR of 5.1E-06 $(\mu g/m^3)^{-1}$ developed by California EPA and provided in the RSL table. Inhalation risk was added for carcinogenic SSCLs and employed the current PEF of 1.36E+09 m^3/kg as well as a trespasser/recreational exposure time of 2 hours based upon professional judgement. The IRIS RfD for pentachlorophenol has been updated from 0.03 mg/kg-day to 0.005 mg/kg-day.

Carcinogenic polynuclear aromatic hydrocarbons (cPAHs): The cPAH or B2 PAH toxicity is still based upon the toxicity equivalence to benzo(a)pyrene and the same TEFs are used to calculate cPAH TEQ SSCLs as were used to calculate the PRGs. The oral cancer slope factor used is still 7.3 $(mg/kg\text{-}day)^{-1}$ but now there is an IUR of 0.0011 $(\mu g/m^3)^{-1}$ developed by California EPA and inhalation risk was added for SSCLs and employed the current PEF of 1.36E+09 m^3/kg as well as a trespasser/recreational exposure time of 2 hours based upon professional judgement.

Target Risks and Hazard Quotients:
Target risks and hazard quotients cannot be less protective than those used to calculate the PRGs included in the ROD. Consistent with the ROD, all carcinogenic SSCLs are based upon a target risk of 1E-06. Non-carcinogenic SSCLs for dioxins/furans and pentachlorophenol were calculated based upon a target hazard quotient of 1 based upon critical effects of reproductive effects and liver effects, respectively. All SSCLs are based upon carcinogenic risks because these SSCLs were the more protective of the potential SSCLs (carcinogenic and non-carcinogenic).

Averaging Times:
Carcinogenic averaging times are based upon the average human lifespan of 78 years multiplied by 365 days included in the EPA Exposure Factors Handbook dated October 2011. This is an update from the 70 year lifespan upon which the PRG is based. The non-carcinogenic averaging times are based upon the exposure duration multiplied by 365 days consistent with the ROD.

Exposure Frequencies:
The site-specific exposure frequencies of 150 days per year for industrial workers and 60 days per year for trespassers/recreational users from the ROD are still appropriate and were used to develop the SSCLs. The Montana Department of Environmental Quality (DEQ) default exposure frequency of 124 days per year was used to calculate the construction worker SSCLs.

Exposure Durations:
The exposure durations for trespassers/recreational users of 12 years (6-18 year olds) and industrial workers of 25 years included in the ROD are still appropriate. The DEQ default exposure duration of 1 year was used to calculate the construction worker SSCLs.

Absorption Factors:
All oral relative absorption factors are 100% consistent with the ROD. Dermal absorption factors have been updated from 0.1 for organics, and 0.01 for inorganics and dioxins/furans upon which the PRGs were based. The dermal absorption factors for dioxins/furans, pentachlorophenol, and cPAHs used to calculate the SSCLs are 0.03, 0.25, and 0.13, respectively.

Conversion Factors:
Conversion factors for ingestion and inhalation are used as appropriate in both the PRG and SSCL calculations.

Ingestion Rates:
Soil ingestion rates for both trespassers/recreational users and industrial workers are 100 mg/day. Based upon current DEQ default values, trespassers/recreational users are assumed to ingestion 100% of their total daily soil quantity from onsite sources on the days that they visit the site, which is more protective than the 50% included in the PRG calculation. An ingestion rate of 330 mg/day was used for the construction worker.

Body Weights:
The adult body weight provided in the EPA February 2014 Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors of 80 kg was used for the industrial and construction worker SSCLs. This is an update of the 70 kg body weight used for the PRG calculation. A 45 kg DEQ default body weight for the trespasser/recreational user was used for the SSCLs as an update to the 43 kg used for PRG calculation.

Skin Surface Areas:
The updated skin surface of 3,527 square centimeters per day (cm^2/day) was used for both the industrial and construction workers based upon the EPA February 2014 default exposure factors, which is an update of the 3,120 cm^2/day used for PRG calculation. The DEQ default skin surface area for trespassers/recreational users of 4,400 cm^2/day was used as an update to the 5,165 cm^2/day used for PRG calculation.

Adherence Factors:
The PRGs were based upon a skin adherence factor of 1.45 mg/cm^2 was used for all receptors. Current adherence factors for trespassers/recreational users, industrial workers, and construction workers are 0.04, 0.12, and 0.3 mg/cm^2, respectively and were used in the SSCLs calculations.

ATTACHMENT C

Potential for PCP in Soil at or Near Ground Surface to Impact Groundwater Due to Leaching from Infiltration

MEMORANDUM

TO: David Bowers, Montana Department of Environmental Quality (DEQ)
FROM: Tetra Tech, Inc. [EMI Unit]
DATE: May 23, 2018
RE: Montana Pole and Treating Plant (MPTP)
Analysis of Soil Cleanup Level for Pentachlorophenol Protective of Groundwater

Executive Summary

Soil cleanup levels for pentachlorophenol (PCP) at the Montana Pole and Treating Plant (MPTP) site have been established based on risk to human health associated with direct exposure to vadose zone soils. These soil cleanup levels did not consider the impact of leaching PCP from the vadose zone to groundwater outside of the land treatment unit (LTU) offload footprint. This memo presents the background and development of a soil cleanup level for PCP that meets the MPTP Record of Decision (ROD) groundwater cleanup level (1 microgram per liter [ug/L]) (U.S. Environmental Protection Agency [EPA] and Montana Department of Environmental Quality [DEQ] 1993). Five lines of evidence are employed in the assessment of this cleanup level:

1. Empirical Site Evidence – Monitoring Well Data,
2. Empirical Site Evidence – North Side Soil Data,
3. Empirical Site Evidence – Near Creek Recovery Trench (NCRT) Data,
4. Results of Synthetic Precipitation Leaching Procedure (SPLP) Testing, and
5. Results of a Spreadsheet Mixing Model.

These lines of evidence support PCP soil cleanup levels ranging from 0.56 milligrams per kilogram (mg/kg) to 26.9 mg/kg. Accounting for the biases associated with the various lines of evidence a "realistically conservative" value of 2.0 mg/kg is proposed for the site.

1.0 Introduction

The MPTP site is located in Butte, Montana, and operated as a wood treating facility from 1946 to 1984 (EPA and DEQ 1993). A site map is provided as Exhibit 1. During most of this period, a solution of about 5 percent 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.

Phase 4 of the remedial action is ongoing and involves continued capture and treatment of contaminated groundwater and biological treatment of contaminated soils. This phase also includes offloading soil in the LTU as lifts of surface soil are remediated to below the cleanup levels set for the

site in the MPTP ROD for certain contaminants of concern. The soil currently remaining in the LTU is scheduled to be offloaded in 2018; this will be the final offload.

A data gaps investigation addressing site-wide concentrations of selected contaminants in soil was completed in mid-2017; a final report presenting the results of this investigation was issued in November 2017 (Tetra Tech 2017). The 30 percent design for the LTU offload was submitted to DEQ on January 30, 2018, and the final design will be submitted mid-summer 2018. The design will include offloading all the remaining soil from the LTU with onsite disposal beneath an engineered impermeable cap and cover soil, removing and disposing of the LTU liner and associated materials and equipment, and reclaiming the current LTU and retention pond areas.

The MPTP ROD established a PCP soil cleanup level of 34 (mg/kg) and a PCP groundwater cleanup level of 1.0 (µg/L) (EPA and DEQ 1993). The basis for the ROD PCP soil cleanup level was noted as "risk;" it corresponds to a 1.0×10^{-6} excess cancer risk for recreational use for soil, and a noncancer health hazard quotient less than 1.0. The basis for the ROD PCP groundwater cleanup level was noted as the "maximum contaminant level (MCL)," and a 1.7×10^{-6} excess cancer risk for drinking water. A noncancer health hazard quotient was not noted in the ROD for PCP in groundwater.

The ROD PCP cleanup level for soil (34 mg/kg), did not consider the potential impact that leaching of PCP from treated LTU soils, and other potentially contaminated site soils, might have on the quality of subjacent groundwater. That is, it did not assess whether offloaded treated soil from the MPTP LTU, or other site soils exhibiting concentrations of up to 34 mg/kg could result in a concentration of PCP in groundwater greater than the ROD 1 µg/L groundwater cleanup level.

PCP is logical to target for leaching to groundwater as it is mobile in surface soil, subsurface soil, and groundwater. Unlike PCP, polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (furans), collectively referred to as "dioxins," are not mobile in soil and therefore would not leach from soil to groundwater. However, dioxins can be mobilized if present in a carrier oil. Based on data collected during remedy implementation, the ROD soil cleanup level of 0.20 microgram/kilogram (µg/kg) for dioxin toxicity equivalence quotient (TEQ) in soil has not been achieved with biological treatment at the LTU. The Fourth FYR Report (April 2017) indicated that the average dioxin TEQ concentrations associated with treated soils from the LTU ranged from 0.7 to 2.8 µg/kg, and also stated that:

> "it is also possible that some dioxins are introduced to the trenches in sheens of oils, though in recent years observations of sheens have been limited to just a few instances at the NHRT and are not commonplace."

In 2018 the DEQ recalculated the site-specific cleanup levels (SSCLs) for PCP in soil for the MPTP site using updated exposure parameters and toxicity criteria (DEQ 2018). The recalculated cleanup levels are provided in the table below, along with the preliminary remediation goals (PRGs) provided in the MPTP ROD.

Chemical of Concern	Recreational Use		Industrial Use		Construction Worker	
	PRG	SSCL	PRG	SSCL	PRG	SSCL
PCP	34 mg/kg[1]	36 mg/kg	9 mg/kg	7 mg/kg[2]	Not applicable	77 mg/kg

Notes:
1 ROD recreational use cleanup level
2 Proposed cleanup level for industrial use

The above table indicates the industrial SSCL for PCP (7.0 mg/kg) would be the lowest recalculated cleanup level, but this value is based only on risk to human health, and does not take into account leaching of PCP from surface soil, subsurface soil to a depth of 15 feet outside of the offload footprint. Thus, the effect of leaching PCP from soil outside of the offload footprint (PCP-contaminated soil that will not be protected by an engineered impermeable cap) must be considered. This memorandum addresses this issue.

2.0 Lines of Evidence

This memorandum addresses the issue noted above by developing five lines of evidence that support a PCP soil cleanup level that would be protective of groundwater and thus meet the MPTP ROD groundwater cleanup level for PCP (1.0 µg/L). These lines of evidence include:

1. Empirical Site Evidence – Monitoring Well Data,
2. Empirical Site Evidence – North Side Soil Data,
3. Empirical Site Evidence – Near Creek Recovery Trench (NCRT) Data,
4. Results of Synthetic Precipitation Leaching Procedure (SPLP) Testing, and
5. Results of a Spreadsheet Mixing Model.

