Supplemental Characterization Report for the Cabins Area at Mammoth Mill Inyo National Forest Mono County, California

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Acronyms and Abbreviations

ARIC	area requiring institutional controls
BLM	Bureau of Land Management
BCY	bank cubic yards
bgs	below ground surface
CFR	Code of Federal Regulations
COCs	chemicals of concern
EPA	U.S. Environmental Protection Agency
ERRG	Engineering/Remediation Resources Group, Inc.
Forest Service	U.S. Department of Agriculture Forest Service
GPS	global positioning system
HHRA	human health risk assessment
HI	Hazard Index
ICs	institutional controls
ILCR	Incremental Lifetime Cancer Risk
LUCs	land use controls
mg/kg	milligrams per kilogram
PA/SI	Preliminary Assessment/Site Inspection
PRP	potentially responsible party
RPA	Removal Preliminary Assessment
SI	Site Inspection
TCRA	time-critical removal action
TestAmerica	TestAmerica Laboratories, Inc.
TLI	TLI Solutions, Inc.
UAO	Unilateral Administrative Order
USGS	U.S. Geological Survey

Water Board	Lahontan Regional Water Quality Control Board
XRF	x-ray fluorescence
§	Section

Section 1. Introduction

Engineering/Remediation Resources Group, Inc. (ERRG) has prepared this Supplemental Characterization Report to summarize an expanded investigation conducted at the Mammoth Mill Site on the Inyo National Forest, Mono County, California (Figure 1). ERRG conducted this work in support of the time-critical removal action (TCRA) being carried out by the U.S. Department of Agriculture Forest Service (Forest Service), Region 5 under the Comprehensive Environmental Response, Compensation, and Liability Act.

The remainder of this section describes the project purpose, report organization, site background, and previous investigations conducted at the site.

1.1. PURPOSE

The purpose of this project was to (1) fully delineate the vertical and horizontal extent of contamination in the Cabins Area, (2) re-run calculations in the streamlined human health risk assessment (HHRA), and (3) evaluate removal action alternatives that eliminate exposure to chemicals of concern (COCs) in soil within the Cabins Area. Specifically, additional samples were collected to delineate the extent of COCs in soil and a focused risk analysis was conducted, in conjunction with an evaluation of removal action alternatives, to assess how varying cabin occupancy affects cleanup scenarios for the Cabins Area. Multiple HHRA scenarios were evaluated to determine how various cabin occupancy durations affect potential risks to cabin occupants. Results of the HHRA scenario analysis were used to inform the evaluation of removal action alternatives and select a preferred remedy.

This Supplemental Characterization Report summarizes the results of the additional investigation to delineate the extent of contamination in the Cabins Area, as well as the focused risk analysis and evaluation of removal action alternatives. Specifically, this report (1) summarizes the additional data collected, (2) describes how the data was evaluated, (3) discusses the horizontal and vertical extent of contamination, (4) summarizes the focused risk analysis, and (5) evaluates removal action alternatives in the context of the revised data set and focused risk analysis.

It is important to note that the Cabins Area was initially distinguished from other areas of the site during development of the Preliminary Assessment/Site Inspection (PA/SI) (ERRG, 2016). This decision was made because the cabins were considered an area of focused exposure and potential risks associated with residential occupation of the cabins required separate evaluation in the streamlined HHRA. The boundary of the original Cabins Area only encompassed those cabins where elevated metals were known to be present at the time (i.e., Cabins 7, 8, 9, 12, 13, and 26) (ERRG, 2016). However (as discussed in Section 1.4.7), subsequent results for grid samples collected north of this area (conducted in support of the Focused Site

Inspection [SI] [ERRG, 2018a]) indicated that metals contamination in the Cabins Area was more extensive than originally thought. As a result, the boundary of the Cabins Area was extended to include an additional 5-acre area north of the Cabins Area (ERRG, 2018a). All cabins on the west side of the creek (i.e., Cabins 1 through 10, 12, 13, and 26) were included in the revised Cabins Area boundary. Figure 2 shows the original and revised boundaries for both areas. For the purposes of this report, the "Cabins Area" described herein refers to the larger revised area that encompasses Cabins 1 through 10, 12, 13, and 26.

This study and its recommendations only apply to the Cabins Area and do not include the Mill Area or Diversion Ditch connecting the Mill Area to the creek. The Mill Area is the presumed source of metals-impacted soil in the Cabins Area and ideally would be addressed prior to completing work in the Cabins Area to avoid re-impacting the Cabins Area following completion of the TCRA. If waste piles and other source materials remain at the Mill Area during and after TCRA activities in the Cabins Area, metals from the Mill Area will likely migrate downslope and be deposited in the Cabins Area. Metals from the Mill Area and Diversion Ditch are also likely to migrate downstream within the Diversion Ditch to the creek.

1.2. REPORT ORGANIZATION

After Section 1, the remainder of this Supplemental Characterization Report is organized as follows:

- Section 2 describes the activities performed during the supplemental characterization investigation and the evaluation of the delineation data.
- Section 3 summarizes the data gaps identified based on the delineation data evaluation during preparation of this report.
- Section 4 summarizes the results of the focused risk analysis for human health.
- Section 5 summarizes the analysis of removal action alternatives and identifies the recommended removal action alternative to address site contamination.
- Section 6 presents the conclusions based on the additional evaluation and provides recommendations for further action.
- Section 7 lists the supporting documents and guidance used to prepare this report.

Figures and tables are presented after Section 7. In addition, the following supplemental information is appended to this document:

- Appendix A, Focused Risk Analysis for the Cabins Area
- Appendix B, Alternatives Analysis
- Appendix C, Photographic Log
- Appendix D, Archaeology Report
- Appendix E, Daily Field Logs

- Appendix F, Trench Logs
- Appendix G, Analytical Laboratory Reports
- Appendix H, X-Ray Fluorescence (XRF) and Laboratory Correlation Evaluation
- Appendix I, Mercury and Arsenic Concentration Correlation Evaluation
- Appendix J, Land and Topographic Survey

1.3. BACKGROUND

This section summarizes site background information including a description of the Mammoth Mill Site and its location, operational history, climate, geology, sensitive habitats, and land use and site access. The PA/SI Report provides a more detailed description of the site background (ERRG, 2016).

1.3.1. Site Location and Description

The Mammoth Mill Site is located approximately 4 miles southwest of the town of Mammoth Lakes, California at an elevation of 8,370 feet above mean sea level (Figure 1). It is located within an area historically known as "Mill City," because of the past gold mining activity in the region (Forest Service, 2014). It is represented on the Bloody Mountain Quadrangle 7.5-Minute Series topographic map (U.S. Geological Survey [USGS], 1994) in the northeast quarter of the northeast quarter of Section 9, Township 4 South, Range 27 East.

The Cabins Area of the site encompasses approximately 10 acres, north and east of the Mill Site (Figure 3). Both the Cabins Area and the Mill Site are within the geographic boundary of the town of Mammoth Lakes, California. The site is located on the Inyo National Forest, within the Long Hydrologic Area, designated as Unit 603.10 in the "Water Quality Control Plan for the Lahontan Region" (Basin Plan) (Lahontan Regional Water Quality Control Board [Water Board], 1995). The site is administered by the Mammoth Ranger District of the Inyo National Forest (Forest Service, 2014). The Cabins Area is accessed from Old Mammoth Road, along the Mill City Tract Road (Figure 3). The site is heavily used for recreation and includes 14 recreational cabins along the Mill City Tract, several of which are in close proximity to the former mill and its associated waste piles (Figure 3).

The site drains through a series of ephemeral drainages to Mammoth Creek. An unnamed tributary to Mammoth Creek runs along the east side of the Cabins Area (Figure 3). Mammoth Creek flows eastward through the town of Mammoth Lakes and into a series of playa lakes.

1.3.2. Operational History

The Mammoth Mill is a former gold ore processing facility dating from the late 1870s. During this period, ore was extracted from claims to the southwest, at the Old Mammoth Mine. The Mammoth Mining

Company purchased and consolidated five of the claims and needed a nearby mill to process the ore (Caldwell, 1990, as cited in Forest Service, 2014).

Stamp mills, such as the Mammoth Mining Stamp Mill, depended on the use of mercury to separate gold from ore that had been crushed in the mill. The process involved breaking the ore from cobbles and boulders into smaller particles ranging in size from coarse sand to silt. Particles were suspended in water to which mercury was added; the slurry was then passed over a corrugated surface or was otherwise agitated (Meyerriecks, 2003, as cited in Forest Service, 2014). The gold and mercury would amalgamate to form a paste. This amalgam was then heated to evaporate and recover the mercury and leave the gold (Meyerriecks, 2003, as cited in Forest Service, 2014). Tailings left over from this process were typically deposited near the mill site and allowed to dry. Tailings commonly have significantly elevated concentrations of mercury because not all mercury was recovered or reused during processing.

1.3.3. Climate

The region receives 22.95 inches of annual precipitation, with the rainy season generally between November and March. The average annual total snowfall is 206.0 inches based on annual records beginning in 1993 (Western Regional Climate Center, 2019). The site is identified on Mono County Flood Insurance Rate Map 06051C1625D to be in an area with less than a 0.2 percent annual chance of flooding (Federal Emergency Management Agency, 2011).

1.3.4. Geology

The site is located on the eastern edge of the Sierra Nevada geomorphic province and just south of the western edge of the Long Valley Caldera. The Sierra Nevada province is characterized by massive granitic rocks that are between 80 and 210 million years old. Native gold is common within the Sierra Nevada geomorphic province and is typically found in quartz veins emplaced along shear zones through the migration of hydrothermal fluids (Harden, 1998). The Sierra Nevada fault, which runs along the eastern edge of the Sierra Nevada mountains through the area of the site, became active about 3 million years ago and created the high relief and steep slopes of the eastern Sierra. The Long Valley Caldera is a much more recent geologic feature, which is the result of a volcanic super eruption that occurred about 760,000 years ago; the most recent eruption inside the caldera occurred about 50,000 years ago. The region remains volcanically active today (USGS, 2019a). The nearby Mammoth Mountain (northwest of the site) was built up by a series of approximately 25 eruptions that were fed by a magma body distinct from the caldera's source; this volcanic activity dates between 100,000 and 51,000 years ago (USGS, 2019b).

1.3.5. Sensitive Habitats

Sensitive habitats have not been previously identified at or downstream of the site, and the Water Board has not established specific water quality requirements for Mammoth Creek. The Water Board has identified that beneficial uses of Mammoth Creek include municipal supply, agricultural supply,

groundwater recharge, freshwater replenishment, recreation, fishing, cold freshwater habitat, and wildlife habitat (Water Board, 1995).

Habitat identified within a 4-mile radius of the site is known to be used by a number of rare and threatened species, including California tiger salamander (*Ambystoma californiense*), Lahontan cutthroat trout (*Oncorhynchus clarkii henshawi*), and Paiute cutthroat trout (*Oncorhynchus clarkii seleniris*), which are federally listed as threatened species. These species have been identified within Bloody Mountain, Mammoth Mountain, Crystal Crag, and Old Mammoth quadrangles (ERRG, 2016).

1.3.6. Land Use and Site Access

The former mill building and waste piles associated with the mill are located south and west of the former Mill City Tract, a collection of privately owned recreational cabins built on land owned by the Inyo National Forest and leased to the cabin owners. The former Mill City Tract is accessed by Mill City Tract Road, to the south of Old Mammoth Road. The area was historically populated during the summer months, primarily on weekends, and was a popular destination for hikers because of interest in the historic mill foundations and flywheel. A maintained hiking trail passes between the mill and the waste piles, and the closest recreational cabins are located within 100 feet of the waste piles. Large amounts of snowfall in the Mammoth Lakes area during the winter months limit accessibility.

On May 13, 2019, the Forest Service executed a closure order for the area effective May 15, 2019, through May 15, 2022 (Forest Service, 2019a). The closure area includes all cabins within the former Mill City Tract, as well as the former stamp mill, and extends to Old Mammoth Road on its eastern boundary.

1.4. PREVIOUS INVESTIGATIONS

This section summarizes the results of previous investigations, focusing on those that pertain to the Cabins Area.

1.4.1. Upper Owens River Water Quality Study

In 2014, a water quality study for the Upper Owens River (which included Mammoth Creek and its tributaries) identified elevated concentrations of metals, most notably mercury, in the unnamed tributary to Mammoth Creek (California Trout, Inc., 2014). The preliminary results of this study triggered further investigation at the site due to a concern for offsite migration of metals present in the mine waste.

1.4.2. Removal Preliminary Assessment

In 2014, the Forest Service conducted a Removal Preliminary Assessment (RPA) at the Mammoth Mill (Forest Service, 2014) in response to the elevated mercury concentrations detected in the Upper Owens River study. The Forest Service collected samples using a hand-held XRF and found that arsenic, lead, and mercury were present at elevated concentrations in soil at the site (Forest Service, 2014).

The RPA Report noted that a removal action was justified to address elevated mercury contamination present in soil, and that any action to address mercury was expected to fully address arsenic and lead contamination. The RPA Report also noted the need for additional delineation of the extent of contamination (Forest Service, 2014).

1.4.3. Potentially Responsible Party Search

In 2016, TLI Solutions, Inc. (TLI) completed a potentially responsible party (PRP) search for the Mammoth Mill Site (TLI, 2016). The PRP search included ownership and operational research, collection of corporate information about parties involved in the site, and assessment of the viability of the involved parties. After compiling a list of corporate entities and private individuals that have owned and/or operated the site, the PRP search identified a viable PRP.