These five lines of evidence are discussed individually in the following sections.

Line of Evidence #1 - Empirical Site Evidence – Monitoring Well Data

Another supporting line of evidence related to the potential for leaching of PCP in soils is the relatively low concentration of PCP in groundwater observed in samples at three monitoring wells on the south side of the MPTP site (wells MW-A-95, MW-09, and GW-09). These wells are located downgradient of previous LTU offloads and are not believed to be substantially influenced by other potential continuing sources of PCP (see Exhibit 2).

Monitoring well MW-A-95 is located immediately downgradient of soil offloaded from the LTU in 2007, but in a location not expected to be affected by any other continuing sources of PCP (Exhibit 2). Surficial soil samples collected in 2017 from the 2007 offload area near well MW-A-95 and analyzed for PCP exhibited concentrations between 25 mg/kg and 32 mg/kg. However, since 2007, the concentration of PCP in groundwater at well MW-A-95 has generally been below 1 µg/L, with a few values between 1 µg/L and 5 µg/L (Exhibit 2).

Monitoring well MW-09 is located immediately downgradient of soil offloaded from the LTU in 2005, but in a location not expected to be affected by any other continuing sources of PCP (Exhibit 2). A surficial soil sample collected in 2017 from the 2005 offload area near well MW-09 exhibited a PCP concentration of 38 mg/kg. However, since 2005 the concentration of PCP in groundwater at well MW-09 has always been well below 1 µg/L (Exhibit 2).

Monitoring well GW-09 is located immediately downgradient of soil offloaded from the LTU in 2005 and 2007, but in a location not expected to be affected by any other continuing sources of PCP (Exhibit 2). A soil sample from the most western offload area upgradient of well GW-09 was not collected during the Data Gap Investigation (Tetra Tech 2017). However, the concentration of PCP in soil samples collected directly from the LTU soil in 2003 was 26.9 mg/kg, and in 2006 was 13.6 mg/kg (average value equal to 20.25 mg/kg) (Tetra Tech 2015). As noted in the Data Gap Investigation (Tetra Tech 2017), the concentration of PCP in soils from the 2005 and 2007 offloads ranged from 25 mg/kg to 38 mg/kg (average value equal to 31.5 mg/kg) (Exhibit 2). Therefore, this line of evidence assumes that soil in the most western offload area upgradient of well GW-09 likely ranges between about 20 mg/kg and 38 mg/kg (average value equal to about 26 mg/kg).

However, since 2005 the concentration of PCP in groundwater at well GW-09 has generally been well below 1 µg/L, except for a few likely anomalous higher values (Exhibit 2). The site conceptual model suggests that occasionally higher concentrations of PCP in groundwater may be the result of groundwater that has come in contact with residual oil in the "smear zone" as discussed in the Annual Sampling and Monitoring Report (Tetra Tech 2018).

It is also important to note that, with very few exceptions over the 2005 to 2018 period of record, the PCP plume footprint based on the 1 µg/L contour interval has not extended west of the location of monitoring well MW-A-95. This observation suggests that PCP-contaminated soil (as high as 38 mg/kg) associated with the 2005 and 2007 LTU offloads has not resulted in an increase in the concentration of PCP in groundwater immediately downgradient of the offload areas.

Summary: With few exceptions, groundwater collected from wells downgradient of the 2005 and 2007 offloads consistently exhibited PCP concentrations below the ROD groundwater standard (1 µg/L), even

though they were located immediately downgradient of locations where surficial soil has exhibited PCP concentrations that range between 25 mg/kg and 38 mg/kg. These observations support development of a PCP soil cleanup level as high as 38 mg/kg.

Line of Evidence #2 - Empirical Site Evidence – North Side Soil Data

Surface and subsurface soil data were collected during the 2017 Final Soil and Surface Water Data Gap Investigation (Tetra Tech 2017). The highest concentrations of PCP in soil were found in grids N-G and N-H at the 5 to 10 foot depth interval (Exhibit 3). The highest soil PCP concentrations in grid N-G was 2,500 µg/kg (equal to 2.5 mg/kg); the highest PCP concentrations in soil in grid N-H was 2,400 µg/kg (equal to 2.4 mg/kg) (Exhibit 3). However, a groundwater solute plume of PCP, as defined by the 1 µg/L isoconcentration line is not present downgradient of these sample locations, and the concentration of PCP in five downgradient wells has consistently been less than 1µg/L (Exhibit 3) suggesting concentrations of up to 2.5 mg/kg in soil do not affect the concentration of PCP in groundwater.

Summary:

PCP-contaminated soil on the north side of the MPTP site exhibiting concentrations of up to 2.5 mg/kg is not associated with PCP in groundwater at concentrations equal to or greater than 1 µg/L. This line of evidence supports a PCP soil cleanup level as low as 2.5 mg/kg that would be protective of groundwater.

Line of Evidence #3 – Empirical Site Evidence – NCRT Data

The MPTP site provides empirical data to assess potential PCP impacts to groundwater from remaining PCP impacts in surface soils, as described below.

LTU soils were offloaded on the northern part of the Site in 1999, covering most of the area between the near highway recovery trench (NHRT) and the NCRT as shown on Exhibit 4. Leaching of PCP from that offloaded soil would presumably affect most of the water discharging to the NCRT (in addition to any other continuing sources of PCP that would impact water collected at the NCRT, such as unexcavated soil east of the MPTP water treatment plant building upgradient of the NCRT).

The average concentration of PCP in soil offloaded from the LTU in 1999 was approximately 14 mg/kg, based on sampling performed at that time (Exhibit 4).

The concentration of PCP in water extracted at the NCRT declined in the years that immediately followed the offload (as a result of previous excavation at the site), and stabilized soon thereafter (by late 2002) at concentrations generally between 4 µg/L and 10 µg/L.

Scaling the offloaded soil concentration of 14 mg/kg by a factor of 10, and similarly scaling the observed concentrations at the NCRT, suggests PCP concentrations of 1.4 mg/kg in soil would likely alter PCP

concentrations in groundwater no more than approximately 0.4 µg/L to 1.0 µg/L (at or below the groundwater cleanup level of 1 µg/L).

Given that there are known continuing sources of PCP to groundwater collected at the NCRT other than leaching from offloaded soil, such as unexcavated soil near the water treatment plant building (upgradient of the NCRT), the calculations above are conservative and the impacts to groundwater caused by leaching from surficial soil would be expected to be less than the range of values presented above.

Summary: PCP concentrations of 1.4 mg/kg in soil would likely affect PCP concentrations in groundwater no more than approximately 0.4 µg/L to 1.0 µg/L (at or below the groundwater cleanup level of 1 µg/L). As described in the preceding paragraph, this range of values is conservative and the impacts to groundwater resulting from leaching from surficial soil are likely biased high (in other words, actual impacts are expected to be less than the calculated values).

Line of Evidence #4 – SPLP Results

The guidance document for the New Jersey Department of Environmental Protection (NJDEP) SPLP V3.1 spreadsheet model (NJDEP 2013) states:

> *"The SPLP is an EPA SW-846 test method that can be used with soil samples from a contaminated site to estimate the site-specific adsorption-desorption potential of a contaminant that may affect ground water. The SPLP procedure (SW-846 Method 1312) consists of a batch equilibrium experiment in which a contaminant is partitioned between soil solids and an extracting solution, using a 20:1 ratio of solution to solid. The resulting solution is known as the leachate. Method 1312 directs the user to compare contaminant concentrations in the SPLP leachate with "appropriate criteria" to determine whether the contaminated soil represents an unacceptable leaching threat.*"

The NJDEP SPLP V3.1 spreadsheet model (NJDEP 2013) was used to estimate a soil cleanup level for the MPTP site that may be protective of groundwater in hydrologic and hydrogeologic conditions similar to those found in New Jersey (Exhibit 5). Application of, and results from, the NJDEP SPLP spreadsheet model at the MPTP site are considered conservative from the perspective of protecting human health and the environment, because the NJDEP SPLP methodology was developed for an area that receives 46 inches of precipitation per year compared with about 12.75 inches of precipitation per year at the MPTP site. A higher degree of leaching would occur in a wetter environment (New Jersey) compared with a drier environment (Butte, Montana). However, the NJDEP SPLP spreadsheet model was applied in this line of evidence because it is readily available, in the public domain, easy to apply, provides consistent

and reproducible (albeit conservative) results, and because a comparable model does not currently exist for the State of Montana.

Before the NJDEP SPLP spreadsheet model was run, a total of 17 soil samples from the north and south areas of the MPTP site were collected on a random basis and then analyzed for PCP in soil and the required SPLP parameters. The lithology of the soil samples was characteristically silty sand, clayey sand, and gravelly sand. Complete results from these analyses are provided in the Final Soil and Surface Water Data Gap Investigation Report (Tetra Tech 2017).

The NJDEP SPLP spreadsheet model was then applied using a calculated dilution-attenuation factor (DAF) (equal to 20) and default NJDEP chemical-specific values for PCP, including the NJDEP spreadsheet default values for water solubility (1.95E+03 milligrams per liter [mg/L]) and Henry's Law constant (1.00E-06 [dimensionless]). The health-based groundwater quality criterion (GWQC) for the SPLP spreadsheet model was set to the MPTP ROD groundwater cleanup level (1.0 µg/L). The NJDEP spreadsheet model yields a conservative "SPLP soil remediation standard" of 0.56 mg/kg (Exhibit 5) using MPTP site data. However, Tetra Tech (2017) established that a more reasonable value might be closer to 2.2 mg/kg considering the MPTP site-specific DAF is closer to 79, about 4 times greater than the default model DAF of 20 (Tetra Tech 2017).

Summary: The NJDEP SPLP spreadsheet model calculated a conservative soil cleanup level (0.56 mg/kg) that would be protective of groundwater; however, a reasonable range could be 0.56 mg/kg to 2.2 mg/kg taking into account a site-specific DAF (79), the low rate of infiltration, and the large volume of dilution available in the aquifer.

Line of Evidence #5 – Mixing Model

A mixing model written in Excel 2016 was used to calculate the minimum, median, and maximum incremental impacts to groundwater caused by leaching from offloaded treated soils in the Final Soil and Surface Water Data Gap Investigation Report (Exhibit 6) (see Tetra Tech 2017 for details). Estimates were based on measured concentrations of PCP in unfiltered leachate from the outlet of the LTU, the amount of precipitation expected to infiltrate through the soil horizons (including the offloaded soils), the physical properties of the vadose zone and aquifer, and the estimated groundwater flux associated with the offload area south of Interstate 15/90.

Concentrations of PCP in LTU leachate are based on unfiltered samples collected from the LTU discharge before it enters the LTU pond for the 2011 to 2017 period of record. PCP concentrations in the undiluted, unfiltered leachate from the outlet of the LTU range from approximately 20 µg/L to 4,350 µg/L (Exhibit 6). The concentration of PCP in LTU soils ranged from 14 to 34 mg/kg during this same time

period (Tetra Tech 2015). The higher value is associated with a very large storm event (similar to a 100-year event) that likely flushed contaminated material out of the LTU discharge system and into the leachate which was sampled. Data collected during the large storm event in 2011 are clearly biased-high, but were nonetheless included for completeness. Details related to all calculations and assumptions are provided in the final data gap report (Tetra Tech 2017) and are also summarized in Exhibit 3. Key findings are summarized below:

Estimated Range of Impacts - Leaching of PCP in Offloaded Soil to Groundwater

Incremental Impact to Groundwater	Concentration (µg/L)
Minimum	0.25
Median	25
Maximum	55*

Note:
* Value is biased high due to datum associated with large flood event in 2011.

Summary: The estimated incremental impact of mixing LTU leachate with subjacent groundwater ranges between 0.25 µg/L and 55 µg/L; however, the maximum value is likely biased high because the sample was collected during a large storm event.

3.0 Summary of Lines of Evidence

The five lines of evidence detailed above are summarized in the table below:

Line of Evidence Number	Type of Analysis	Range of PCP in Soil (mg/kg)	Range of PCP in Leachate (µg/L)	Range of PCP in Groundwater (µg/L)	Range of Possible Soil Cleanup Levels Protective of Groundwater Based on this Line of Evidence (mg/kg)
#1	Empirical – site monitoring Well Data	20.0 to 38.0	NA	Generally less than 1.0	Less than 20.0
#2	Empirical – north side soil data	2.4 to 2.5	NA	Generally less than 1.0	Less than 2.5
#3	Empirical – NCRT data	14.0	NA	4.0 to 10 $^{\Phi}$	1.4$^{\Phi}$
#4	SPLP results	0.054 to 38.0	0.24 to 2,800	NA	0.56 to 2.2
#5	Mixing model – site data	14.0 to 26.9	20 to 4,350*	0.25 to 55*	14.0 to 26.9

Notes:
NA Not applicable

Notes: (Continued)
* Value is biased high due to datum associated with large flood event in 2011
Φ Value is biased low due to impacts to NCRT from known continuing sources near the water treatment plant.

4.0 Recommendation

Based on the presented lines of evidence, data provided in the summary table above, and best professional judgement, a PCP soil cleanup level equal to 2.0 mg/kg is recommended for PCP-contaminated soil outside of the LTU offload footprint. The weight of existing lines of evidence suggest that leaching of soil exhibiting concentrations of PCP equal to or less than 2.0 mg/kg would not result in subjacent groundwater exceeding the ROD 1 µg/L groundwater cleanup level. The foundation for this recommendation is built on these observations:

- Monitoring wells located immediately downgradient of the 2005 and 2007 offloads have generally exhibited concentrations of PCP in groundwater less than 1 µg/L, even though the concentrations of PCP in offloaded soil are generally greater than 20 mg/kg.
- An area of north-side soils exhibiting up to 2.5 mg/kg does not impact the concentration of PCP in groundwater above the 1 µg/L ROD groundwater cleanup level; a plume of PCP greater than 1 µg/L is not present downgradient of this area.
- The average concentration of PCP in soil offloaded from the LTU in 1999 and placed upgradient of the NCRT was approximately 14 mg/kg. However, concentrations in groundwater collected at the NCRT suggest PCP concentrations of 1.4 mg/kg in soil would likely alter PCP concentrations in groundwater no more than approximately 0.4 µg/L to 1.0 µg/L. These values are conservative given there is unexcavated PCP-contaminated soil near the water treatment plant building (upgradient of the NCRT).
- NJDEP DEP SPLP results (DAF equal to 20) provide a conservatively low soil cleanup level (0.56 mg/kg), but local factors at this site in Montana (such as much lower annual precipitation and recharge, relatively high groundwater flux, and a DAF equal to 79) would suggest that a soil cleanup value closer to 2.2 mg/kg might be appropriate.

5.0 References

Montana Department of Environmental Quality (DEQ). 2018. Memorandum from Aimee Reynolds to David Bowers. Montana Pole Direct Contact Cleanup Level 5-Year Review. April 25.

New Jersey Department of Environmental Protection (NJDEP). 2013. Guidance Document — Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Synthetic Precipitation Leaching Procedure, Version 3.0, November.

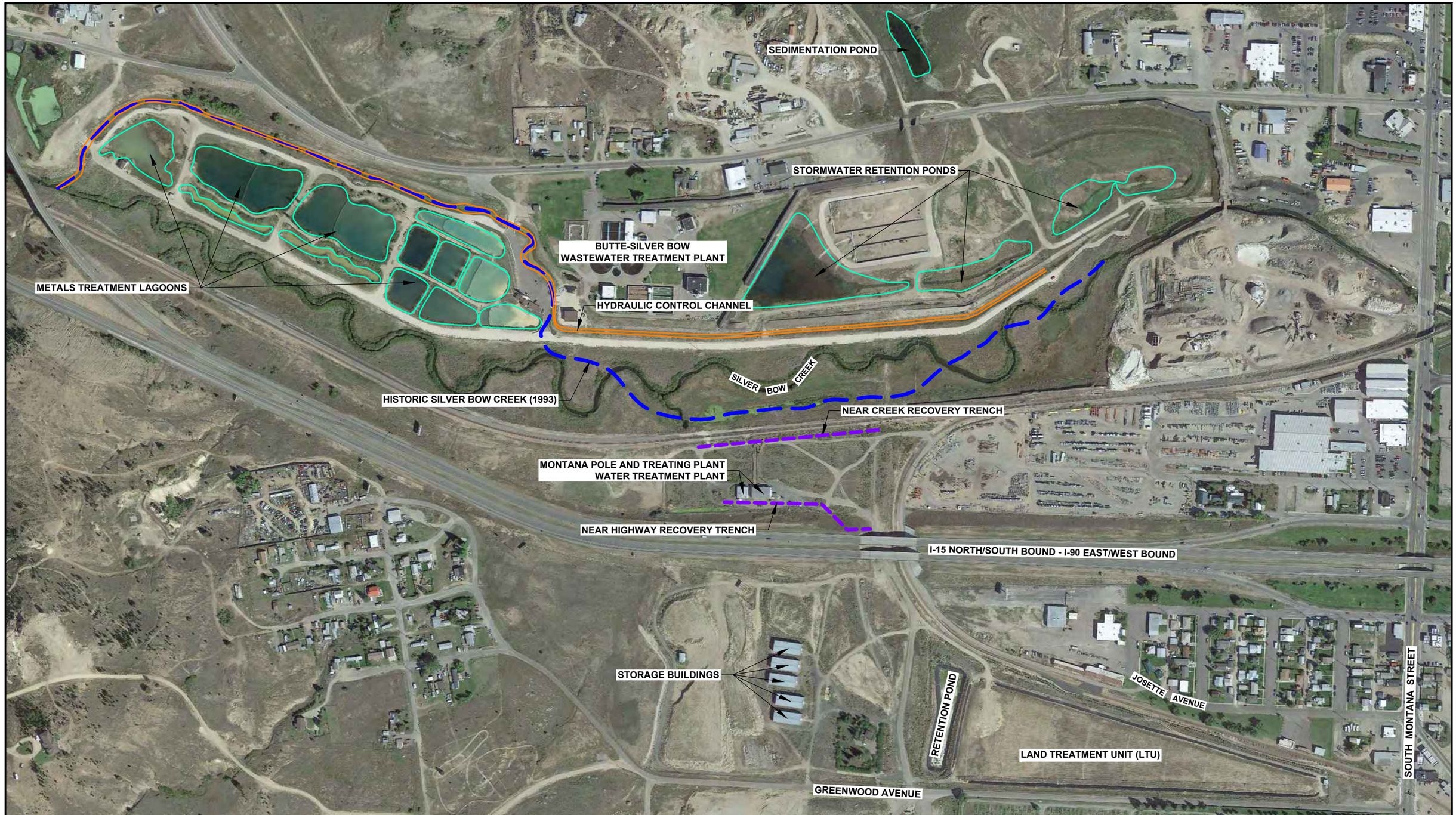
Tetra Tech, Inc. [EMI Unit] (Tetra Tech). 2015. Draft Memorandum, Montana Pole and Treating Plant (MPTP) Land Treatment Unit (LTU) Offload Summary. April 16.

Tetra Tech. 2017. Final Soil and Surface Water Data Gap Investigation Report. November.

Tetra Tech. 2018. Draft 2017 Annual Sampling and Monitoring Report for the Montana Pole and Treating Plant Butte-Silver Bow, Montana. Revision 0.

EXHIBITS

EXHIBIT 1



AERIAL IMAGERY SOURCE: GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

200 0 200 400

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

EXHIBIT 1
SITE MAP

TETRA TECH

Exhibit 1_Site Map.dwg - DWH - 04/24/2018

EXHIBIT 2

ACTIVE BNSF RAILROAD LINE

NEAR CREEK RECOVERY TRENCH

ENTRY GATE

1000

WATER TREATMENT PLANT

GATE

NEAR HIGHWAY RECOVERY TRENCH

I-15 SOUTH BOUND / I-90 WEST BOUND

I-15 NORTH BOUND / I-90 EAST BOUND

100

10

1

PCP GENERALLY LESS THAN 1 µg/L

M PCP ALWAYS LESS THAN 1 µg/L

M A PCP GENERALLY LESS THAN 1 µg/L

GATE

ACTIVE BNSF RAILROAD LINE

VAULT

PCP ASSUMED 20 mg/kg TO 38 mg/kg AVERAGE = 26 mg/kg (OFFLOADED SOIL)

PCP = 38 mg/kg (OFFLOADED SOIL)

PCP = 25 mg/kg TO 32 mg/kg (OFFLOADED SOIL)

GATE

STORAGE BUILDING 5

STORAGE BUILDING 4

STORAGE BUILDING 3

STORAGE BUILDING 2

STORAGE BUILDING 1

BLOWER BUILDING

SOIL BORROW STORAGE AREA

AULT

?