1.4.4. Preliminary Assessment/Site Inspection

In 2016, ERRG conducted a PA/SI to identify whether a release of metals, including arsenic and mercury, had occurred from historical stamp mill operations (ERRG, 2016). The PA/SI included the collection of soil, waste rock, sediment, and surface water samples and a screening-level evaluation of potential risks to human health and the environment. Based on the results of the PA/SI, it was concluded that a release of metals had occurred to soil and sediment. Metals concentrations in surface water samples were not appreciably elevated with respect to background levels. As part of the PA/SI, a screening-level risk evaluation was conducted. In addition to evaluating sitewide risk, the risk evaluation divided the site into the Mill Area and Cabins Area based on distinct site uses in these areas (i.e., the Mill Area is primarily used by hikers and other recreational users, while the Cabins Area is used by cabin occupants). The screening-level risk evaluation included in the PA/SI concluded that exposure to metals posed a moderate to high risk to site visitors in the Mill Area and a moderate risk to cabin occupants in the Cabins Area (ERRG, 2016).

1.4.5. HHRA Refinement

In 2017, ERRG prepared a technical memorandum (ERRG, 2017) to refine the screening-level risk evaluation originally included in the PA/SI Report (ERRG, 2016). In 2016, the Forest Service received information regarding actual cabin occupancy (including total years of ownership per cabin). Based on this information, the Forest Service adjusted several assumptions made in developing the original risk evaluation to ensure this site-specific information was incorporated (Forest Service, 2016a and 2016b). Specifically, potential exposure scenarios for cabin occupants were adjusted to 100 days per year to represent a typical summer recreational cabin user who would use the site from June through September (Forest Service, 2016a), as well as an exposure duration of 40 years[1] (Forest Service, 2016b). In addition, a conservative (i.e., worst-case) exposure duration of 200 days per year was added (Forest Service, 2016a).

[1] Forty years represents the 90th percentile of cabin ownership based on Forest Service records summarizing years individual owners have owned cabins (for reference, the average duration is 20.5 years and maximum duration is 55 years).

The technical memorandum also updated toxicity criteria for several metals, including arsenic and mercury, to the most current values available at the time.

The results of the streamlined risk refinement provided in the technical memorandum were consistent with those of the PA/SI, indicating that concentrations of metals pose a risk to human health (ERRG, 2017). Specifically, risk to cabin occupants in the Cabins Area was considered moderate to high, depending on the assumed number of days of exposure per year. Risk characterization values were found to be driven primarily by arsenic for cancer endpoints and mercury and arsenic for noncancer endpoints. As a result, arsenic and mercury were adopted in subsequent studies as risk drivers for all metals in the area. It is assumed that any planned cleanup activities to address arsenic and mercury will effectively manage overall risk. The technical memorandum recommended additional action to protect the public and cabin occupants, including immediately limiting access to the Mill Area (e.g., land use controls [LUCs]), evaluating removal action alternatives to address exposure concerns, and evaluating the need for a TCRA (ERRG, 2017).

1.4.6. Removal Action Memorandum

On April 14, 2017, the Forest Service signed a Removal Action Memorandum documenting that a TCRA was selected to address the presence and continuing release of metals from the mill tailings and waste piles at the site (Forest Service, 2017a). The Removal Action Memorandum also established cleanup goals for the site, based on the results of the risk refinement (ERRG, 2017). The COCs for the site included arsenic, mercury, lead, and antimony. As noted in Section 1.4.5, the results of the streamlined risk refinement considered arsenic and mercury as the primary COCs that contribute to risks to human health (i.e., risk drivers) at the site. The Removal Action Memorandum established the following cleanup goals for arsenic and mercury:

- Arsenic: 13.3 milligrams per kilogram (mg/kg)
- Mercury: 31 mg/kg

1.4.7. Focused Site Inspection

In January 2018, the Forest Service tasked ERRG to conduct a Focused SI to further delineate the horizontal extent of arsenic and mercury in soil in the Cabins Area in support of the TCRA (ERRG, 2018a). ERRG collected surface and subsurface soil samples within the Cabins Area as it was originally defined in the PA/SI (ERRG, 2016) and Unilateral Administrative Order (UAO) (i.e., the area encompassing Cabins 7, 8, 9, 12, 13, and 26) (Forest Service, 2017b). During field XRF screening, ERRG identified an additional 5-acre area north of the Cabins Area that exhibited elevated XRF readings for arsenic and mercury in surface soil. As a result, ERRG conducted surface XRF screening across the additional 5-acre area to approximate the extent of impacted soil. This approach allowed for partial delineation of the northern area without requiring a scope change to fully delineate the lateral and vertical extent of arsenic and mercury in the new area. The Focused SI concluded that the lateral extent of contamination in the Cabins Area as

originally defined was more extensive than initially thought and was not constrained. Additional sampling was recommended to fully delineate the lateral and vertical extent of arsenic and mercury in soil in the entire Cabins Area (encompassing Cabins 1 through 10, 12, 13, and 26). Figure 2 presents the original and final Cabins Areas. As discussed in Section 1.1, the Cabins Area is considered a separate area of focused exposure and is distinguished from the Mill Area and Diversion Ditch in the UAO (Forest Service, 2017b).

Section 2. Supplemental Characterization Investigation

This section describes the supplemental characterization investigation, including collection of delineation samples from the Cabins Area and data evaluation. Fieldwork was conducting in October 2018 and was completed in accordance with the site-specific Work Plan and Health and Safety Plan (ERRG, 2018b). Appendix C presents a photographic log of all field activities.

2.1. DELINEATION SAMPLING ACTIVITIES

From October 8 through October 11, 2018, ERRG excavated test pits and trenches to collect soil samples to obtain surface and subsurface data to delineate the horizontal and vertical extent of arsenic and mercury in the Cabins Area. The purpose of this sampling event was not to evaluate concentrations of metals-impacted soil around each cabin; instead, its purpose was to evaluate the extent of metals-impacted soil in the entire area. Therefore, most trench locations were selected along the perimeter of the metals-impacted area to define its limits. Test pit locations were also selected in several locations within the extent of waste to define the vertical extent.

The following subsections describes the field activities conducted to collect the delineation samples.

2.1.1. Mobilization and Utility Clearance

Prior to mobilization, ERRG notified USA North 811 of upcoming intrusive activities to allow member agencies to locate their utility lines crossing the work area, if present, or confirm that no utilities were present in the work area. ERRG also subcontracted an independent subsurface utility surveyor, Pacific Coast Locators, Inc., to conduct a private evaluation of subsurface utilities in the area and mark any buried utilities. All subsurface utility markings were avoided during intrusive sampling activities. On October 8, 2018, ERRG mobilized equipment and supplies to the site to begin delineation sampling activities.

2.1.2. Archaeological Monitoring

ERRG's subcontractor, G2 Archaeology, conducted archaeological monitoring throughout the duration of the fieldwork. Prior to ground-disturbing activities, the archaeological monitor surveyed the area within and surrounding each planned test pit or trench location for the presence of cultural resources. During excavation activities, the archaeological monitor visually inspected the soil and screened approximately 50 percent of all excavated soil through 1/8-inch mesh. The archaeological monitor then described all found artifacts prior to redepositing them into the units. Found prehistoric artifacts consisted almost entirely

of bifacing obsidian debris. A dispersed concentration of historical refuse (e.g., food cans, metal scraps, and glass bottles) was also found, but this deposit was located well beyond the Cabins Area. Appendix D includes the complete archaeological monitoring results.

2.1.3. Trench and Test Pit Excavation and Logging

During each day of onsite field activities, ERRG personnel used a mini-excavator, equipped with a 12-inch bucket, to dig trenches and test pits in approximately 6-inch increments. Trench and test pit excavations were selected in advance and included locations along the perimeter of the known waste area, as well as several within the waste area, to establish lateral and vertical limits of tailings and impacted soil. ERRG used a hand-held XRF to field-screen each excavation and guide sample collection (as described in Section 2.1.4). Daily field activities were recorded continuously in daily field logs, which are included as Appendix E.

For each trench or test pit, ERRG visually inspected and photo-documented the excavation sidewalls as noted in Appendix E. ERRG's field geologist recorded observations from each trench on a trench log and noted the presence of visibly impacted soil (i.e., tailings), soil horizons, and other relevant subsurface features. Appendix F includes the trench logs. All test pit and trench locations were recorded using a field global positioning system (GPS). Figure 4 presents the test pit and trench locations.

2.1.4. XRF Field Screening

To aid in delineating the lateral extent of contamination in the recreational cabins area tract of Mill City, field screening with a hand-held XRF device was performed concurrently with trench and test pit excavation. Excavation locations and the lateral extents of trenches were adjusted, as needed, based on XRF data to delineate the lateral extent of arsenic and mercury. The XRF device was also used to inform the selection of sample depths for vertical delineation of contaminated soil; XRF readings were collected approximately every 3 to 6 inches below ground surface (bgs) as the excavations proceeded. Tables 1 and 2 present the current and historical XRF screening results for the trench and test pit sidewalls compared against the human health cleanup goals and ecological screening criteria, respectively. ERRG performed XRF screening in accordance with U.S. Environmental Protection Agency (EPA) Method 6200 (EPA, 2007), as described in the Work Plan (ERRG, 2018b).

The XRF screening provided real-time in-situ arsenic and mercury concentrations for comparison against the project cleanup goals. Mercury XRF screening results were used over arsenic XRF screening results as the primary guide for field decisions regarding where to collect samples for laboratory analysis. This decision was based on the results of previous field XRF screening, which indicated that arsenic detection limits were often close to or exceeded the cleanup goal, while mercury detection limits were consistently less than the cleanup goal (ERRG, 2018a).

To delineate the lateral extent of contamination, test pit locations were stepped out laterally from areas where XRF results exceeded cleanup goals and trench alignments were adjusted to intersect the anticipated lateral boundary of contamination. To delineate the vertical extent of contamination, trenches and test pits were excavated to depths where XRF results were less than the cleanup goals. Samples for laboratory analysis were collected from just below the boundary of clean (unimpacted) material.

2.1.5. Sampling for Laboratory Analysis

ERRG collected soil samples for analysis of arsenic and mercury by an offsite analytical laboratory, TestAmerica Laboratories, Inc. (TestAmerica), in accordance with the Work Plan (ERRG, 2018b). Sample jars were sealed, labeled, and packaged according to the labeling and chain-of-custody protocols put forth in the Work Plan (ERRG, 2018b) and submitted to TestAmerica for analysis by EPA Methods 6010B and 7471A for arsenic and mercury, respectively (EPA, 1996 and 1994). Figure 4 shows the locations where samples were collected during the supplemental characterization and previous investigations (PA/SI and Focused SI). Figures 5 and 6 show the results for all samples with analytical results exceeding the cleanup goals established in the Removal Action Memorandum (Forest Service, 2017a). Figures 7 and 8 show the sample results that exceeded benchmarks protective of ecological criteria established in the PA/SI Report (ERRG, 2016). Tables 1 and 2 summarize the current and historical analytical laboratory results compared with project cleanup goals and ecological screening criteria, respectively. Appendix G provides the complete analytical laboratory reports for the delineation samples.

In total, 63 soil samples were collected in the field and submitted to the laboratory as part of this supplemental characterization. Of the 63 soil samples, 40 samples were analyzed for arsenic and mercury on October 18, 2018. ERRG requested that the laboratory hold the remaining 23 samples pending the results of the first set of analyses. On November 2, 2018, following receipt of the results for the first 40 samples and Forest Service approval, ERRG requested analysis of 13 additional samples being held by the laboratory. TestAmerica analyzed the 13 additional samples for arsenic and mercury on November 8 and 9, 2018. The remaining 10 samples were not analyzed.

The laboratory erroneously analyzed the 13 additional samples outside of the method holding time; samples were analyzed between 29 and 31 days after sample collection and the holding time is 28 days. As noted in EPA SW-846 Compendium Series (Chapter 3, Inorganic Analytes [EPA, 2018]), *"A longer holding time may be appropriate if it can be demonstrated that the reported analyte concentrations are not adversely affected by preservation, storage and analysis performed outside the recommended holding times."* Because the 13 additional samples in question were analyzed within 3 days of the holding time and because the source of the mercury (mine tailings from the 1800s) has been on site for a significantly longer period of time than the extended holding period, the mercury data from these 13 additional samples are considered usable.

2.1.6. Site Restoration

Following logging and sample collection, ERRG backfilled all test pits and trenches with the excavated material and compacted the excavation area using the excavator bucket and/or by track-walking with the excavator. Each test pit and trench site was lightly graded so that it resembled preexcavation conditions as closely as possible.

2.1.7. Land and Topographic Survey

Triad Holmes Associates completed a land and topographic survey of the site between July and August 2019. The scope of the survey included approximately 33 acres of the site encompassing the Mill Area and Cabins Area, as well as nearby roads, infrastructure, and site features. The survey resulted in a topographic map (at 1-foot contour interval), which was used to replace the existing site basemap[2]. A tree survey was also completed for a subset of the area in the vicinity of the cabins. The tree survey was conducted to help inform the evaluation of alternatives for the TCRA, with those alternatives that removed fewer trees from the site being preferred (as discussed in Section 5). Appendix J includes a complete copy of the land and topographic survey.

2.1.8. Deviations from the Work Plan

The delineation sampling work plan (ERRG, 2018b) originally called for excavation and sampling at up to 10 locations (trenches and test pits) along the perimeter of the suspected waste area, as well as within the waste area. No sampling was planned in the vicinity of Cabin 29 because it was outside of the previously defined waste area. During field sampling and in consultation with the Forest Service Contacting Officer's Representative, an additional 20 trench and test pit locations were added to refine the lateral extent of contamination. In addition, one trench was added near Cabin 29, where results of XRF field testing by the Forest Service and ERRG indicted elevated arsenic concentrations were present at the surface. To allow time for excavation and sampling of the additional locations, ERRG's field geologist only completed trench logs for trenches and not for test pits; field notes and photographic documentation were completed for all excavations.

2.2. DATA EVALUATION

This section describes how the sampling data was used to delineate the extent of contamination and estimate the volume of impacted material. Delineation efforts were focused on delineating the extent of metals-impacted soil where sample results exceeded cleanup goals established in the Removal Action Memorandum.

[2] The sample locations and waste pile locations shown on site maps were not surveyed as part of this effort but were based on field sketches and GPS data collected during each of the several subsequent sampling events (described in Section 1.4).

2.2.1. Contamination Delineation

ERRG evaluated the extent of contamination within the Cabins Area (Figure 3) by comparing both XRF and laboratory analytical results to the project cleanup goals (Table 1). All available site data from previous investigations and this supplemental characterization investigation (including 150 laboratory samples and 331 XRF samples) were included in the delineation evaluation. ERRG evaluated the correlation between the XRF and the laboratory results to determine whether XRF results could be used to delineate the extent of contamination in areas where laboratory data was not available. The result of the correlation evaluation indicated that XRF data from this site correlates well with laboratory data and may be used to supplement information derived from the laboratory data. Appendix H includes the complete results of the correlation study.

ERRG used a combination of laboratory and XRF results to delineate the extent of metals-impacted soil; laboratory results were relied upon more heavily than XRF results. Specifically, laboratory results for both arsenic and mercury were overlain and used to establish the approximate lateral extents of contamination. This boundary was defined as the approximate midpoint between "clean" samples (i.e., those with concentrations of arsenic and mercury less than cleanup goals) and impacted samples (i.e., those with concentrations exceeding cleanup goals). For areas where no laboratory data was available, the XRF data was used to further refine the lateral extent of contamination (see Figures 5 and 6 for laboratory results and Figures 9 and 10 for XRF results). The vertical extent of contamination was defined as the shallowest depth at which laboratory results were less than cleanup goals. Again, the XRF data was used to supplement this delineation effort, as appropriate.

Figure 11 presents the delineated extent of metals-impacted soil in the Cabins Area. Based on the established lateral and vertical extents of contamination, the estimated volume of contaminated material within the Cabins Area is approximately 14,300 bank cubic yards (BCY).

During field activities, ERRG and the Forest Service observed that XRF screening results for soil east of the creek, including the area around Cabin 29, were distinct from the screening results of soil west of the creek. Specifically, screening results from the eastern area contained very high arsenic concentrations without very low mercury concentrations. Because the contaminant profile east of the creek appeared very different from that west of the creek, delineating this area was considered outside the scope of the project. As a result, only mercury concentrations were used to delineate the extent of contamination in the area of the creek and east of the creek. To determine whether the area east of the creek actually had a distinct arsenic–mercury relationship, ERRG evaluated the correlation between arsenic and mercury on either side of the creek. The correlation evaluation concluded that the material on the east side of the creek, including around Cabin 29, is chemically distinct from the material within the Cabins Area (see Appendix I). For this reason, the creek is used as the eastern boundary of contamination within the Cabins Area.

The following subsections provide additional detail on the approach to delineating the lateral and vertical extent of contamination within the Cabins Area.

2.2.1.1. Lateral Delineation of Contamination

All current and previous XRF screening and laboratory results were compared against the cleanup goals for arsenic and mercury to delineate the approximate extent of metals-impacted soil. Laboratory results exceeding the cleanup goals were the driver for lateral delineation; locations where XRF screening results exceeded the cleanup goals generally fell within the delineated extent. In some cases, XRF screening exceedances were collocated with laboratory samples with results less than the cleanup goals; in these cases, laboratory results were used preferentially over the XRF screening results to delineate the lateral extent of contamination.

XRF results exceeding the cleanup goal for arsenic at 12 locations (i.e., XRF-06, MM-S-13, MM-S-11, MM-S-33, MM-S-51, MM-S-75, MM-S-80, MM-S-81, MM-S-82, MM-S-86, MM-S-101, and MM-S-137) were intentionally excluded from the extent of metals-impacted soil. These locations were excluded because they met one or more of the following conditions:

- the location was collocated with a laboratory sample with results less than cleanup goal (e.g., MM-S-11, MM-S-13, MM-S-33, MM-S-51, MM-S-75, MM-S-81, MM-S-82, and MM-S-101);
- the location had relatively low-level exceedances (e.g., XRF-06, MM-S-51, MM-S-75, XRF-162); or
- the location was situated along the boundary of the Mill Area and is anticipated to be addressed as part of the Mill Area cleanup (e.g., MM-S-80 and MM-S-86).

XRF results exceeded the cleanup goal for mercury at five locations (i.e., XRF-18, MM-S-112, XRF-53, MM-S-114, and MM-S-140) were intentionally excluded from the extent of metals-impacted soil shown on Figure 11. These locations were excluded because they met one or more of the following conditions:

- the location was collocated with a laboratory sample with results less than the cleanup goal (e.g., MM-S-112, MM-S-114, and MM-S-140);
- the location had relatively low-level exceedances (e.g., XRF-18, XRF-53, and MM-S-140); or
- the location was on the north side of Old Mammoth Road (e.g., XRF-18 and MM-S-112), outside of the Cabins Area, where cabin occupants and site visitors are not likely to be exposed to them.

Overall, the lateral extent of contamination was considered adequately delineated for the purposes of this study.

2.2.1.2. Vertical Delineation of Contamination

As with lateral delineation, laboratory results exceeding cleanup goals were the driver for delineation of vertical contamination. In almost all cases, laboratory analytical results confirmed the depth at which XRF screening had indicated arsenic and mercury concentrations no longer exceeded cleanup goals. The depth at which a soil sample met cleanup goals (i.e., depth to clean sample) was considered the vertical extent of contamination. In cases where laboratory results were not vertically delineated by clean samples, additional data, including consideration of collocated XRF results and adjacent laboratory results, were evaluated to make assumptions about the likely vertical extent at those locations.

The vertical extent of arsenic was evaluated at each sample location. All but 11 sample locations were delineated by clean samples (Figure 5). Those 11 locations are evaluated further below.

- Laboratory results for the following five surface samples exceeded the cleanup goal for arsenic: MM-S-42, MM-S-43, MM-S-92, MM-S-93, MM-S-97, and MM-S-99 (Figure 5). These samples are located behind Cabins 4, 5, and 6 and are considered vertically delineated by adjacent samples with arsenic concentrations less than the cleanup goal collected at the surface (MM-S-98, MM-S-96, MM-S-94, MM-S-41, MM-S-33) and at depth (MM-S-121, MM-S-131, and MM-S-132). As a conservative measure, an assumed depth of up to 2.0 feet bgs was applied to the depth of impacted soil in the vicinity of these samples.
- The laboratory result for arsenic in MM-S-125 (19 mg/kg) collected from 0.6 feet bgs slightly exceeded the cleanup goal (13.3 mg/kg); this low-level exceedance is considered delineated because it is collocated with an XRF sample with an arsenic result less than the cleanup goal.
- Laboratory results for the following four samples exceeded cleanup goals at the deepest depths sampled: MM-S-108, MM-S-118, MM-S-119, and MM-S-133. These samples were all collected from the area between the main access road and the creek in an area characterized by sediment that appears to be influenced by creek deposits along its floodplain. Because the east side of the creek has much higher concentrations of arsenic than the west side (see Section 3.2), it is likely that sediment from the east side has been deposited along the floodplain, influencing the arsenic concentrations in these samples. An assumed depth of 2.0 feet bgs was established for these samples by adding 1.0 foot to the depth of the deepest sample in this area.
- The laboratory result for surface sample MM-S-14 exceeded the cleanup goal for arsenic. This sample was collected from within the diversion ditch during the PA/SI sampling. The ditch was excluded from this supplemental characterization investigation for the Cabins Area and is considered a separate area (as noted in Section 1.4.7). Note: Figures and tables show the sample results from the diversion ditch for informational purposes only.

The vertical extent of mercury was evaluated at each sample location. All but 10 sample locations were delineated by clean samples (Figure 6). Those 10 locations are evaluated further below.

- Laboratory results for the following seven surface samples exceeded the cleanup goal for mercury: MM-S-42, MM-S-43, MM-S-92, MM-S-93, MM-S-96, MM-S-97, and MM-S-99. These samples are located behind Cabins 4, 5, and 6 and are considered vertically delineated by adjacent samples with mercury concentrations less than cleanup goals collected at the surface (MM-S-98, MM-S-94, MM-S-120, MM-S-41, MM-S-33) and at depth (MM-S-131, MM-S-132, and MM-S-121). As a conservative measure, an assumed depth of up to 2.0 feet bgs was applied to the depth of impacted soil in the vicinity of these samples.
- The laboratory results for mercury at MM-S-32 (collected from 0.5 feet bgs) and MM-S-125 and MM-S-126 (both collected from 0.6 feet bgs) exceeded the cleanup goal; these exceedances are considered delineated because they are collocated with XRF samples with results less than the cleanup goal.

Overall, the vertical extent of contamination was considered adequately delineated for the purposes of this study.

2.2.2. Volume Calculations

Based on the established lateral and vertical extents of contamination, ERRG used a geographic information system to calculate the areal extent of impacted soil (in square feet) and multiplied this by the maximum depth to unimpacted soil within each portion of the impacted area (Figure 11). The total area of impacted soil is approximately 180,873 square feet. Excavation depths within this area range from 0.5 to 2.5 feet bgs as summarized below.

Depth of excavation (feet bgs)	Area (square feet)	Volume (cubic yards)
0.5	730	14
1.0	14,190	552
2.0	91,195	6,755
2.5	74,034	6,855
	Total Volume of Impacted Material:	14,176

The total calculated volume of the impacted area is approximately 14,176 BCY.

2.2.3. Hotspot Evaluation

As further discussed in Sections 4 and 5, the focused risk analysis included a hotspot evaluation. The hotspot evaluation considered removal of those samples with the highest concentrations of metals to assess whether selective removal of the hottest samples would adequately address site risks. Hot spots were preferentially selected from areas of the site that were not directly adjacent to the cabins or in the yards of cabins to minimize disturbance adjacent to the cabins (e.g., avoid the need to remove large numbers of trees in close proximity to cabins). In total, seven individual hot spots (Areas A–G) were established. Areas and

excavation depths for hot spots were calculated using the same methods as described in Section 2.2.2. Figure 12 shows the hotspot removal areas.

Hotspot Area	Excavation Depth (feet bgs)	Area (square feet)	Volume (cubic yards)
A	2.5	22,000	2,040
B	2.5	30,000	2,780
C	1.0	11,000	400
D	2.0	21,000	1,540
E	0.5	900	17
F	0.5	750	14
G	0.5	1,400	25
		Total Hotspot Volume (cubic yards):	6,816

Section 3. Data Gaps Evaluation

This section discusses the data gaps identified during the supplemental characterization investigation.

3.1. LATERAL AND VERTICAL EXTENT OF CONTAMINATION

Laterally, the extent of metals-impacted soil in the Cabins Area is considered delineated (as shown on Figure 11), with the creek as the eastern boundary[3].

Vertically, the extent of metals-impacted soil in the Cabins Area is considered adequately delineated. However, the vertical extent of contamination may be overestimated for the three areas discussed below.

1. The area between Cabins 4 and 10 was more sparsely sampled than areas to the south because the purpose of the delineation sampling was not to evaluate concentrations of metals-impacted soil around each cabin. Rather, the purpose was to evaluate the extent of metals-impacted soil in the entire area. As a result, most trenches were located along the perimeter of the metals-impacted area and several test pits were located within the extent of waste to define the vertical limits. While this area is considered adequately delineated for the purposes of this investigation, collection of additional samples would provide more detail on the specific extent of contamination in the vicinity of each cabin. To be conservative, the deepest depths of contamination were applied over this area, with an assumed depth of 2.5 feet bgs.
2. Several surface samples in the area behind Cabins 4, 5, and 6 had elevated metals concentrations, with no clean samples directly beneath them; instead, these locations relied on adjacent samples for vertical delineation. To be conservative, impacted soil in this area was assumed to extend to 2.0 feet bgs to avoid underestimating soil volumes.
3. In the area between the main access road and the creek, mercury is vertically delineated, but arsenic is not. This area has likely been impacted by floodplain deposition along the creek, where elevated arsenic concentrations from east of the creek[3] have mixed with site contamination. Although mercury in this area does not extend deeper than 1.0 feet bgs, the depth to unimpacted soil in this area was assumed to extend to a depth of 2.0 feet bgs, to conservatively estimate volumes and account for arsenic contamination.

Addressing the above data gaps would not change the conclusions of this investigation, but collecting additional data in these areas (e.g., collecting detailed grid data) may be useful during the pre-construction phase of the TCRA to provide additional detail on the extents of contamination prior to excavation.

[3] As noted in Section 3.3, delineating arsenic east of the creek was considered beyond the scope of this investigation.

3.2. SOIL BENEATH CABINS

Sampling beneath or within the cabins was beyond the scope of this study. Therefore, metals concentrations in soil beneath or within the cabins are unknown. In the absence of data to the contrary, it should be presumed that impacted soil exists beneath the cabins and that any site soil potentially tracked into the cabins may be impacted as well.