DECONTAMINATION PAD/HYDRANT

PREVIOUS OAAS RESIDENCE

RETENTION POND

LAND TREATMENT UNIT (LTU)

LTU NUTRIENT FEED BUILDING

GREENWOOD AVENUE

GATE

LEGEND

- MONITORING WELL
- PCP ISOCONTOUR (FEBRUARY 2017) - DASHED WHERE INFERRED ? WHERE UNKNOWN (µg/L)
- OFFLOAD AREA AND YEAR (APPROXIMATE LOCATION)
- µg/L MICROGRAMS PER LITER
- mg/kg MILLIGRAMS PER KILOGRAM
- PCP PENTACHLOROPHENOL

N

100 0 100 200

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

EXHIBIT 2
2005 / 2007 OFFLOAD AND MONITORING WELL DATA

TETRA TECH

Exhibit 2_2005 and 2007 Offload and Mon Well Data.dwg - DWH - 05/23/2018

EXHIBIT 3



LEGEND

- SAMPLING GRID
- PCP ISOCONTOUR (µg/L - FEBRUARY 2017)
- MONITORING WELL (DATA FROM FEBRUARY 2017) (RESULTS IN MICROGRAMS PER LITER (µg/L))
- INTERPRETED DIRECTION OF GROUNDWATER FLOW; OTHER INTERPRETATIONS ARE POSSIBLE
- SOIL BORING SAMPLE LOCATION - DEPTH = 5-10' (RESULTS IN MICROGRAMS PER KILOGRAM (µg/kg))
- J — ESTIMATED VALUE
- U — ANALYZED FOR BUT NOT DETECTED ABOVE THE METHOD DETECTION LIMIT
- 2,400 — SOIL SAMPLES GREATER THAN 2,000 µg/kg (2 mg/kg)

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

35 0 35 70

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

EXHIBIT 3
NORTH-SIDE SUBSURFACE SOIL (5-10 FEET) AND MONITORING WELL DATA

TETRA TECH

Exhibit 3_North Subsurface and Mon Well Data.dwg - DWH - 05/23/2018

EXHIBIT 4

ACTIVE BNSF RAILROAD LINE

NEAR CREEK RECOVERY TRENCH

ENTRY GATE

PCP = 14 mg/kg
OFFLOADED SOIL

CONCENTRATION OF PCP IN GROUNDWATER EXTRACTED FROM THE NEAR CREEK RECOVERY TRENCH AFTER 2002 RANGED FROM 4 µg/L TO 10 µg/L

WATER TREATMENT PLANT

GATE

NEAR HIGHWAY RECOVERY TRENCH

I-15 SOUTH BOUND / I-90 WEST BOUND

I-15 NORTH BOUND / I-90 EAST BOUND

GATE

ACTIVE BNSF RAILROAD LINE

VAULT

BLOWER BUILDING

STORAGE BUILDING 5

STORAGE BUILDING 4

STORAGE BUILDING 3

STORAGE BUILDING 2

STORAGE BUILDING 1

SOIL BORROW STORAGE AREA

DECONTAMINATION PAD/HYDRANT

VAULT

GATE

RETENTION POND

ABANDONED OAAS RESIDENCE

LAND TREATMENT UNIT (LTU)

LTU NUTRIENT FEED BUILDING

GREENWOOD AVENUE

GATE

LEGEND

- OFFLOAD AREA AND YEAR (APPROXIMATE LOCATION)
- APPROXIMATE CONCEPTUAL FUTURE OFFLOAD AREA
- APPROXIMATE LOCATION OF SUBSURFACE SOIL CONTAMINATION - PCP RANGES FROM 8.9 mg/kg TO 38.0 mg/kg

µg/L MICROGRAMS PER LITER

mg/kg MILLIGRAMS PER KILOGRAM

PCP PENTACHLOROPHENOL

N

100 0 100 200

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

EXHIBIT 4
1999 OFFLOAD AND
NEAR CREEK RECOVERY TRENCH

TETRA TECH

Exhibit 4_1999 Offload and NCRT.dwg - DWH - 05/01/2018

EXHIBIT 5

NJDEP SPLP Spreadsheet, V3.1, November 2013

Case name/area of concern:	PCP Soil Remediation Level Protective of Groundwater
Case number:	
Sampling date:	5/31/2017

CALCULATE SITE SPECIFIC IGW STANDARD | Reset Spreadsheet | Print Results | Instructions | Print to file | Exit

Contaminant:	Pentachlorophenol	
CAS No:	87-86-5	enter NA if inorganic
Water solubility (mg/L)	1.95E+03	
Aqueous reporting limit (µg/L):	7.70E+00	if unavailable, enter a value below lowest concentration measured
Soil reporting limit (mg/kg):	8.00E-02	
Health-based GWQC (µg/L)	1.00E+00	
DAF (20, or site-specific if approved):	20	
Leachate Criterion (µg/L):	2.00E+01	
Henry's law constant (dimensionless):	1.00E-06	enter 0 if inorganic

NOTE:
USE ONE PAGE PER CONTAMINANT, do not leave empty rows between samples
Do not enter samples with soil concentrations at or below the reporting limit.
When leachate concentration is non-detect, enter the aqueous reporting limit
Enter site-specific dilution-attenuation factor (DAF) if desired

Data entry cells (do not skip rows)
Optional data entry
Calculated or locked cells
Indicates that Alternative Remediation Standard needs to be recalculated

Sample ID	Soil sample weight (kg)	Leachate Volume (L)	Total Soil Concentration (mg/kg)	SPLP Leachate Concentration (µg/L)	Final pH of Leachate (except VOCs)	Optional data				Kd (L/kg)	% Contaminant in Leachate	Field leachate concentration (µg/L)	Pass or fail?
						Sampling Depth (ft)	Soil Type	Organic Carbon (mg/kg)	Organic Carbon (%)				
A-3-10	0.1	2	0.083	0.24	9.5	10		300	30	325.8	5.78	0.24	PASS
A-1-10	0.1	2	0.086	0.24	9.4	10		1230	123	338.3	5.58	0.24	PASS
J-1-10	0.1	2	0.054	0.27	9.12	10		6310	631	180.0	10.00	0.27	PASS
N-Y-1-10	0.1	2	0.56	3.1	8.79	10		28800	2880	160.6	11.07	3.10	PASS
N-X-1-10	0.1	2	0.23	5.7	9.35	10		1370	137	20.4	49.57	5.70	PASS
F-1-10	0.1	2	0.33	5.8	9.39	10		2240	224	36.9	35.15	5.80	PASS
N-U-1-10	0.1	2	0.48	6	9.41	10		1170	117	60.0	25.00	6.00	PASS
N-O-1-10	0.1	2	0.36	9.4	9.32	10		2850	285	18.3	52.22	19.51	PASS
N-C-2-10	0.1	2	1.1	37	8.6	10		14000	1400	9.7	67.27	111.30	FAIL
N-G-4-10	0.1	2	2.5	73	8.58	10		4650	465	14.2	58.40	173.61	FAIL
N-H-3-10	0.1	2	2.4	88	9.18	10		3070	307	7.3	73.33	323.19	FAIL
N-R-1-12	0.1	2	7.5	300	9.15	11.5		3010	301	5.0	80.00	1455.37	FAIL
N-S-1-12	0.1	2	2.5	260	9.25	11.5		3700	370	0.0	208.00	16293.71	FAIL
N-N-2-12	0.1	2	10	930	9.83	11.5		926	92.6	0.0	186.00	65174.83	FAIL
N-Q-2-12	0.1	2	29	2400	9.37	11.5		5430	543	0.0	165.52	189007.02	FAIL
N-P-1-10	0.1	2	34	3000	9.59	10		3030	303	0.0	176.47	221594.44	FAIL
N-T-1-10	0.1	2	38	2800	9.51	10		955	95.5	0.0	147.37	247664.37	FAIL

SPLP RESULTS for

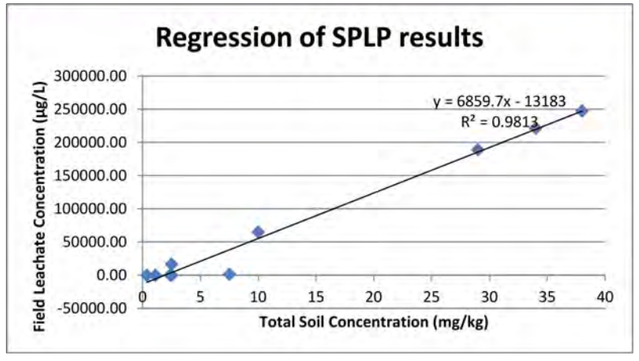
OPTION 1a: All adjusted leachate concentrations are below the leachate criterion
OPTION 1a NOT VALID

OPTION 1b: Simple inspection of tabulated results to find highest acceptable standard

REMEDIATION STANDARD = 0.56 mg/kg

OPTION 2: Remediation standard using site-specific Kd value
Kd ratio = 3383333.33, USE MINIMUM Kd
Kd USED FOR CALCULATING STANDARD = . L/kg
result before rounding = 0.0031 mg/kg
REMEDIATION STANDARD = 0.08 mg/kg (controlled by soil PQL)

OPTION 3: Remediation standard using linear regression
Number of points = 10
(points were eliminated because leachate concentrations were not above the aqueous reporting limit)
Soil concentration midrange = 19.18
Number of points above midrange = 3
Enough points above midrange? NO
R-Square high enough? YES
Leachate criterion within range of leachate concentrations? YES
OPTION 3 NOT VALID



Montana Pole and Treating Plant
Butte-Silver Bow Montana

EXHIBIT 5
SPLP RESULTS

TETRA TECH

EXHIBIT 6

CALCULATIONS

Conversions		
Convert micrograms to pounds	2.2046E-09	
convert cubic feet to liters	28.316	
Recharge Calculation		
Recharge = Area *Groundwater Recharge Rate		
	30,959	cubic feet per year
	876,635	Liters per year
Mass of PCP Leached Calculation		
Mass of PCP leached per year from south offloaded soil = leachate concentration * volume of recharge		
Minimum mass of PCP leached per year		
	17,532,701	micrograms per year
	0.04	pounds per year
Median mass of PCP leached per year		
	1,753,270,088	micrograms per year
	3.87	pounds per year
Maximum mass of PCP leached per year		
	3,813,362,441	micrograms per year
	8.41	pounds per year
Groundwater Flux per Year Calculation		
Flux = hydraulic conductivity * gradient * area perpendicular to groundwater flow		
	6,718	cubic feet per day
	2,452,110	cubic feet per year
	69,433,949	liters per year
Dilution Attenuation Factor Calculation		
Volume of clean groundwater divided by volume of contaminated groundwater from recharge		
	79	unit less
Groundwater Impact from Leachate Calculation		
Concentration of PCP in leachate divided by the dilution attenuation factor		
minimum impact	0.25	micrograms per liter
median impact	25.3	micrograms per liter
maximum impact	54.9	micrograms per liter

CONCENTRATIONS OF PCP IN LTU LEACHATE - 2011 TO 2017

Station ID	Sample ID	Sample Date	Chemical	Concentration	Units
LTUDIS	LTUDIS050211	5/2/2011	PENTACHLOROPHENOL	4,350	UG/L
LTUDIS	LTUDIS061311	6/13/2011	PENTACHLOROPHENOL	3,261	UG/L
LTUDIS	LTUDIS081312	8/13/2012	PENTACHLOROPHENOL	25.6	UG/L
LTUDIS	LTUDIS081213	8/12/2013	PENTACHLOROPHENOL	679	UG/L
LTUDIS	LTUDIS081114	8/11/2014	PENTACHLOROPHENOL	149	UG/L
LTUDIS	LTUDIS081015	8/10/2015	PENTACHLOROPHENOL	61.4	UG/L
LTUDIS	LTUDIS050216	5/2/2016	PENTACHLOROPHENOL	975	UG/L
LTUDIS	LTUDIS080816	8/8/2016	PENTACHLOROPHENOL	16.7	UG/L
LTUDIS	LTUDIS080816	8/8/2016	PENTACHLOROPHENOL	17.4	UG/L
LTUDIS	LTUDIS080317	8/3/2017	PENTACHLOROPHENOL	21.6	UG/L

ASSUMPTIONS

Input	Value	Unit	Source
Precipitation	12	inches per year	This value is based on the 30-year period of record from 1981 to 2010 (www.usclimatedata.com).
Precipitation	1	foot per year	
Area of previously offloaded soil south of Interstate 15/90	`	square feet	Calculated from offloaded areas shown in Figure 1B. Assume an approximately square shape for calculating the area perpendicular to groundwater flow. This shape yields a conservative estimate of the clean groundwater flowing into the south area.
Aquifer thickness	22	feet	Average site value based on remedial investigation report (Atalantic Richfield Company [ARCO] 1993; page 1-23).
Groundwater Recharge (assume 10 percent)	1	inch per year	Assumed value based upon professional judgement and physical properties of site.
Groundwater Recharge (assume 10 percent)	0.083	foot per year	
Hydraulic conductivity	100	feet per day	Value based upon various sources and the remedial investigation (ARCO 1993), see attachment 2 in Tetra Tech 2016a for a full discussion on the rationale.
Hydraulic gradient	0.005	unit less	Value based upon remedial investigation (ARCO 1993; pages 3-12) and annual monitoring (Tetra Tech 2016b).
Leachate concentration (minimum)	20	micrograms per liter	Approximate minimum concentration of PCP measured in retention pond discharge. Concentration on 8/3/2017 was 21.6 micrograms per liter.
Leachate concentration (median)	2,000	micrograms per liter	Approximate median concentration of PCP measured in retention pond discharge. Calculated as the median from the minimum and maximum concentrations.
Leachate concentration (maximum)	4,350	micrograms per liter	Approximate maximum concentration of PCP measured in retention pond discharge. Concentration on 5/2/2011 was 4,350 micrograms per liter.
Minimum Mass of PCP under Interstate 15/90	6,700	pounds	Tetra Tech 2013. Feasibility Level Analysis for In Situ Treatment Beneath Interstate 15/90. Page 4.
Median Mass of PCP under Interstate 15/90	10,000	pounds	Tetra Tech 2013. Feasibility Level Analysis for In Situ Treatment Beneath Interstate 15/90. Page 4.
Maximum Mass of PCP under Interstate 15/90	13,400	pounds	Tetra Tech 2013. Feasibility Level Analysis for In Situ Treatment Beneath Interstate 15/90. Page 4.

Montana Pole and Treating Plant
Butte-Silver Bow Montana

EXHIBIT 6
MIXING MODEL

TETRA TECH

ATTACHMENT D

Identification of Additional ARARs

ATTACHMENT D

IDENTIFICATION OF ADDITIONAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

1.0 INTRODUCTION

The September 1993 Record of Decision (ROD) for the Montana Pole and Treating Plant (MPTP) site presented federal and state Applicable or Relevant and Appropriate Requirements (ARARs) that were identified for the selected remedial action for the site at the time. Those ARARs are incorporated into this Explanation of Significant Differences (ESD) by reference, and remain in effect for the remedy. Pursuant to 40 Code of Federal Regulations (CFR) §300.430(f)(1)(ii)(B)(2), and in accordance with the footnote on page 7-2 in the July 1999 EPA guidance entitled "A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents," ARARs for an ESD are only identified for new components of the remedy, which must be discussed and met or waived. Accordingly, only ARARs that are pertinent to the five significant changes proposed by this ESD are presented in this section. For purposes of clarity, it should be noted that the Environmental Quality Section of the Administrative Rules of Montana (ARM) has been re-codified since the 1993 ROD and changed from Title 16 to Title 17.

The revised remedy identified in this ESD for the MPTP meets all ARARs.

1.1 ARARs Overview

Under § 121(d)(2)(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), on-site remedial actions must attain a level or standard of control that achieves any standard, requirement, criterion, or limitation under any federal environmental law determined to be legally applicable or relevant and appropriate, including, but not limited to: the Resource Conservation and Recovery Act (RCRA); the Toxic Substances Control Act (TSCA); the Safe Drinking Water Act (SDWA); the Clean Air Act (CAA); the Clean Water Act (CWA); the Marine Protection, Research, and Sanctuaries Act; and the Solid Waste Disposal Act. The modified remedy for MPTP satisfies the requirements of CERCLA § 121.

CERCLA Section 121(e) states that no federal, state, or local permit will be required for any portion of any remedial action conducted entirely on site. "On site" is defined as the areal extent of contamination and all suitable areas in close proximity to the contamination necessary for implementation of the response action. This exemption applies only to the administrative requirements of the permit. On-site actions must still

comply with the substantive requirements that permits enforce. Substantive requirements pertain directly to actions or conditions in the environment.

An ARAR can be either applicable or relevant and appropriate to a remedial action. Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law. These requirements specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a site.

Relevant and appropriate requirements are cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that are not applicable to circumstances at a site, but do address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site.

Identified ARARs are divided into the following three categories as defined in EPA's Remedial Investigation/Feasibility Study (RI/FS) guidance (EPA 1988a):

- Chemical-specific requirements
- Action-specific requirements
- Location-specific requirements.

Chemical-specific ARARs are usually health- or risk-based requirements, often expressed as numerical values that, when applied to site-specific conditions, establish the acceptable amount of a chemical that can be detected in or discharged to the ambient environment. Action-specific ARARs are usually technology- or activity-based requirements triggered by the remedial activities selected to accomplish a remedy, such as capping, air stripping, or other remedies. Location-specific ARARs are requirements that place restrictions on either the concentrations of hazardous substances or on the conduct of activities solely because activities are in specific locations (such as wetlands, floodplains, historic places, and other locations).

1.2 Identification of Additional ARARs

Administrative Rules of Montana (ARM) Rule 17.53.801 adopts the federal hazardous waste treatment, storage and disposal regulations set out in 40 CFR 264. 40 CFR § 264.552 establishes action-based requirements for Corrective Action Management Units (CAMU). The regulations are intended for remedy implementation for hazardous waste management sites, and as identified below are applicable to the dioxin in soils at MPTP.

40 CFR § 264.552(a) (applicable) allows for the designation of a corrective management unit for managing CAMU-eligible wastes for cleanup implementation where the CAMU is located within the contiguous property at a facility.

40 CFR § 264.552(a)(3) (applicable) prohibits placement of liquids in CAMUs.

40 CFR § 264.552(c) (applicable) sets out CAMU requirements. Subsection 552(c)(2) specifies that waste management activities associated with the CAMU cannot create unacceptable risks to humans or the environment resulting from exposure to hazardous wastes or hazardous constituents. Subsection 552(c)(4) requires waste remaining in place after closure to be managed and contained to minimize future releases to the extent practicable. Subsection 552(c)(7) requires that the CAMU will minimize the land area upon which wastes remain in place after CAMU closure.

40 CFR § 264.552(e) (applicable) requires that a permit or order (in this case the MPTP decision documents) include specific requirements for the CAMU. Subsection 552(e)(3)(ii) allows alternative requirements for CAMU units if the alternate design prevents migration of hazardous constituents to ground or surface water at least as effectively as liner and leachate collection systems, considering location characteristics and design and operating practices. Subsection 264.552(e)(4) requires CAMU-eligible wastes and principal hazardous constituents in that waste meet specific treatment standards. Subsection 264.552(e)(5) requires ongoing groundwater monitoring that will detect releases of hazardous constituents and, if necessary, corrective action. Subsection 264.552(e)(6) requires that CAMU closure minimizes the need for further maintenance and prevents escape of dangerous constituents. Subsection 264.552(e)(6)(iv) requires that the cap for final closure must meet performance criteria including: minimization of migration of liquids through the closed unit, minimum maintenance and erosion, promotion of drainage, accommodation of settling and subsidence, and permeability less than or equal to underlying natural subsoils. Subsection 264.552(e)(6)(v) requires post-closure monitoring and maintenance to ensure cap and final cover integrity.

ATTACHMENT E

Corrective Action Management Unit Justification

DESIGNATION OF A CORRECTIVE ACTION MANAGEMENT UNIT
Montana Pole Treating Plant, Butte, Montana
EPA ID No. MTD986073583

Date: April 5, 2019

Summary

The Montana Department of Environmental Quality (DEQ) is designating an approximately 9-acre portion of the Montana Pole and Treating Plant site (Montana Pole site) as a Corrective Action Management Unit (CAMU), in accordance with 40 CFR §264.552 as incorporated by reference in ARM 17.53.801.

Regulatory Background

The Resource Conservation and Recovery Act (RCRA), a federal statute, governs the identification, generation, transportation, treatment, storage and disposal of hazardous waste, and environmental cleanup at certain regulated facilities. The Montana Hazardous Waste Act (MHWA) grants authority to DEQ to adopt and administer a hazardous waste program pursuant to RCRA. DEQ is authorized by EPA under RCRA as the lead agency for the hazardous waste program. The Administrative Rules of Montana (ARM) Title 17, Chapter 53 incorporates by reference the relevant federal hazardous waste management standards found at 40 CFR Parts 260 through 279.

The main goal of RCRA and the MHWA is to prevent the release of hazardous waste and constituents through appropriate management and disposal, and to minimize the generation of process-related hazardous waste while promoting recycling and reuse. During a Superfund cleanup of contaminated sites, RCRA and MHWA substantive regulations also apply to cleanup waste and contaminated media that meet the regulatory definition of hazardous waste when those regulations are identified in a Superfund decision document.

Corrective Action Management Units (CAMUs) are special units created to facilitate treatment, storage, and disposal of hazardous wastes managed during cleanup, and to remove the disincentives to cleanup that hazardous waste regulations can sometimes impose. A CAMU is used only for managing CAMU-eligible wastes as part of implementing corrective action or cleanup at a facility. A CAMU must be located within the contiguous property where wastes to be managed in the CAMU originated.

A CAMU is designated by EPA or a state authorized to implement a RCRA-equivalent hazardous waste program (in this case Montana DEQ). The CAMU designation for the Montana Pole site is based upon an analysis of whether the Montana Pole Site CAMU and CAMU-eligible wastes meet the requirements set out in 40 CFR § 264.552 as incorporated by reference in ARM 17.53.801. DEQ's CAMU analysis is discussed in detail below. For ease of reading, where the federal rule under the CFR is incorporated by reference into ARM, only the federal citation is used in this document.