3.3. ARSENIC EAST OF CREEK

The area east of the creek was excluded from the supplemental characterization investigation because it is considered chemically distinct from the area impacted by activities at the Mammoth Mill Site (see Section 2.2.1 and Appendix I). The source of elevated arsenic concentrations east of the creek is unknown at this time and would require additional evaluation. Because Cabin 29 is located east of the creek, this cabin was also excluded from this investigation. Therefore, the environmental risks associated with elevated arsenic concentrations near Cabin 29 may require additional evaluation, especially in terms of potential risk to Cabin 29 occupants or recreational visitors to the east side of the creek.

Section 4. Focused Risk Analysis

This section summarizes the results of the focused risk analysis for the Cabins Area shown on Figure 3 (i.e., the area west of the creek that encompasses Cabins 1–10, 12, 13, and 26). ERRG enlisted the services of its qualified risk assessor, Thomas Harder & Co., to incorporate additional data into the existing data set from the PA/SI risk evaluation and focus the evaluation on risks to cabin occupants within the Cabins Area. As discussed in Sections 1.1 and 1.4.7, the Cabins Area is considered to be a separate area of focused exposure, especially for cabin occupants (Forest Service, 2017b). For this reason, the analysis of human health risk was focused on current and future cabin occupants.

The following subsections summarizes the focused risk analysis, including the purpose, methodology, assumptions, results, and risk management decisions based on risk analysis results. Appendix A includes the complete focused risk analysis report.

4.1. PURPOSE

The purpose of the focused risk analysis was to (1) expand the risk evaluation data set included in the PA/SI (ERRG, 2016) and risk refinement in the technical memorandum (ERRG, 2017) to include soil samples collected from the Cabins Area in October 2017 and October 2018 and (2) focus the risk analysis on exposure of cabins occupants to metals. To accomplish this, the risk analysis was conducted iteratively, in conjunction with the evaluation of removal action alternatives (see Section 5 and Appendix B).

The goal of the iterative risk analysis was to evaluate the relative benefits of (1) restricting site access through LUCs and (2) removing contaminated soil from areas of the site with the highest concentrations of site COCs (i.e., “hot spots”). This goal was accomplished by varying the exposure frequency (or number of days cabin occupants are at the site per year) to evaluate the relative risk to cabin occupants. By running various risk scenarios and sensitivity analyses, the effectiveness of LUCs and/or hotspot removals in reducing site risks could be more fully evaluated.

It should be noted that the purpose of the focused risk analysis was not to identify risks per cabin or per parcel or evaluate risks to individuals who may come in contact with site COCs. Rather, the purpose was to evaluate risks for the entire Cabins Area to be used to supplement previous risk evaluations (ERRG, 2016 and 2017).

4.2. METHODOLOGY

The general methodology for the risk analysis was consistent with previous risk evaluations (ERRG, 2016 and 2017) and using the same risk drivers (i.e., arsenic and mercury) established during previous risk evaluations (see Section 1.4.5). The focus of the analysis was on the cabin occupants; evaluating multiple risk scenarios (i.e., varying the number of days of exposure and the areas to which cabin occupants would potentially be exposed). This first step was done to narrow down the number of scenarios that could then be applied to all receptors (i.e., recreational users and construction workers, as well as cabin occupants).

As discussed in Section 2.2.3, individual hot spots were established by focusing on removing samples that exhibited the highest concentrations of arsenic and mercury. Hot spots were preferentially selected from areas of the site that were not directly adjacent to cabins or in the yards of cabins to minimize disturbance adjacent to cabins (e.g., avoid the need to remove large numbers of trees in close proximity to cabins). Thirteen hotspots scenarios (or combinations) were then selected based on the greatest likelihood of risk reduction (Figure 12). Because Areas A and B have some of the highest concentrations of COCs, they were included in all 13 scenarios with all other hot spots being variable among scenarios.

Two factors were evaluated in an iterative manner during the risk analysis: (1) the number of days on site (i.e., exposure frequency) and (2) the number of hot spots and volume of soil to be removed. In this manner, the most favorable risk scenarios were identified for cabin occupants (i.e., those that result in low risk and lowest volume of soil for removal while still allowing a reasonable number of days on site per year). These 13 scenarios were then applied to the recreational user and construction worker receptors.

Finally, two separate sensitivity analyses were conducted to evaluate (1) specific exposure frequencies of 15, 30, 45, 60, 75, 90, and 100 days and (2) relative bioavailability of arsenic. The sensitivity analysis of exposure frequency was conducted to determine how varying the number of days on site affected risks to cabin occupants with and without removal of hot spots. The bioavailability sensitivity analysis was conducted to determine how the bioavailability of arsenic affects the potential risks to cabin occupants. Because the site-specific bioavailability of arsenic is unknown, the sensitivity analysis included a range of bioavailability values for comparative purposes only. Specifically, the following relative bioavailability values were used for arsenic: 0.6 (the default value), 0.5, 0.4, 0.3, 0.2, and 0.1.

4.3. ASSUMPTIONS AND DEFINITIONS

The parameters and assumptions used in this analysis were based on those established in previous risk evaluations (ERRG, 2016 and 2017) and were modified (where possible) to include site-specific input available to the Forest Service. Table 3 provides the basis for each of the major assumptions used in the risk evaluation.

Risks were established based on the risk management criteria set forth in Bureau of Land Management (BLM) guidance for evaluating risks from metals in soil at abandoned mine sites (BLM, 2004 and 2017). Cancer risks and noncancer hazards were evaluated.

Cancer risk is the estimated probability that a person will develop cancer from exposure to site contaminants, generally expressed as an upper-bound probability and referred to as the Incremental Lifetime Cancer Risk (ILCR). For example, an ILCR of 1×10^{-5} is a 1 in 100,000 (or a 0.001%) chance of developing cancer, meaning that, for every 100,000 people, one additional cancer case may occur as a result of exposure to site contaminants.

Noncancer hazard is the risk of health effects other than cancer, expressed as a number called the hazard index (HI). An HI of 1.0 or less is considered an acceptable exposure level for noncancer health hazards.

The risk management criteria established in the BLM guidance (BLM, 2004) are as follows:

- Low Risk (less than criteria): ILCR below $1 \times 10^{-5}$and HI below 1.0
- Moderate Risk (1 to 10 times criteria): ILCR between 1×10^{-5} and $1 \times 10^{-4}$and HI between 1 and 10
- High Risk (10 to 100 times criteria): ILCR between 1×10^{-4} and $1 \times 10^{-3}$and HI between 1 and 10
- Extremely High Risk (more than 100 times the criteria): ILCR greater than $1 \times 10^{-3}$and HI greater than 100

4.4. RESULTS OF THE FOCUSED RISK ANALYSIS

As presented in Appendix A, the focused risk analysis concluded that if no removal action is conducted exposure of cabin occupants to metals in soil within the Cabins Area posed a moderate cancer risk and a high noncancer hazard risk. The risk levels are reflected in the “No Removal Action” scenario presented in Table 2 of Appendix A. Under the No Removal Action scenario, the exposure frequency for cabin occupants would need to be limited to 14 days per year to avoid unacceptable cancer risks and limited to 5 days per year to avoid unacceptable noncancer risks. Because these limitations were not considered realistic exposure frequencies for current and future cabin occupants, hotspot areas were removed iteratively until more reasonable numbers of days on site per year were achieved while maintaining a low risk of exposure.

Seven hotspot removal areas were established based on the highest concentrations of arsenic and mercury in the Cabins Area (see Figure 12). Each of the 13 scenarios considered for this analysis involves removal of different combinations of the seven hot spots (Areas A–G). Resulting levels of risk were then recalculated for each removal scenario. Table 2 of Appendix A presents the results for the removal scenarios.

Nine risk scenarios (2, 4, 5, 6, 7, 8, 9, 11, and 13) reduce arsenic concentrations to at or less than the background threshold concentration such that it was eliminated as a chemical of potential concern. Under these removal action scenarios, the cancer risk value does not exist, arsenic does not contribute to the noncancer risk value, and mercury is the sole COC and only risk driver. Implementation of any of the nine scenarios would result in an overall low risk of exposure to cabin occupants to site-wide risks, with Scenario 2 resulting in the lowest overall risk. The following table summarizes the risk associated with each scenario.

Risk Scenario (Hotspots Removed)	Removal Volume (cubic yards)	Days Onsite per Year (maximum)	Resulting Risk Level
No Removal Action	0	5	High risk
Scenario 1 (A, B, C)	5,220	9	High risk
Scenario 2 (A, B, C, D)	6,760	259	Low risk
Scenario 3 (A, B, C, G)	5,245	10	High risk
Scenario 4 (A, B, D)	6,360	176	Low risk
Scenario 5 (A, B, D, E)	6,377	113	Low risk
Scenario 6 (A, B, D, E, F)	6,391	111	Low risk
Scenario 7 (A, B, D, E, F, G)	6,416	184	Low risk
Scenario 8 (A, B, D, E, G)	6,402	187	Low risk
Scenario 9 (A, B, D, G)	6,385	178	Low risk
Scenario 10 (A, B, E)	4,837	9	High risk
Scenario 11 (A, B, E, G)	4,862	182	Low risk
Scenario 12 (A, B, F)	4,834	10	High risk
Scenario 13 (A, B, F, G)	4,859	172	Low risk

Notes: Risks presented are for cabin occupants exposed to the 0- to 2-foot-bgs soil interval; complete risk tables are presented in Appendix A.

All nine of the scenarios that result in low risk for cabin occupants also result in low risk for recreational visitors and construction workers (see Tables 3 and 4 of Appendix A).

Based on the sensitivity analysis for exposure frequency, risk remains acceptable for all exposure frequencies for the same nine hotspot scenarios (2, 4, 5, 6, 7, 8, 9, 11, and 13). The remaining hotspot scenarios (1, 3, 10 and 12) show reduced risk values (from “high” risk to “moderate” risk), but still result in unacceptable risk at 15 days of occupancy and above. Therefore, decreasing the allowable days on site results in reduced risk, but the hot spots to be removed to achieve low risk remain unchanged; that is, the same nine removal scenarios result in low risk.

Based on the sensitivity analysis for arsenic bioavailability, the bioavailability of arsenic has little effect on the overall risk results unless the assumed bioavailability is below 0.4 and the exposure frequency is reduced to 15 days or fewer per year. Even at the lowest value of arsenic bioavailability evaluated (0.1), moderate risk exists at the site if no action is taken.

4.5. RISK MANAGEMENT DECISION

Based on the results of the focused risk analysis, nine hotspot removal scenarios (2, 4, 5, 6, 7, 8, 9, 11, and 13) result in low risk for cabin occupants, recreational users, and construction workers. Of the nine low-risk scenarios, Scenario 2 results in the lowest overall risks and allows the most days on site (259), although it requires the largest volume of removal (approximately 6,760 bank cubic yard). Of the remaining eight scenarios, only two scenarios (11 and 13) require removal of less than 6,000 bank cubic yards of material to achieve low risk. Scenario 11 requires removal of 4,862 bank cubic yards and allows 182 days at the site while Scenario 13 requires removal of 4,859 bank cubic yards and allows 172 days at the site. Because Scenario 11 allows for 10 more days at the site than Scenario 13, and because it is considered otherwise equivalent[4] to Scenario 13, Scenario 11 was selected as the hotspot scenario for inclusion in the alternatives analysis (see Appendix B and Section 5).

[4] The difference in removal volumes (3 bank cubic yards) between the two scenarios falls within the error of the calculations and assumptions used to calculate the hotspot volumes (see Section 2.2.3).

Section 5. Removal Action Alternatives Analysis

ERRG completed an analysis that identified and evaluated potential removal action alternatives to address soil contamination at the Cabins Area in terms of implementability, effectiveness, and relative cost. Using currently available site data, including delineation sample results and the results of the focused risk analysis (Appendix A), ERRG evaluated potential alternatives to eliminate or minimize risks posed to human health and wildlife.

The removal action alternatives evaluated included (1) LUCs that restrict or prohibit access to the Cabins Area, (2) onsite encapsulation that would cover all of the impacted area with a clean cap to prevent exposure, (3) hotspot removal where the highest concentrations of metals-impacted soil would be removed and disposed of in either an onsite repository or at an offsite facility, and (4) complete removal of all impacted soil and disposal in either an onsite repository or at an offsite facility. Table 4 summarizes the comparative analysis of all removal action alternatives. Appendix B provides the complete alternatives analysis.

5.1. PURPOSE AND METHODOLOGY

The objective of the alternatives analysis was to identify and evaluate potential alternatives to address metals-impacted soil within the Cabins Area and to use the results to guide remedy selection for the TCRA.

Alternatives were evaluated qualitatively against three criteria: effectiveness, implementability, and relative cost. The qualitative evaluation was not intended to weigh or rank each alternative quantitatively, but was rather intended to show how each alternative may or may not meet the TCRA objectives (i.e., to mitigate exposure of humans and wildlife to site COCs in tailings and soil within the Cabins Area), taking into consideration each aspect of implementing the TCRA. The cost estimates developed for the analysis generally follow cost estimation guidance from EPA and are considered order-of-magnitude estimates with an intended accuracy of +50 to -30 percent (EPA, 2000).

Following the evaluation of each alternative against the three criteria, the alternatives were compared with one another and combined, if appropriate, to determine which alternative or combination of alternatives would best meet the TCRA objectives (see Appendix B). The results of the alternatives analysis were used to inform the selection of the preferred removal action alternative (as discussed in Section 5.4).