Regulatory Evaluation

Per 40 CFR § 264.552 as incorporated by reference in ARM 17.53.801, the DEQ Director shall designate a CAMU after an analysis of, and in accordance with the following:

1. 40 CFR § 264.552(a) states that the CAMU must be located within the contiguous property under the control of the owner or operator where the wastes to be managed in the CAMU originated.

The CAMU is located within the contiguous property where the F032 wastes to be managed originated. The contaminated soils were treated in a land treatment unit (LTU) within the contiguous property. The treated soils were off-loaded from the LTU back into the area where the waste was originally excavated, also within the contiguous property. DEQ, as lead agency, controls the property currently.

2. 40 CFR § 264.552(a)(1) states that the wastes to be disposed of must be CAMU-eligible.

The treated F032 soil located within the Montana Pole site is a CAMU-eligible waste because it is a solid (i.e., non-liquid) hazardous remediation waste being managed as a part of cleanup. The treated soils are part of a remedial action and meet the treatment standards for waste placed in a CAMU.

3. 40 CFR § 264.552(a)(3) prohibits the placement of liquids in CAMUs.

The waste to be placed on the CAMU is soils containing F032 hazardous waste. No liquids are present in the soils.

4. 40 CFR § 264.552(c)(1) requires that the CAMU facilitate the implementation of a reliable, effective, protective and cost-effective remedy.

The EPA-approved remedy, as reflected in the proposed 2019 Explanation of Significant Difference and anticipated in the 1994 Record of Decision, for this treated F032 contaminated soil is to place it in an approved location. The consolidation of the treated F032 contaminated soil is a reliable, effective, protective and cost-effective remedy:

- The proposed final remedy reflected in the 2019 ESD includes covering and capping the treated F032 contaminated soil. This facilitates a reliable remedy element, since the designated section will be managed as a CAMU for perpetuity.
- The CAMU, with an engineered cover that will be incorporated into the final cover, will support the effective long-term management of the contaminated soil.
- Excavation of the soils will eliminate the potential exposure risk currently posed to human health in an industrial area and placement of the soils in the CAMU will further contribute to the protectiveness of human health and the environment because the material will be protectively managed under an engineered cover.

- The CAMU will support the cost-effectiveness of the selected remedy because of its proximity to the source of the contaminated soil (i.e., limited haul costs), and the avoidance of significant disposal costs at a permitted off-site disposal facility. The use of an engineered cover, when compared to hauling and disposing of over 200,000 cy of contaminated soil, is more cost effective.

5. 40 CFR § 264.552(c)(2) requires that waste management activities associated with the CAMU shall not create unacceptable risks to humans or to the environment from exposure to hazardous wastes or constituents.

The CAMU will not create unacceptable risks to humans or to the environment from exposure to hazardous wastes or constituents because the CAMU design includes a cover which will be engineered to: reduce storm water infiltration and subsequent leaching, and eliminate direct contact by environmental receptors. In addition, the proposed location of the CAMU is and will remain restricted from public use.

6. 40 CFR § 264.552(c)(3) states that a CAMU shall be placed at a contaminated area of the facility unless placement of a CAMU at an uncontaminated area of the facility is more protective.

The CAMU will be placed within the current footprint of the treated F032 contaminated soil, which is a contaminated area of the facility. This location is also the origin of the contaminated soils that were treated before placement back into the original source area.

7. 40 CFR § 264.552(c)(4) requires that areas of the CAMU where waste is to remain in place after the closure of the CAMU be managed and contained so as to minimize future releases, to the extent practicable.

The CAMU will be located on approximately 9 acres at the Montana Pole site. The engineered cover for the CAMU will be designed and managed by DEQ according to Montana hazardous waste requirements, which will minimize future releases. The CAMU monitoring and maintenance requirements will be incorporated into the Operation and Maintenance Plan (O&M Plan) for the Facility.

8. 40 CFR § 264.552(c)(5) requires that the CAMU will expedite the timing of remedial activity implementation, when appropriate and practicable.

The designation of a CAMU will expedite the timing of Phase 4 and Phase 6 in the Montana Pole Record of Decision (ROD) remedial activity implementation as the final off-load of treated F032 contaminated soil is available immediately and easily accessible. If a CAMU is not designated, this remedial activity will be delayed until a comparable, cost-effective and equally protective waste disposal option is identified which could take considerable time.

9. 40 CFR § 264.552(c)(7) states that the CAMU shall, to the extent practicable, minimize the land areas of the facility upon which wastes will remain in place after the closure of the CAMU.

The CAMU will minimize the land areas of the facility upon which wastes will remain in place after the closure of the CAMU. Consolidation of the contaminated soil will amount to a 9-acre area within the footprint of the 36-acre southern portion of the Montana Pole site.

10. 40 CFR § 264.552(d) requires that sufficient information be provided to the DEQ Director:

a. on the origin of the waste and how it was subsequently managed.

The pole plant treated wood for industrial uses, such as telephone poles, bridge timbers and mine structures. For most of the plant's lifetime, pentachlorophenol (PCP) mixed with petroleum oil was added to the wood products to slow decay. Plant activities and practices led to the uncontrolled release of the treatment materials. Per the ROD, the contaminated soil found at the site was treated through biological land treatment in the on-site LTU and lifts of the treated soils were off-loaded from the LTU back into the original excavation areas.

b. on whether the waste was listed or identified as hazardous at the time of disposal and/or release.

EPA listed wood preserving wastes as hazardous waste on December 6, 1990. Contaminated soil at Montana Pole is the result of releases from wood treating operations that ran from 1946 to 1984. Releases from wood treating operations at Montana Pole are not considered a hazardous waste because the releases occurred prior to designation of the F032 listing. However, the F032 hazardous waste listing does apply to soils contaminated with wood treating wastes that were, or are, being actively managed and disposed during remedial activities after the date of the listing designation.

c. on whether the disposal and/or release of the waste occurred before or after the land disposal restrictions of 40 CFR Part 268 were in effect for the waste listing or characteristic.

The effective date for land disposal restrictions for F032 was May 12, 1999 (40 CFR 268.30(b)). Releases of wood treating wastes at Montana Pole occurred prior to the effective date for F032. Active management and disposal of soils containing F032 have and will occur after the effect date for land disposal restrictions of F032 wastes.

11. 40 CFR § 264.552(e)(1) states that the areal configuration of the CAMU will be specified.

The CAMU placement is expected to be over an area that is approximately 9 acres in size.

13. 40 CFR § 264.552(e)(2) states that CAMU-eligible waste management shall include the specification of applicable design, operation, treatment and closure requirements.

The design includes placement and compaction of the contaminated soil within the CAMU area (see Figure 1). Placement will be in maximum 8-inch loose lifts and compacted. The sides will not exceed a 1:4 slope. No treatment of contaminated soils will occur in the CAMU. The CAMU will be closed according to the closure requirements in 40 CFR § 264.552(e)(6) and an operation and maintenance (O&M) plan will define the requirements for corrective action during closure and post-closure of the CAMU. It is expected that CAMU cover requirements will be fully integrated into the final cover design, and maintained in accordance with the O&M plan.

14. 40 CFR § 264.552(e)(3)(ii)(B) states that alternative design requirements may be approved to include a design without a liner when the CAMU is to be established in an area with existing significant levels of contamination and if the design would still prevent contaminant migration from the unit that would exceed long-term remedial goals.

The groundwater at Montana Pole is part of a larger Controlled Groundwater Area (CGWA) in place for the Butte Alluvial and Bedrock Site Groundwater Closure Area. The CGWA was placed to meet the requirements of the Records of Decision or Consent Decrees for the Butte Priority Soils Operable Unit (BPSOU), Butte Mine Flooding Operable Unit (BMFOU) and Montana Pole Site. The PCP plume is a remnant of the historic operation and remains because of soils that were too deep for practical excavation. The removal and treatment of contaminated soils, combined with pump and treat by the water treatment plant, have resulted in reduced PCP concentrations in the groundwater, as well as a shrinking plume. Therefore, the design does not include a liner because the CGWA and shrinking plume are protective. Also, the engineered cover proposed for the final cap is designed to prevent the infiltration of surface water therefore reducing the potential of leaching to groundwater of F032 waste from the contaminated soil.

15. 40 CFR §264.552(e)(4) requires minimum treatment standards for CAMU-eligible wastes.

Treatment standards analysis:

(e)(4)(i): determination of principal hazardous constituents (PHCs)

The Montana Pole and Treating Plant Record of Decision (ROD) lists:

- PCP,
- polynuclear aromatic hydrocarbons (PAHs): anthracene; benzo(a)pyrene; benzo(a)anthracene; benzo(k)fluoranthene; benzo(b)fluoranthene; dibenzo(a,h)anthracene; indeno(1,2,3-c,d)pyrene; phenanthrene; chrysene; fluorene; naphthalene; pyrene; and
- dioxins (polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans), which include: tetrachlorodibenzo-p-dioxins; tetrachlorodibenzofurans; pentachlorodibenzo-p-dioxins; pentachlorodibenzofurans; hexachlorodibenzo-p-dioxins; hexachlorodibenzofurans

These contaminants are found in the waste materials found at the site, and identified in the ROD as listed hazardous waste (F032 and F034). The ROD also identifies the CAMU rule as applicable with regard to placement of treated waste, if treatment levels specified in the ROD cannot be met after treatment.

(e)(4)(ii): PHCs must include all constituents in the waste that would be subject to LDRs (basis of listing)

The treated soils that would be subject to treatment requirements per 40 CFR Part 268 and the Montana Pole ROD contain all of the F032 and F034 PHCs except the following listed contaminants:

Phenolic compounds other than PCP:

- 2-4-dimethyl phenol
- phenol
- 2,3,4,6-tetrachlorophenol
- 2,4,6 trichlorophenol

The group of phenolic compounds were sampled during the RI, and were screened out during the risk assessment process. These compounds were omitted because the maximum detections were all below the risk-based concentrations for the site. Therefore, these compounds were not sampled during soil treatment. Treated soil concentrations for these compounds are a data gap that will be addressed before proceeding with construction of the CAMU.

Metals:

- Arsenic
- chromium

In the ROD arsenic and chromium are identified as potentially being "material derived during extraction and beneficiation processes." Therefore, these metals may be "excluded from Subtitle C under the mining waste (Bevill) exclusion."

(e)(4)(iii) and (iv): treatment analysis of PHCs

The dioxins/furans and PAH PHCs in the treated soils meet the treatment standards determined in accordance with paragraph (e)(4)(iv)(A) and (C). All but one sample for pentachlorophenol PHCs in the treated soils meet the treatment standards determined in accordance with paragraph (e)(4)(iv)(A) and (C). All of the dioxins/furans F032 congeners and all of the F032 PAHs are less than 10 times the Universal Treatment Standard (UTS); 40 CFR § 264.552(e)(4)(iv)(A) and (C). For pentachlorophenol, 95% (95/100 samples) of the treated soil samples are less than 10 times the Universal Treatment Standard, 40 CFR § 264.552(e)(4)(iv)(C). The other five samples exceed the Alternative Treatment Standard (ATS; less than 10 times the UTS), but four of those samples were below the 90 percent reduction in total PHC concentrations. Attachment 1 contains tables for the analysis of each PHC.

(e)(4)(v): adjusted standards for those constituents that don't meet the treatment analysis of (e)(4)(iii) and (iv)

The 90 percent reduction target for PCP at Montana Pole is 151 mg/kg, and is based on the highest pentachlorophenol concentration found in surface or subsurface soil during the RI. The one PCP exceedance of the 90 percent target concentration was 159 mg/kg. This one sample does not represent the effectiveness of the PCP treatment and exists as an outlier to the rest of the treated soils PCP concentrations. DEQ performed a ProUCL analysis of the 100 performance samples taken for the treated soils. The 95 percent Upper Confidence Level for the PCP treated soil is 30.99 mg/kg, which verifies that the majority of the performance concentrations represent an overall effectiveness well below the 90 percent reduction target of 151 mg/kg. Attachment 2 contains the outcome for the ProUCL analysis.

16. 40 CFR § 264.552(e)(5) requires that groundwater monitoring and corrective action requirements are sufficient to (1) detect and characterize existing releases of hazardous constituents in groundwater from sources located within the CAMU, (2) detect and characterize future releases from wastes that will remain in the CAMU after closure, and (3) require notification to EPA and corrective action as necessary to protect human health and the environment for releases to groundwater from the CAMU.

The O&M Plan being developed by DEQ will define the requirements for corrective action performance groundwater monitoring for the CAMU at the Site including appropriate notification and the necessary protective corrective actions based on detection and characterization of a release. Also, performance groundwater

monitoring of the existing PCP plume has been conducted in the area of the CAMU for over 20 years. The existing ground water monitoring equipment therefore can be used to successfully monitor for releases from the CAMU as part of the O&M Plan.

17. 40 CFR § 264.552(e)(6) establishes the requirements for closure and post-closure of CAMUs.

(e)(6)(i): Closure of corrective action management units shall:

(A) Minimize the need for further maintenance; and

The design for the offload closure currently considers two options: earthen engineered cover, or a solar array built on an earthen engineered cover. Both will be designed to minimize maintenance to the maximum extent possible. A solar array will require access for maintenance, but may allow for cost savings that allow longer term operation of the groundwater treatment plant should that be necessary. DEQ and EPA will determine the cost-benefit of additional access and maintenance for a solar array.

(B) Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, for areas where wastes remain in place, post-closure escape of hazardous wastes, hazardous constituents, leachate, contaminated runoff, or hazardous waste decomposition products to the ground, to surface waters, or to the atmosphere.

Treated soils with contaminants of concern (COCs) at concentrations above site cleanup levels are considered wastes that will remain in place, but the CAMU design will meet the control, minimize or eliminate" requirement of (i)(B) because all of the treated wastes will be consolidated and placed in the CAMU area. Specifically, the design for the CAMU incorporates a non-permeable liner, which will cover all wastes, preventing direct contact, wind or surface water erosion, and leaching to surface water or groundwater from infiltration. The impermeable liner will be covered with an earthen engineered cover that will prevent photo-decay of the impermeable liner and establish vegetation to prevent erosion. Some untreated wastes remain in place at depths too deep to excavate at the time of the removal portion of the remedy. These wastes are already in contact with groundwater in the 'smear zone' beneath the CAMU footprint, but should be unaffected by direct infiltration in the CAMU footprint due to the cover. The groundwater that has contacted the wastes will be captured and treated through the current groundwater treatment system.

(e)(6)(ii) Requirements for closure of CAMUs shall include the following, as appropriate and as deemed necessary by the DEQ Director for a given CAMU:

(A) Requirements for excavation, removal, treatment or containment of wastes; and

Treated site soils and remaining untreated site soils containing PCP will be contained on-site in the CAMU. Dust control will be strictly enforced

during relocation of the soils from the LTU to the CAMU. The Record of Decision (ROD) and Explanation of Significant Difference (ESD) already describe the excavation, removal, treatment or containment of wastes as approved by the EPA Regional 8 Administrator. Non-soil waste that has been in contact with F032 contaminated soils will be handled and disposed of in accordance with applicable RCRA regulations. The proposed ESD describes the rationale for containing the wastes and the design basis describes the rationale and plan for containment.

(B) Requirements for removal and decontamination of equipment, devices, and structures used in CAMU-eligible waste management activities within the CAMU.

Standard earth-moving equipment will be used to relocate the soils from the LTU to the CAMU and to remove the LTU liner and any waste-impacted soils beneath the liner that contain COC concentrations above site cleanup levels. The liner and other wastes that require cleaning prior to disposal in a RCRA Subtitle D landfill will be washed clean of soil with pressure washers prior to disposal. Wastes that cannot be decontaminated will be transported to a permitted RCRA Subtitle C facility for incineration or disposal. All construction and washing equipment that comes in contact with soils containing F032 waste will be required to be decontaminated with the pressure washers. Decontamination of equipment will be evaluated through collection and analysis of equipment blanks.

(e)(6)(iii) In establishing specific closure requirements for CAMUs under paragraph (e) of this section, the DEQ Director shall consider the following factors:

(A) CAMU characteristics;

The wastes in the CAMU will consist of treated and untreated site soils containing COCs as described above. The cap will be designed and engineered in such a way that the soils will be placed in the CAMU footprint and compacted in lifts to the design proctor and contoured to the designed lines and grades. The design will include a review of applicable design stability requirements, which the design will exceed with a given factor of safety. The compacted soils will be covered with an impermeable 40 mil HDPE liner, a geocomposite drainage net, and an earthen, vegetated engineered cover. Monitoring wells currently placed to evaluate plume boundaries will be extended up through the compacted lifts of waste and through the liner. The well perforations will be sealed at the liner to prevent infiltration at the well locations.

(B) Volume of wastes which remain in place after closure;

No surface wastes exceeding site cleanup goals for industrial use and/or protection to groundwater will be left in place after LTU closure. All surface wastes will be contained within the footprint of the LTU. Contaminated soil at depths too deep to excavate, at the time of the removal portion of the remedy, and located in the 'smear zone will remain

in place. Their locations are documented in the LTU Offload Design Investigation Report by Tetra Tech in 2017.

(C) Potential for releases from the CAMU;

Potential release scenarios would likely be caused by damage to the engineered cover, a flood that damages the CAMU, or a seismic event that causes sluffing of the engineered cover and underlying wastes. Institutional controls and regular maintenance will be used to prevent damage to the engineered cover. The impermeable liner and earthen engineered cover will prevent air or surface water erosion of the wastes. They will also prevent infiltration of surface water and subsequent leaching of wastes to groundwater. The final site design locates the CAMU outside of the 100-year floodplain that bisects the site. The CAMU is designed with maximum slopes of 4:1, which should be protective for all seismic events in the area. As long as the earthen engineered cover is maintained, the potential for release is minimal.

(D) Physical and chemical characteristics of the waste;

The wastes consist of unconsolidated site soils, including clayey sands, gravels, and crushed asphalt that have residual concentrations of the site COCs (PAHs, PCP, and dioxins). The wastes may also contain concentrations of metals above Regional Screening Levels (RSLs) due to previous ore processing near the site.

(E) Hydrogeological and other relevant environmental conditions at the facility which may influence the migration of any potential or actual releases; and

None of the designed actions associated with the creation of the CAMU and consolidation of the wastes will change the existing hydrogeologic or other migration regimes.

(F) Potential for exposure of humans and environmental receptors if releases were to occur from the CAMU.

The potential for exposure in the unlikely incident of a waste release from the CAMU is minimal. No residential areas exist in the surface flow path between the CAMU and the nearest surface water body, Silver Bow Creek. The groundwater treatment system captures and treats groundwater from downgradient of the CAMU. There is also a controlled groundwater area that restricts all groundwater use around the site. The engineered cover will prevent direct contact by site visitors and wildlife.

(e)(6)(iv) Engineered cover requirements:

(A) At final closure of the CAMU, for areas in which wastes will remain after closure of the CAMU, with constituent concentrations at or above remedial levels or goals applicable to the site, the owner or operator must cover the CAMU with a final cover designed and constructed to meet the following performance criteria, except as provided in paragraph (e)(6)(iv)(B) of this section:

(1) Provide long-term minimization of migration of liquids through the closed unit;

The engineered cover will include an upper 40 mil HDPE liner, geocomposite drainage net, and vegetated soil engineered cover that will prevent migration of liquids through the surface of the closed unit.

(2) Function with minimum maintenance;

The engineered cover will be designed to function with minimal maintenance. CAMU slopes are not steep and should not require regular significant maintenance.

(3) Promote drainage and minimize erosion or abrasion of the cover;

The engineered cover design meets EPA guidance with a minimum 3% slope on surface areas to promote drainage of surface water. A geocomposite drainage net installed over the liner will allow drainage of infiltrated water over the liner without failure of the overlying soil engineered cover. The CAMU will be bordered on all sides by stormwater control ditches to prevent flow onto the CAMU and contain any flow off the CAMU. Drainage water will be directed to an on-site stormwater containment area and will not be discharged from the site.

(4) Accommodate settling and subsidence so that the cover's integrity is maintained; and

The base of the CAMU and wastes within the CAMU will be compacted to 90-95% proctor to prevent settlement of wastes within the CAMU that could disrupt the cover.

(5) Have a permeability less than or equal to the permeability of any bottom-liner system or natural subsoils present.

The engineered cover design includes an impermeable HDPE liner that is less permeable than the sandy subsoils at the site.

(e)(6)(v) Post-closure requirements as necessary to protect human health and the environment, to include, for areas where wastes will remain in place, monitoring and maintenance activities, and the frequency with which such activities shall be performed to ensure the integrity of any cap, final cover, or other containment system.

Post closure requirements and monitoring activities to protect human health and the environmental to ensure the integrity of the cap for areas where waste remains in place will comply with 40 CFR Part 264, Subpart M as recommended in Appendix A of the ROD for Federal Action-Specific ARARs.

Conclusion

Consistent with Superfund law, DEQ as lead agency for the Montana Pole site is designating approximately 9 acres as a CAMU for use as a final repository for treated remediation wastes off-loaded as a remedial action under the *Montana Pole and Treating Plant Record of Decision, September 1993*. The information provided in this document and supporting documents fulfills

the regulatory requirements for DEQ to consider in designating this CAMU. Based upon consideration of all information available at this time, DEQ has concluded that it is appropriate to designate this area as a CAMU.

Documents Relevant to this Decision

Montana DEQ, 1993. Montana Pole and Treating Plant Record of Decision, September 1993.