5.2. SUMMARY OF ALTERNATIVES

The following alternatives were identified and selected for the Cabins Area based on their ability to mitigate risk to human health and the environment, their technical feasibility, and professional experience with projects of a similar size and scope:

- Alternative 1, Complete LUCs[5] – Institutional Controls (ICs) and Fencing
- Alternative 2, Minor Grading and Onsite Encapsulation with LUCs
- Alternative 3A, Hotspot Excavation and Onsite Repository with LUCs
- Alternative 3B, Hotspot Excavation and Offsite Disposal with LUCs
- Alternative 4A, Complete Excavation and Onsite Repository with LUCs
- Alternative 4B, Complete Excavation and Offsite Disposal

The following subsections describe each alternative evaluated. Table 4 summarizes the results of the evaluation in comparison with the three criteria (effectiveness, implementability, and cost). Section 5.3 summarizes the results of the comparative analysis of alternatives.

5.2.1. Alternative 1, Complete LUCs – ICs and Fencing

This alternative completely prohibits access to the site by both cabin occupants and recreational users by implementing LUCs. The Forest Service would establish the area requiring institutional controls (ARIC) based on the need to prohibit land use in the metals-impacted area (e.g., an area similar to the current closure area). Site access is restricted by instituting legal and administrative access prohibitions in conjunction with engineering controls (fencing) to discourage trespassers. As shown in Figure B-2 in Appendix B, approximately 320 linear feet of industrial chain-link fence would be installed along Old Mammoth Road at the north end of the site. A single locking gate would be installed at the junction with Mill City Tract Road to allow for authorized access to the site for maintenance and inspection purposes only. Signs would be installed along the perimeter of the ARIC to alert passersby that access is prohibited. No other site modifications would be made; the cabins and all existing soil contamination would remain at the site.

5.2.2. Alternative 2, Minor Grading and Onsite Encapsulation with LUCs

This alternative involves encapsulating all metals-impacted soil in the Cabins Area beneath 2 feet of clean fill as shown on Figure B-2 in Appendix B. To avoid the need to modify cabin foundations and to ensure ground surface elevations adjacent to the cabins remain relatively unchanged, minor grading would be required around each of the nine cabins (i.e., 1, 2, 3, 4, 5, 6, 10, 13, and 26) located inside or directly

[5] Per EPA, LUCs may consist of non-engineered instruments, such as administrative and legal controls (i.e., ICs) and/or engineered and physical barriers, such as fences and guards, to minimize the potential for exposure to contamination and/or protect the integrity of a response action. LUCs are typically designed to work by limiting land and/or resource use or by providing information that helps modify or guide human behavior at a site.

adjacent to the affected area before the cap could be installed (see Figure B-2 in Appendix B). Approximately 2 feet of soil would be removed surrounding each cabin's foundation; the removal area would be graded to match the existing grade away from the cabin foundations. Site preparation would include removal of approximately 935 trees and protection of 26 trees. A 2-foot clean cap would then be placed over the entire impacted area and ICs (i.e., digging restrictions) and engineering controls (i.e., signage) would be implemented to protect current and future site users and ensure the integrity of the cap.

5.2.3. Alternative 3A, Hotspot Excavation and Onsite Repository with LUCs

Alternative 3A involves selective removal of hot spots within the Cabins Area, while taking into consideration the maximum number of days cabin occupants would be allowed on site per year. As discussed in Section 4.5, hotspot Scenario 11 (removal of Areas A, B, E, and G) was selected for evaluation under this alternative. This alternative includes hotspot excavation and encapsulation within an onsite repository and backfill of the removal areas. Following implementation, site access for both cabin occupants and recreational users would be restricted to no more than 182 days (approximately 6 months) per year to maintain low risk to human health. ICs (i.e., digging restrictions) and engineering controls (i.e., fencing, gate, and signage) would be established to protect current and future site users and ensure the integrity of the cap. Site preparation would include removal 637 trees (no trees would be protected).

5.2.4. Alternative 3B, Hotspot Excavation and Offsite Disposal with LUCs

Alternative 3B involves selective removal of the same hot spots as Alternative 3A (Areas A, B, E, and G) and offsite disposal. The extent and volume of removal under this alternative is identical to Alternative 3A, except that contaminated soil would be transported and disposed of at an offsite licensed facility as Bevill-exempt waste in accordance with Title 40 Code of Federal Regulations (CFR) Section (§) 261.4(b)(7), rather than being encapsulated on site. Similar to Alternative 3A, site access for both cabin occupants and recreational users would be restricted to no more than 182 days (approximately 6 months) per year to maintain low risk to human health. ICs (i.e., digging restrictions) and engineering controls (i.e., fencing, gate, and signage) would be established to protect current and future site users and ensure the integrity of the cap. Site preparation would include removal of approximately 362 trees (no trees would be protected).

5.2.5. Alternative 4A, Complete Excavation, Onsite Repository, and LUCs

Alternative 4A involves the complete removal of metals-impacted soil from the Cabins Area, encapsulation within an onsite repository, backfill of the removal area, and implementation of ICs (i.e., digging restrictions) and engineering controls (i.e., signage) to protect current and future site users and ensure the integrity of the cap. Site preparation would include removal of approximately 1,483 trees (no trees would be protected).

5.2.6. Alternative 4B, Complete Excavation and Offsite Disposal

Alternative 4B involves complete removal of metals-impacted soil from the Cabins Area and transportation and disposal at an offsite licensed facility as Bevill-exempt waste in accordance with Title 40 CFR § 261.49(b)(7), followed by backfill of the removal area. Site preparation would include removal of approximately 961 trees (no trees would be protected).

5.3. COMPARATIVE ANALYSIS OF ALTERNATIVES

This section summarizes the comparative analysis of each alternative with one another using the three evaluation criteria (effectiveness, implementability, and relative cost). Table 4 summarizes the results of the comparative analysis. Appendix B provides a detailed description of the comparative analysis.

5.3.1. Effectiveness

Alternative 1 is the least effective, followed by Alternative 3A, then Alternative 3B. Alternatives 2 and Alternative 4A are similarly effective to one another, but both are less effective than Alternative 4B, which is the most effective.

5.3.2. Implementability

All of the alternatives were considered implementable because the services and materials necessary to implement the alternatives are readily available, and Alternatives 1 through 3B could be conducted within one construction season. However, Alternatives 4A and 4B would both require two construction seasons. Alternative 1 requires the least amount of site work, thus it is the easiest to implement. Alternatives 2, 3B, and 4B are all considered moderately implementable. Alternatives 3B and 4B would require a significant level of effort to remove trees, excavate, and dispose of materials off site, with Alternative 4B requiring more time and effort than Alternative 3B because a larger volume of material would be addressed. Alternatives 3A and 4A were considered the most difficult to implement because they both require a significant level of effort to remove trees, excavate hot spots, encapsulate materials in an onsite repository, and implement long-term maintenance of the repository along with ICs and engineering controls.

Alternative 1 is unlikely to be accepted by regulators, stakeholders, and community members. Alternatives 2, 3A, 3B, and 4A are all likely to be accepted by regulators, stakeholders, and community members, particularly cabin occupants who would be allowed to return to the site and reoccupy their cabins with some limitations (i.e., restrictions on digging and/or access restrictions). The only limitations for Alternatives 2 and 4A would be to restrict digging in capped areas, making them more acceptable than Alternatives 3A and 3B, which restrict site access to 6 months of the year. Alternative 4B is the most likely to be accepted because it would allow cabin occupants and recreational users unrestricted future use of the Cabins Area.

5.3.3. Cost

The following table summarizes the estimated capital costs and estimated total costs, including ongoing maintenance, for each alternative:

Alternative	Estimated Capital Cost	Estimated Total Cost (Including Operation and Maintenance)	Estimated Total Present Value Cost
Alternative 1	$76,241	$609,491	$441,794
Alternative 2	$5,196,200	$5,750,000	$5,570,251
Alternative 3A	$3,635,747	$4,404,587	$4,154,496
Alternative 3B	$3,309,848	$3,346,576	$3,527,788
Alternative 4A	$8,422,678	$9,263,878	$8,979,490
Alternative 4B	$8,778,987	$8,786,587	$8,786,394

5.4. ALTERNATIVE SELECTION

All of the alternatives, except Alternative 1, met the effectiveness and implementability criteria and were qualitatively rated between "good," "very good," or "excellent" in each area. Alternative 1 (Complete LUCs – ICs and Fencing) was rated "poor" in terms of its overall ability to meet the TCRA objectives because contaminants would remain on site (resulting in poor long-term effectiveness) and cabin occupants and recreational users would be prohibited from accessing the site (resulting in unacceptable community acceptance).

Of the remaining acceptable alternatives, Alternatives 4A and 4B would most effectively achieve the TCRA objectives; however, they are also the most costly. Alternatives 3A and 3B meet criteria for effectiveness and implementability at "good" or "very good" levels and were more cost-effective than the other alternatives. Normally, the more cost-effective of the acceptable alternatives (Alternative 3B) would be selected as the recommended alternative on this basis. However, Alternatives 3A and 3B result in metals-impacted soil remaining on site in areas where individual cabin occupants may come into contact with it on a regular basis. To evaluate risks to individual cabin occupants, a parcel-specific risk assessment would be required. The available data around each cabin is not adequate to allow for this calculation, so additional sampling and study would be required to complete this evaluation. The results of that evaluation are unknown, but may result in additional hot spots requiring excavation, which would proportionally increase the cost of Alternatives 3A and 3B.

To further compare Alternatives 2 and 3B, an analysis of major assumptions made in developing the cost estimates for these two alternatives was completed. Based on the assumptions made in developing the cost estimates, Alternative 2 is approximately $2 million more costly than Alternative 3B (considering total present value costs). A more detailed examination of the major assumptions that were used to develop the

cost estimates for these two alternatives reveals that the cost of these two alternatives would be much closer if these assumptions were to change. Table 5 summarizes several of the major assumptions and how they influence the resulting cost for both alternatives.

As outlined in Table 5, the costs for Alternative 2 would be reduced by nearly $2 million if a local import fill source were identified. While the costs for Alternative 3B would also be reduced under this scenario, Alternative 3B relies upon the assumption that waste transported off site would be classified as Bevill exempt, an assumption that could result in more than $700,000 cost increase if it is not approved. In addition, the costs for Alternative 3B do not factor in any potential cost of conducting additional risk assessments per parcel in support of Alternative 3B, which could easily exceed $100,000.

Alternative 2 is otherwise preferable to Alternatives 3A or 3B because it eliminates the exposure pathway to human health and is therefore more protective, but it is potentially significantly more costly. Alternative 2 would be the recommended alternative if the costs were more equivalent. If costs for Alternative 2 were to decrease by $2 million and costs for Alternative 3B were to increase by $800,000, then Alternative 2 would be less costly than Alternative 3B and would be recommended.

5.5. RECOMMENDED ALTERNATIVE

Based on the comparative analysis of alternatives, the following alternative is recommended: **Alternative 2, Minor Grading and Onsite Encapsulation with LUCs**.

This alternative involves encapsulating all metals-impacted soil in the Cabins Area beneath 2 feet of clean fill. To avoid the need to modify the cabins' foundations and keep ground surface elevations adjacent to the cabins relatively unchanged, minor grading would be required around each of the nine cabins located inside or directly adjacent to the affected area (i.e., Cabins 1, 2, 3, 4, 5, 6, 10, 13, and 26) before the cap would be installed (see Figure 13). Approximately 2 feet of soil would be removed surrounding each cabin's foundation; the removal area would be graded to match the existing grade away from the cabin foundations. A 2-foot-thick clean cap would then be placed over the entire impacted area. LUCs (i.e., ICs such as digging restrictions and engineering controls such as signage) would be implemented to protect current and future site users and ensure the integrity of the cap.

This alternative would effectively eliminate or minimize risk of exposure to both cabin occupants and recreational users, minimize risks to construction workers, remove the most contaminated soil from the Cabins Area, and require long-term inspection and maintenance following its implementation. This alternative would eliminate risks to wildlife within the removal area and would require post-removal monitoring to evaluate whether residual risks to wildlife remain. Limited LUCs would be required under this alternative to protect the cap and ensure no future exposure to site users.

The following major assumptions apply to this alternative:

- An engineering design, including an architectural assessment of each cabin, would be completed to establish specifications for excavation, cap placement, and all other site elements, including LUCs. The design should consider the need for sloping or shoring adjacent to the cabins or alternate methods (e.g., modified foundation headers) to provide structural support during excavation and long-term protection of the cabins after the cap is installed. The design should also consider the need for perimeter surface water drainage systems or French drains, as appropriate, to ensure the final installed cap provides positive surface water drainage away from each cabin's foundation. Engineering controls such as grading, drainage ditches, and culverts would be used where needed to ensure the integrity of the cap. Additionally, because archaeological resources are present at the site, all earthmoving work should be evaluated during the planning phase to identify whether archaeological oversight would be required. Finally, ecological resources should be evaluated to ensure that any sensitive habitat (e.g., the area directly adjacent to and within the unnamed creek) is protected during grading and cap installation.
- This alternative would impact approximately 961 trees, some of which may require protection (i.e., from suffocation, fungal growth, etc.). Because the total number of trees to be preserved has not been determined[6], this evaluation assumed that "large" trees (i.e., with trunks larger than 24 inches in diameter) would be preserved and "small" trees (i.e., with trunks less than or equal to 24 inches in diameter) would be removed. Removal would include felling each tree and removing its stump. Preservation would include constructing a dry well (18-inch barrier wall filled with drain rock) around the base of each tree to be protected. Based on available tree survey data, approximately 26 large trees would be protected and approximately 935 small trees would be removed.
- A bulldozer would be used to shape an estimated total of 350 BCY (at a radius of approximately 10 feet) around each of the affected cabins to a depth of 2 feet. Note: Design considerations may require additional effort to protect cabins during and after construction (e.g., shoring, sloping, foundation headers, or other means of protecting cabins).
- Brightly colored demarcation fabric would be placed over the entire area to be capped.
- An estimated 16,642 loose cubic yards of clean material would be imported to the site, stockpiled, and used to encapsulate the full extent of metals-impacted soil to a thickness of 2 feet. Note: The cost of this alternative may be significantly reduced if a local source of clean fill can be identified.
- Approximately 530 linear feet of silt fence would be installed along the western bank of the creek to prevent water-based erosion of the cap.
- Final grading and hydroseeding would occur throughout the entire disturbed area (approximately 4 acres) to restore the site.
- Biannual inspections would be conducted to evaluate whether the cap, signs, and/or BMPs have degraded or been damaged, and minor repairs would be made annually. Major repairs to the cap or BMPs would be necessary every 5 years.

[6] A determination regarding the specific trees to be protected will be made following discussions with all relevant stakeholders. Most trees at the site are Sierra lodge pole pines (*Pinus contorta var. murrayana*), with a lesser component of red and white fir (*Abies magnifica var. magnifica* and *Abies concolor*, respectively). All of these trees have long life cycles (300 years or more), with some Sierra lodge pole pines living upward of 600 years (Forest Service, 2019c).

Section 6. Conclusions and Recommendations

This section presents the conclusions and makes recommendations for further action based on the results of the supplemental characterization investigation. The purpose of this investigation was to (1) fully delineate the vertical and horizontal extent of contamination in the Cabins Area, (2) focus the analysis of risks to human health in the Cabins Area, and (3) evaluate removal action alternatives, incorporating all historical and new data for the Cabins Area.

6.1. CONCLUSIONS

The vertical and horizontal extent of arsenic and mercury contamination within the Cabins Area is considered adequately delineated (see Figure 11). The total estimated volume of material exceeding cleanup goals within the Cabins Area is 14,176 BCY. Note: This does not include any areas east of the creek (see Section 3.2).

The focused risk analysis concluded that, if no removal action were conducted, exposure of cabin occupants would need to be limited to 5 days per year to avoid unacceptable risks. Because these limitations were not considered realistic for current and future cabin occupants, hotspot removal areas targeting the highest concentrations of arsenic and mercury were established and evaluated in 13 risk scenarios. Nine risk scenarios resulted in low risk. Of these, Scenario 11 was the hotspot scenario included in the alternatives analysis because this scenario required removal of the least volume of soil, while maximizing the number of allowable days on site (182 days per year). As noted in Section 4.1, the focused risk analysis evaluated risks for the entire Cabins Area to be used to supplement previous risk evaluations and did not identify risks per cabin or per parcel. Thus, removal of hot spots identified in Scenario 11 is protective of human health for receptors exposed to the entire Cabins Area, not specific portions of the area.

Removal action alternatives were evaluated, including LUCs, encapsulation of contaminated areas, removal of hot spots, and complete removal of all impacted soil. Alternatives were evaluated for effectiveness, implementability, and relative cost. Table 4 summarizes the results of the comparative analysis.

All of the alternatives, except Alternative 1, met the effectiveness and implementability criteria and were qualitatively rated between “good,” “very good,” or “excellent” in each area. Alternative 2 was similar to Alternative 4A in terms of effectiveness, but significantly less costly. Alternatives 2, 3A, and 3B were similar in terms of implementability and cost. Alternative 4B was the most effective, but also the most costly.

Alternative 2 was preferable to Alternatives 3A or 3B, because it eliminates the exposure pathway to human health, thus it is more protective, although it is significantly more costly if a local borrow source for import fill cannot be identified. Alternative 2 was also preferable to Alternatives 4A and 4B because it meets the TCRA objectives at a much lower cost.

6.2. RECOMMENDATIONS

Based on the results of this study **Alternative 2, Minor Grading and Onsite Encapsulation with LUCs** is recommended to clean up soil contamination in the Cabins Area (see Figure 13). This recommendation is contingent on identifying a local borrow source for import fill material so that the overall costs of Alternative 2 are reduced to equivalent to or less costly than Alternatives 3A and 3B. If a local borrow source is not identified, Alternative 3B may become the recommended alternative.

As noted in Section 1, this study and its recommendations only apply to the Cabins Area and do not take into consideration the Mill Area or Diversion Ditch connecting the Mill Area to the creek. The Mill Area is the presumed source of metals-impacted soil in the Cabins Area and ideally would be addressed prior to completing work in the Cabins Area to avoid re-impacting the Cabins Area following completion of the TCRA. If waste piles and other source materials remain at the Mill Area during and after TCRA activities in the Cabins Area, it is likely that metals from the Mill Area will migrate downslope and be deposited in the Cabins Area; metals from the Mill Area and Diversion Ditch are also likely to migrate downstream within the Diversion Ditch to the creek.

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Figures

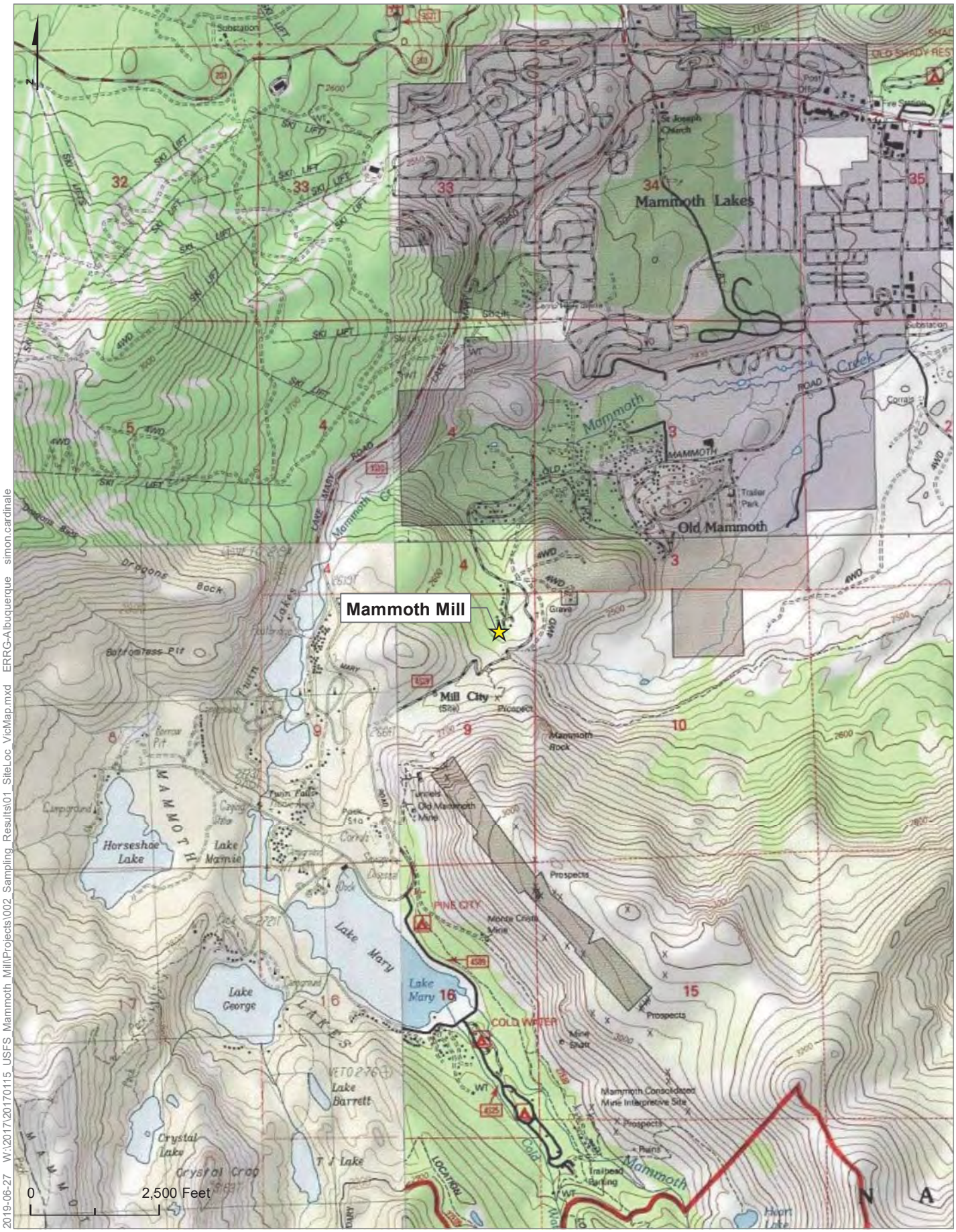

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Figure 1. Site Location and Vicinity Map

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

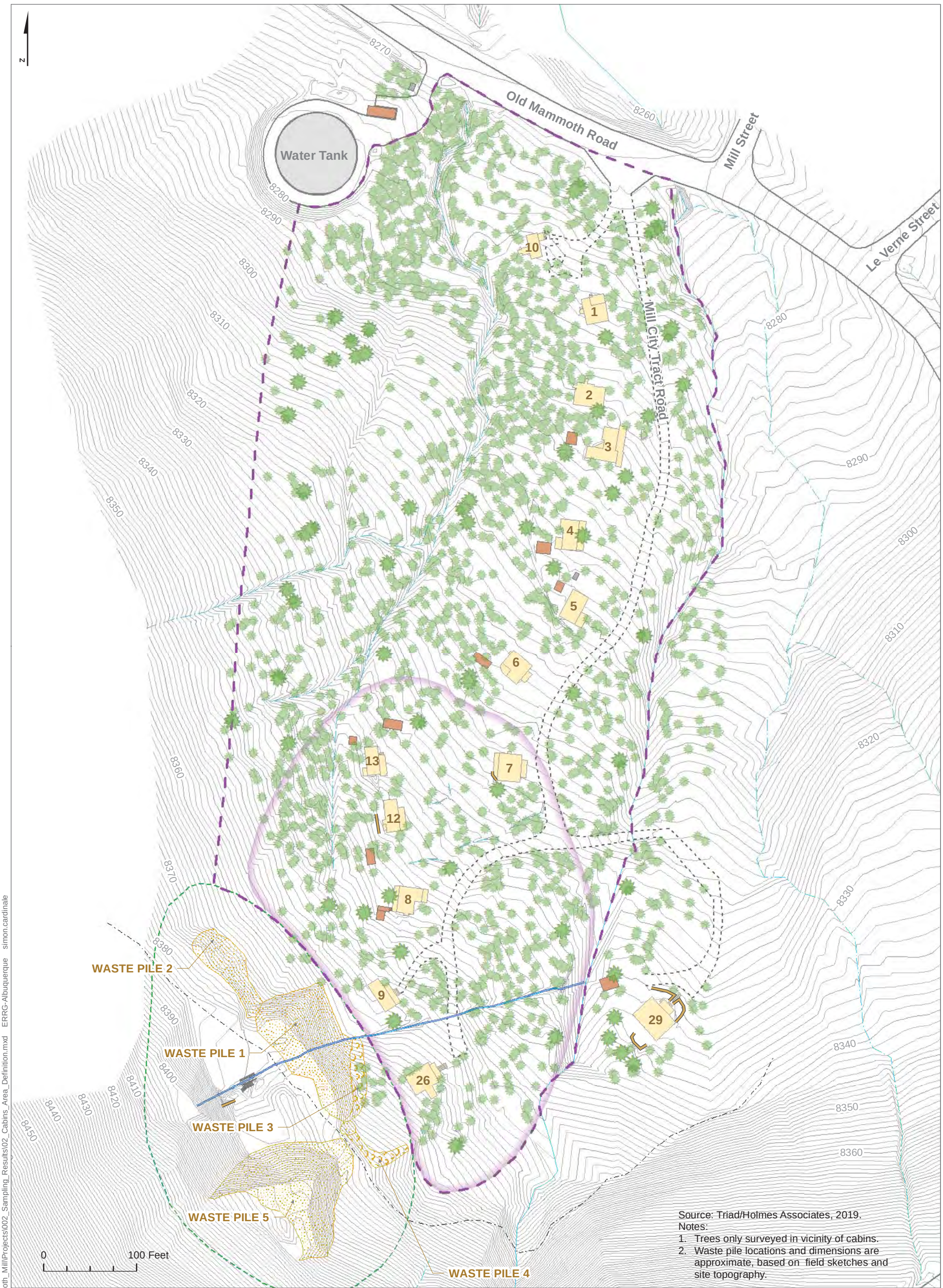

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Figure 2. Cabin Area Definition

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Inyo National Forest, Mono County, California