Montana DEQ, 2017. Fourth Five-Year Review Report for the Montana Pole and Treating Plant Site, Butte, Montana, May 2017.

Attachments

Attachment 1: PHC Tables

Attachment 2: PCP ProUCL Analysis Outcome

Figure

Figure 1: CAMU footprint in relationship to existing plume

Declaration

The CAMU designation is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant, appropriate to the remedial action to the extent practicable, and is cost effective. The CAMU designation will facilitate a remedy that utilizes permanent solutions and alternative treatment, or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

5/8/19

Date

Shaun McGrath
Director
Department of Environmental Quality

Attachment 1
PHC Tables

Dioxins/Furans	**Maximum Concentration (ug/kg)**	*90% Reduction	ATS ug/kg	UTS ug/kg	Exceeds UTS	Range of Exceedances
2,3,7,8-TCDD	598	59.8	10	1	0/30	None
1,2,3,4,7,8-HxCDD	17.1	1.71	10	1	0/30	None
1,2,3,4,7,8-HxCDF	12.9	1.29	10	1	1/30	1.1
1,2,3,6,7,8-HxCDD	25	2.5	10	1	15/30	1.1 - 3.7
1,2,3,6,7,8-HxCDF	2.3	0.23	10	1	0/30	None
1,2,3,7,8,9-HxCDD	2	0.2	10	1	0/30	None
1,2,3,7,8,9-HxCDF	0.38	0.038	10	1	0/30	None
1,2,3,7,8-PeCDD	2	0.2	10	1	0/30	None
1,2,3,7,8-PeCDF	2	0.2	10	1	0/30	None
2,3,4,6,7,8-HxCDF	2.2	0.22	10	1	0/30	None
2,3,4,7,8-PeCDF	1.3	0.13	10	1	0/30	None
2,3,7,8-TCDF	0.421	0.0421	10	1	0/30	None
* 90 percent reduction is based on the highest concentration						
>UTS, but <ATS					16/360	

	Maximum Concentration (mg/kg)	*90% Reduction	ATS ug/kg	UTS ug/kg	Exceeds UTS	Exceeds ATS	Exceeds 90% Reduction	Maximum Exceedance
Pentachlorophenol	1,510	151	74	7.4	80/100	4/100	1/100	159
* 90 percent reduction is based on the highest concentration								
>UTS, but <ATS								

PAHs	Max Concentraiton (mg/kg)	*90% Reduction	ATS mg/kg	UTS mg/kg	Exceeds UTS	Range of Exceedances
Acenaphthene	457	45.70	34	3.4	3/60	4.1 - 4.9
Anthracene	13.4	1.34	34	3.4	0/60	None
Benzo (a) anthracene	64.9	6.49	34	3.4	0/60	None
Benzo (a) pyrene	9.13	0.91	34	3.4	2/60	3.46 - 6.28
Benzo (b) flouranthene	13.4	1.34	68	6.8	2/60	7.72 - 13.4
Benzo (k) flouranthene	9.13	0.91	68	6.8	0/60	None
Chrysene	4.53	0.45	34	3.4	0/60	None
Dibenzo (a,h) anthracene	116	11.60	82	8.2	0/60	None
Flourene	88.3	8.83	34	3.4	2/60	5.2 - 7.1
Indeno (1,2,3-cd) pyrene	83.4	8.34	34	3.4	0/60	None
Napthalene	284	28.40	56	5.6	0/60	None
Phenanthrene	181	18.10	56	5.6	3/60	6.7 - 22
Pyrene	40.4	4.04	82	8.2	0/60	None
* 90 percent reduction is based on the highest concentration						
>UTS, but <ATS					12/780	

Attachment 2
PCP ProUCL Analysis Outcome

Lognormal UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.12/26/2019 11:02:45 AM
From File	penta_mptp.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

[PCP]

General Statistics

Total Number of Observations	100	Number of Distinct Observations	85
		Number of Missing Observations	0
Minimum	1.31	Mean	24.83
Maximum	159	Median	18.3
SD	23.9	Std. Error of Mean	2.39
Coefficient of Variation	0.962	Skewness	2.926

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.974	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.263	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0801	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0889	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Logged Statistics

Minimum of Logged Data	0.27	Mean of logged Data	2.862
Maximum of Logged Data	5.069	SD of logged Data	0.876

Lognormal Maximum likelihood Estimates (MLEs)

MLE Mean	25.68	MLE Standard Deviation	27.57
MLE Median	17.5	MLE Skewness	4.459
MLE Coefficient of Variation	1.074	80% MLE Quantile	36.57
90% MLE Quantile	53.75	95% MLE Quantile	73.89
99% MLE Quantile	134.2		

Lognormal Minimum Variance Unbiased Estimates (MVUEs)

MVUE Mean	25.54	MVUE SD	26.86
MVUE Median	17.43	MVUE SEM	2.589

Assuming Lognormal Distribution

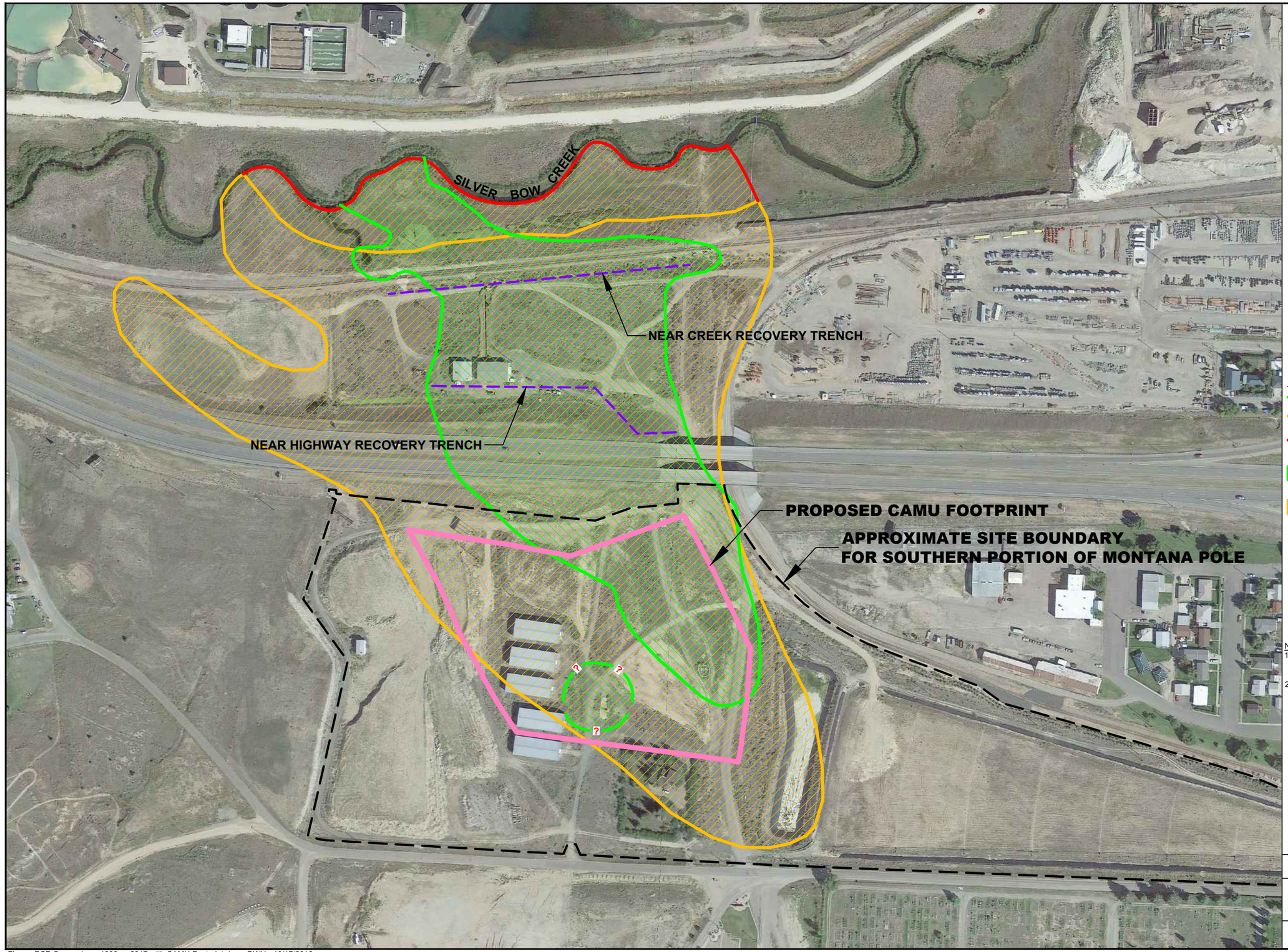
95% H-UCL	30.99	90% Chebyshev (MVUE) UCL	33.31
95% Chebyshev (MVUE) UCL	36.83	97.5% Chebyshev (MVUE) UCL	41.71
99% Chebyshev (MVUE) UCL	51.3		

Nonparametric Distribution Free UCLs

95% CLT UCL	28.77	95% Jackknife UCL	28.8
95% Standard Bootstrap UCL	28.74	95% Bootstrap-t UCL	30
95% Hall's Bootstrap UCL	30.42	95% Percentile Bootstrap UCL	29.21
95% BCA Bootstrap UCL	29.77		

	A	B	C	D	E	F	G	H	I	J	K	L
53	90% Chebyshev(Mean, Sd) UCL					32	95% Chebyshev(Mean, Sd) UCL					35.25
54	97.5% Chebyshev(Mean, Sd) UCL					39.76	99% Chebyshev(Mean, Sd) UCL					48.62
55												
56	**Suggested UCL to Use**											
57	95% H-UCL					30.99						
58												
59	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
60	Recommendations are based upon data size, data distribution, and skewness.											
61	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
62	However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.											
63												
64	**ProUCL computes and outputs H-statistic based UCLs for historical reasons only.**											
65	**H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.**											
66	**It is therefore recommended to avoid the use of H-statistic based 95% UCLs.**											
67	**Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.**											
68												

Figure



LEGEND

- AUGUST 2017 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 2017 PCP PLUME AREA (16.7 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 (2017))

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 SOUTH OF THE SILVER BOW CREEK CHANNEL IS INTERPRETED TO BE MIGRATING TOWARD THE NCRT.

AERIAL IMAGERY SOURCE:
GOOGLE EARTH PRO (2013) DJA SURVEY JUNE 2015

N

125 0 125 250

SCALE IN FEET

Montana Pole and Treating Plant
Butte-Silver Bow Montana

FIGURE
COMPARISON OF PLUME AREAS
1993 VERSUS AUGUST 10, 2017
WITH PROPOSED CAMU FOOTPRINT

TETRA TECH

Figure_PCP Comparison_1993 vs 2017-with CAMU Footprint.dwg - DWH - 10/17/2018