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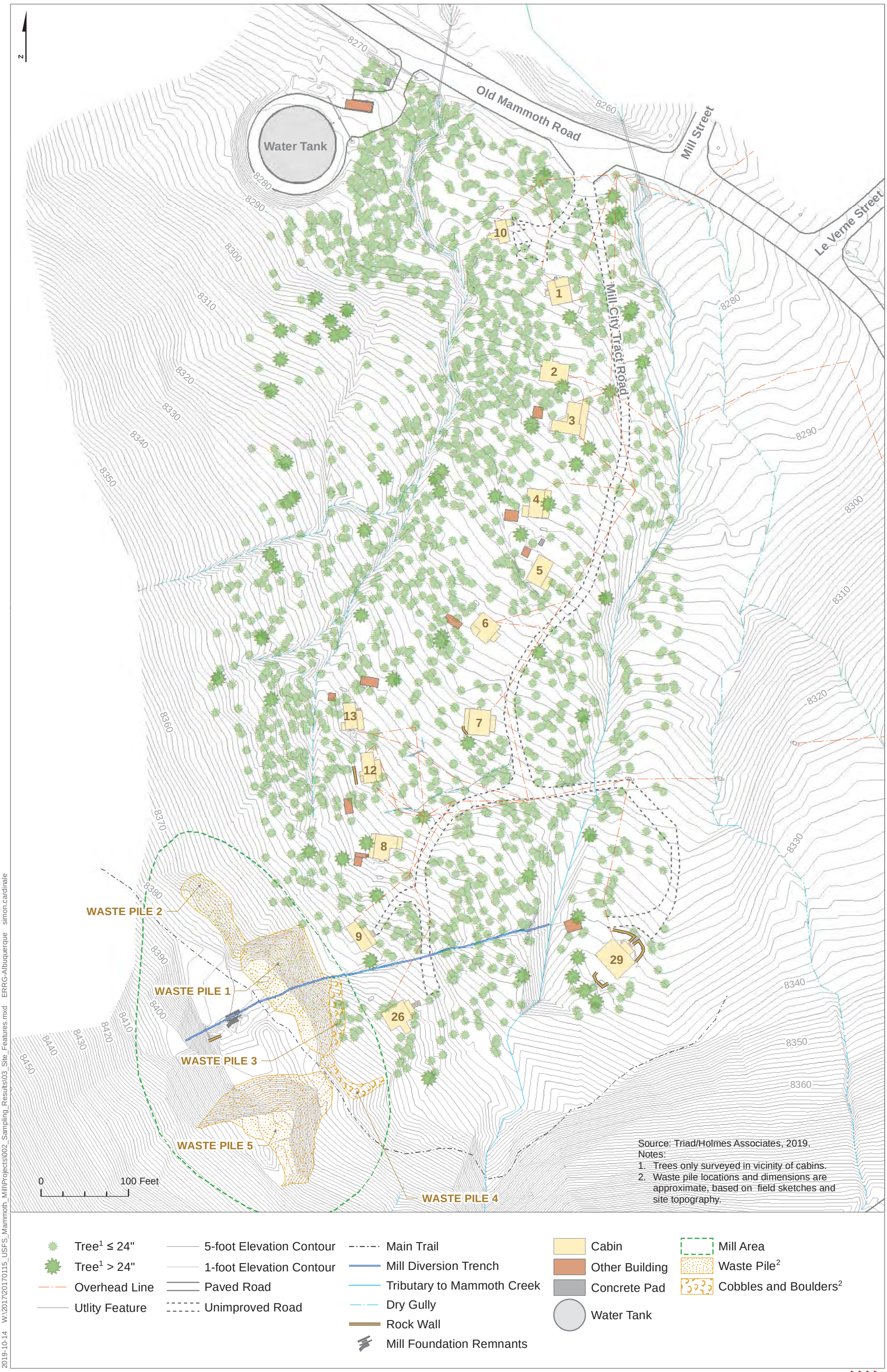

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Figure 3. Site Features

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

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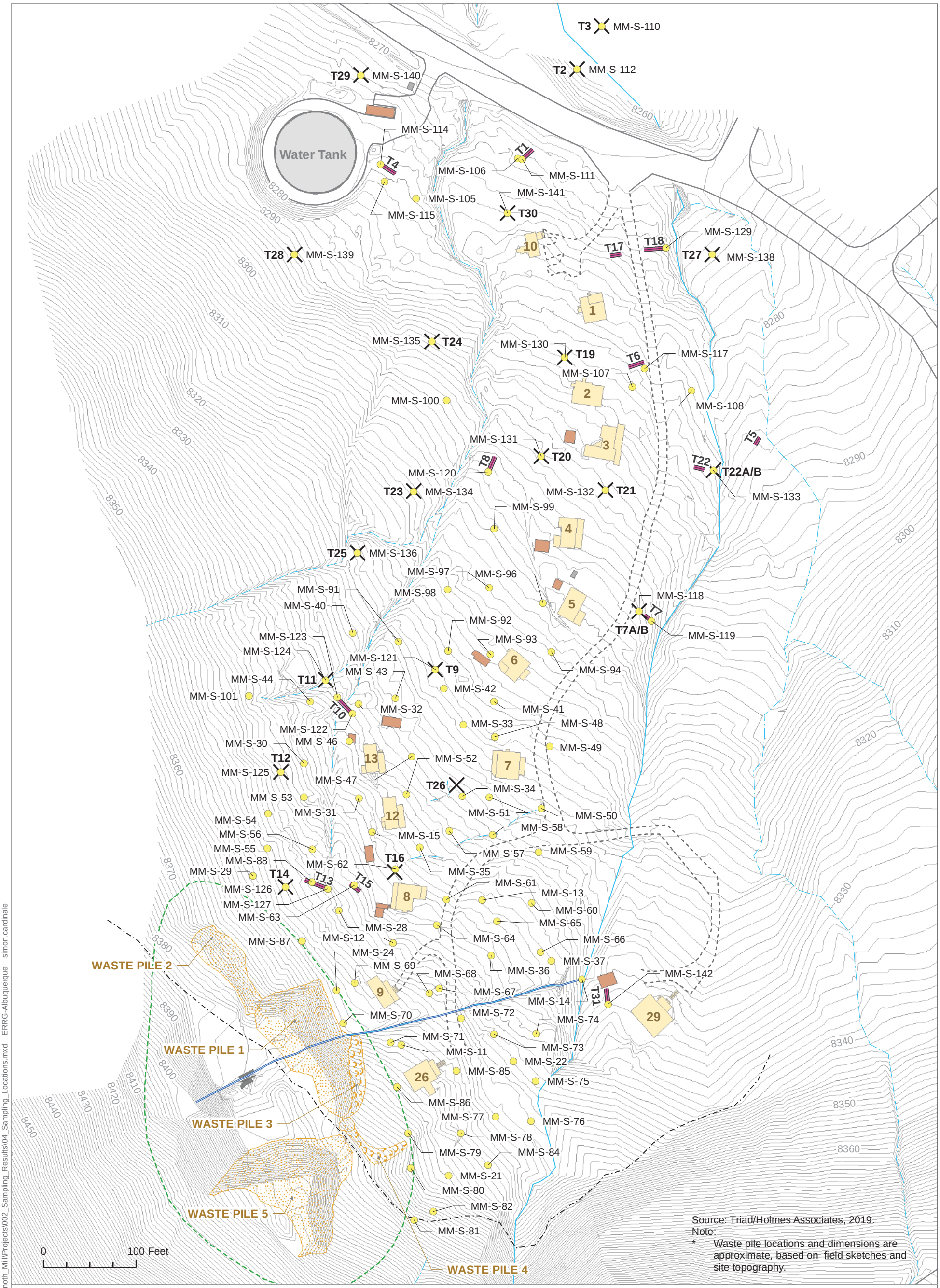

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Figure 4. Site Sampling Locations

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

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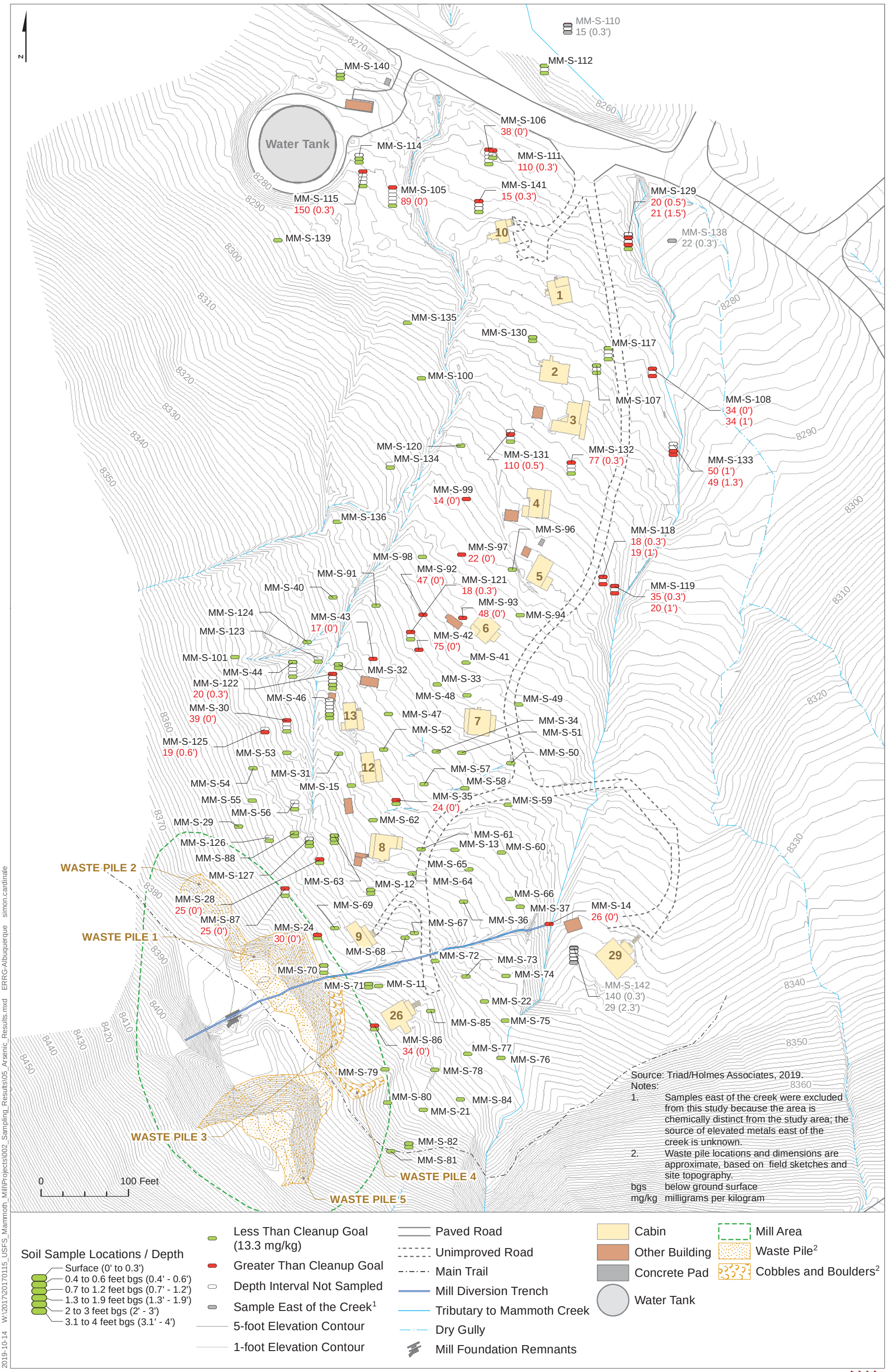

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Figure 5. Analytical Results for Arsenic Compared Against Cleanup Goals

Supplemental Characterization Report for the Cabins Area at Mammoth Mill

Inyo National Forest, Mono County, California

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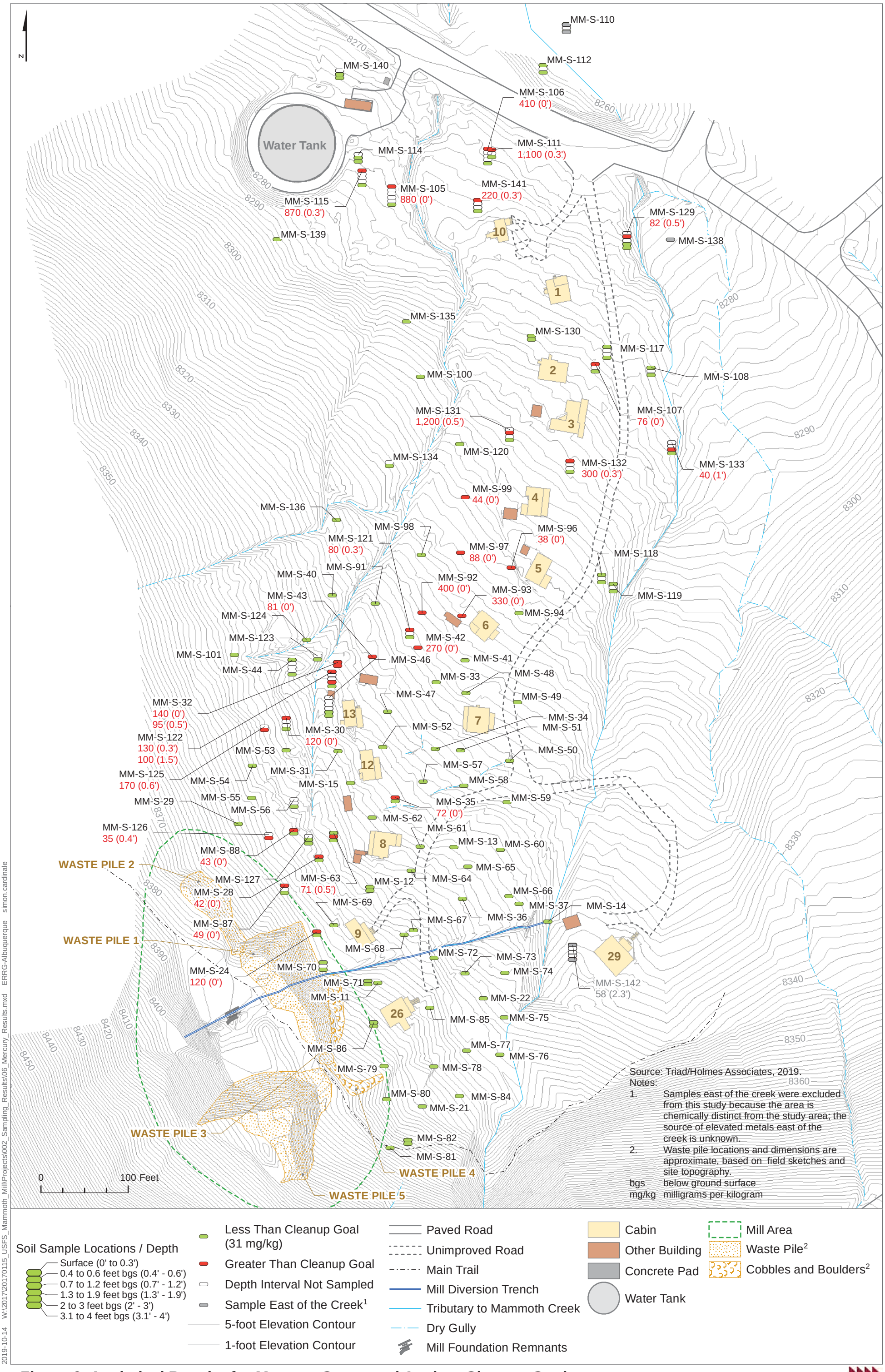

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Figure 6. Analytical Results for Mercury Compared Against Cleanup Goals

Supplemental Characterization Report for the Cabins Area at Mammoth Mill

Inyo National Forest, Mono County, California

ERRG

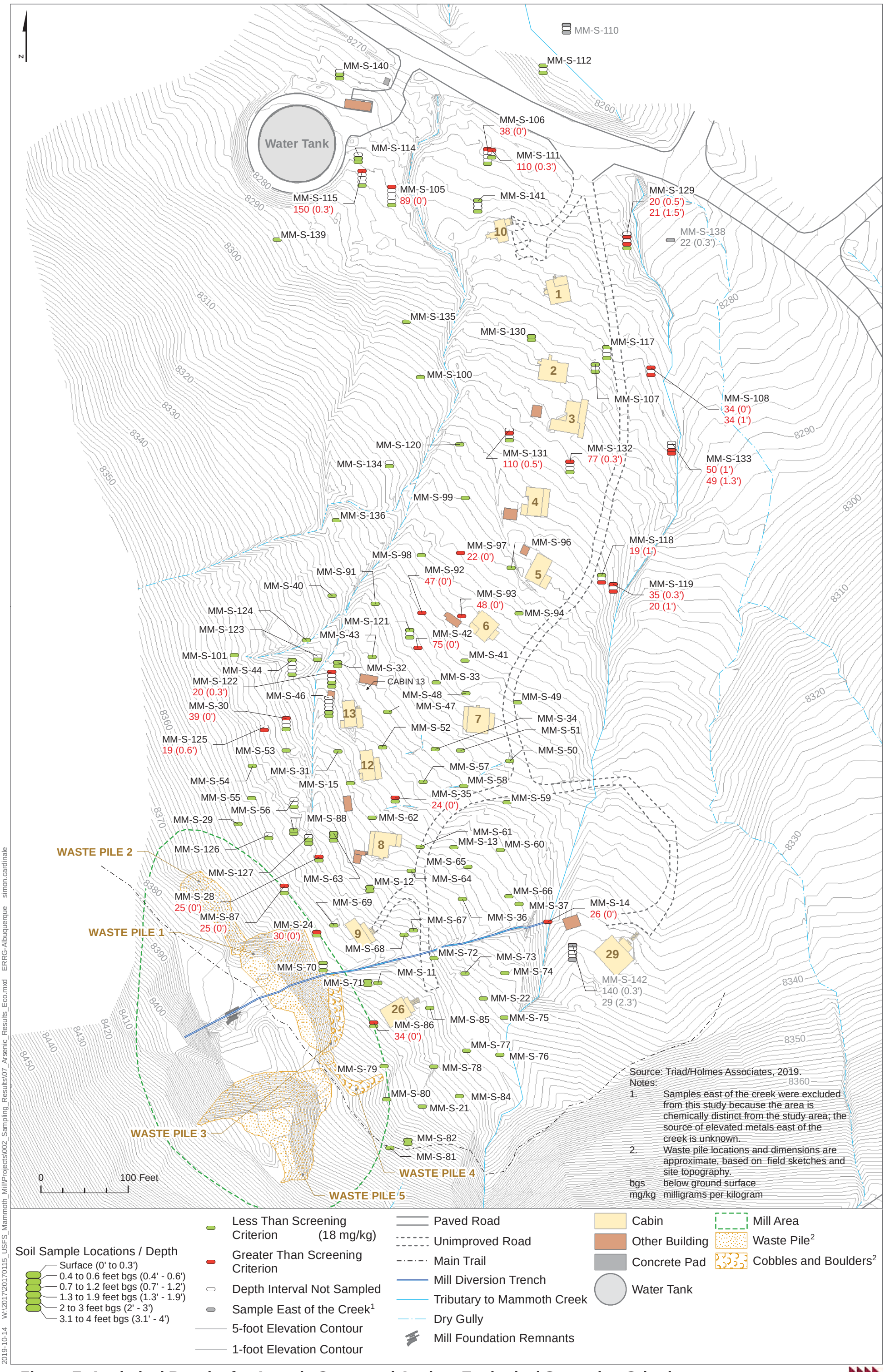

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Figure 7. Analytical Results for Arsenic Compared Against Ecological Screening Criteria

Supplemental Characterization Report for the Cabins Area at Mammoth Mill

Inyo National Forest, Mono County, California

ERRG

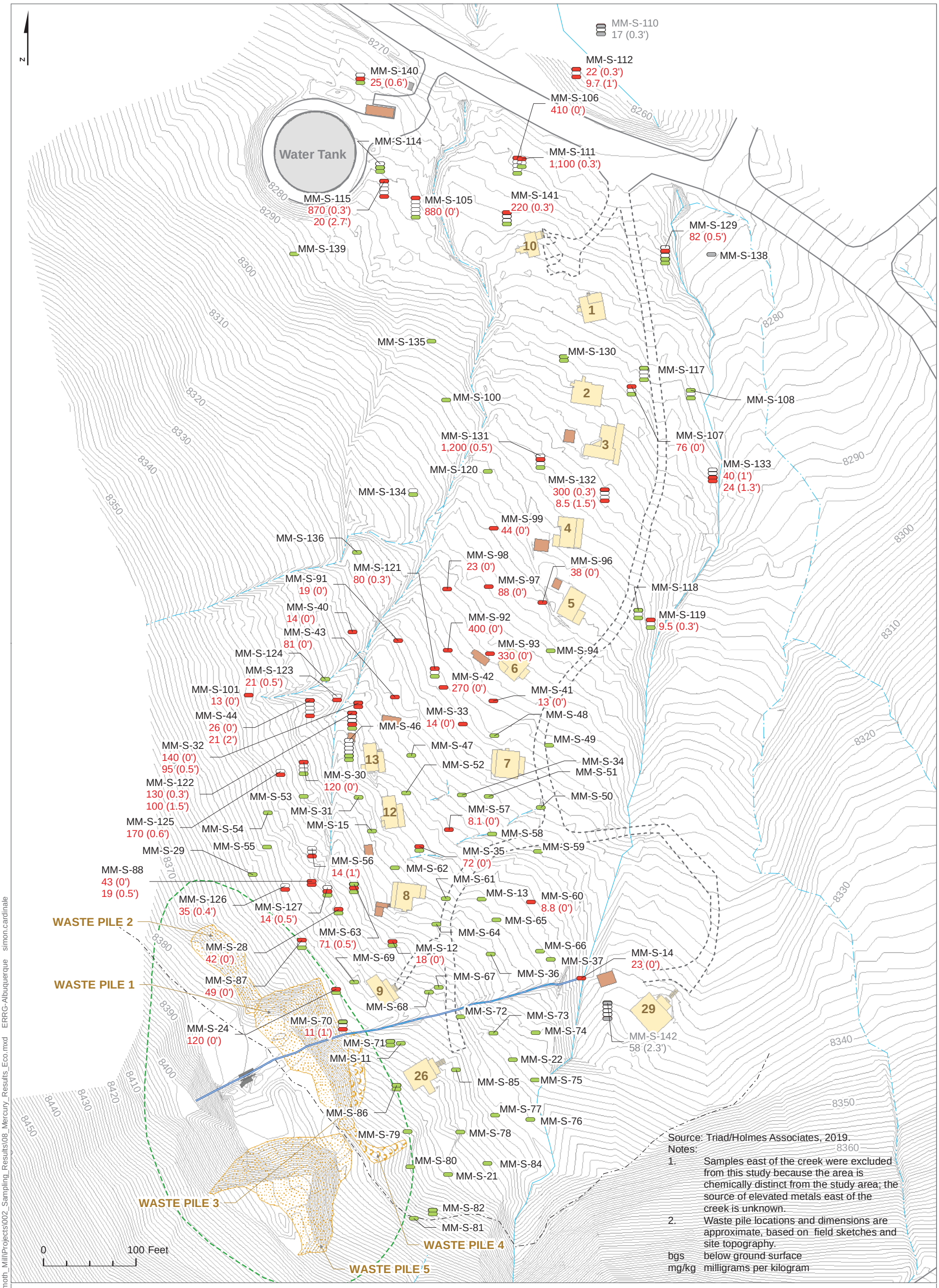

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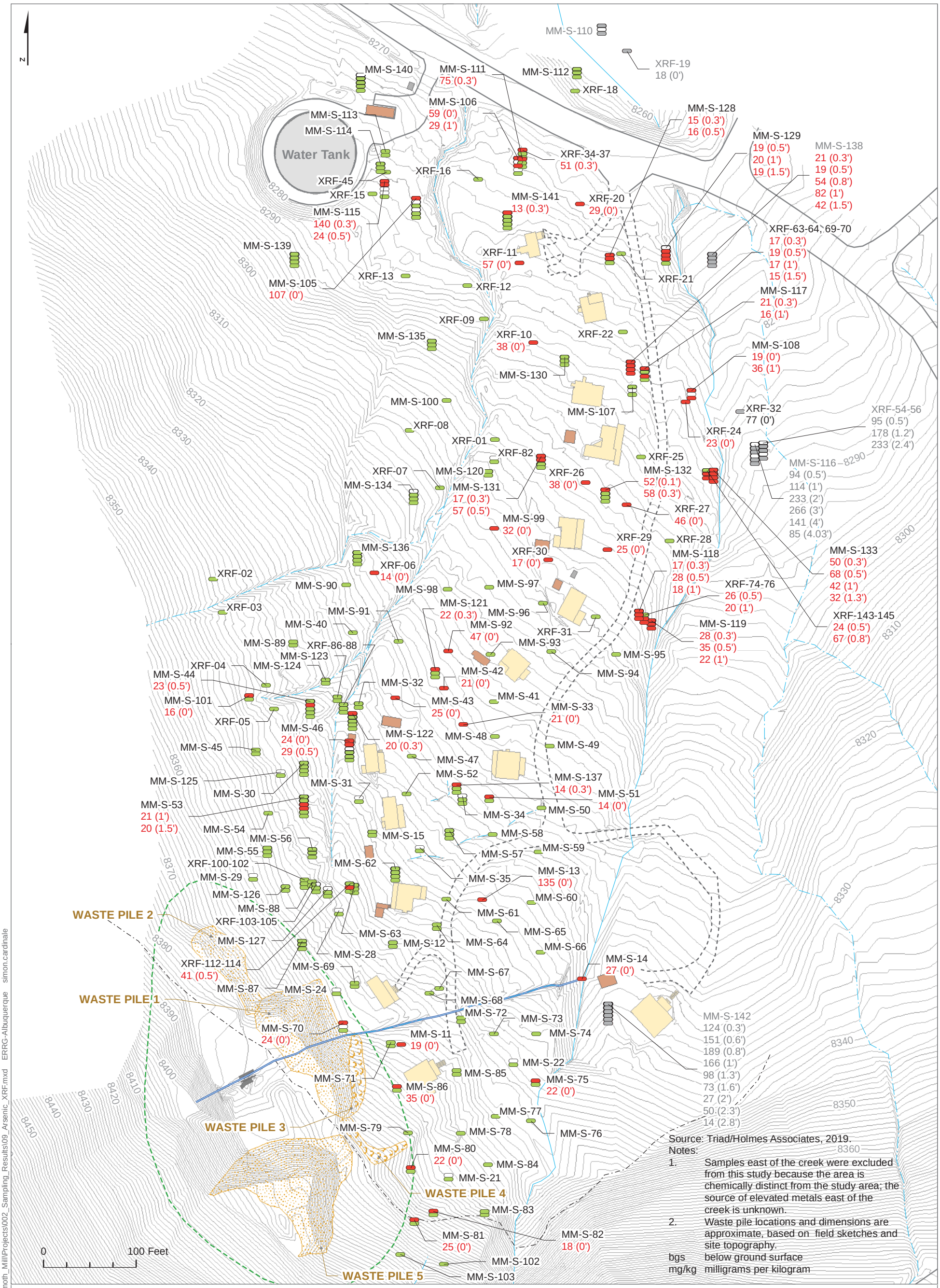
Figure 8. Analytical Results for Mercury Compared Against Ecological Screening Criteria

Supplemental Characterization Report for the Cabins Area at Mammoth Mill

Inyo National Forest, Mono County, California

ERRG



Source: Triad/Holmes Associates, 2019.

Notes:

1. Samples east of the creek were excluded from this study because the area is chemically distinct from the study area; the source of elevated metals east of the creek is unknown.
2. Waste pile locations and dimensions are approximate, based on field sketches and site topography.

bgs below ground surface
mg/kg milligrams per kilogram

Soil Sample Locations / Depth
- Surface (0' to 0.3')
- 0.4 to 0.6 feet bgs (0.4' - 0.6')
- 0.7 to 1.2 feet bgs (0.7' - 1.2')
- 1.3 to 1.9 feet bgs (1.3' - 1.9')
- 2 to 3 feet bgs (2' - 3')
- 3.1 to 4 feet bgs (3.1' - 4')

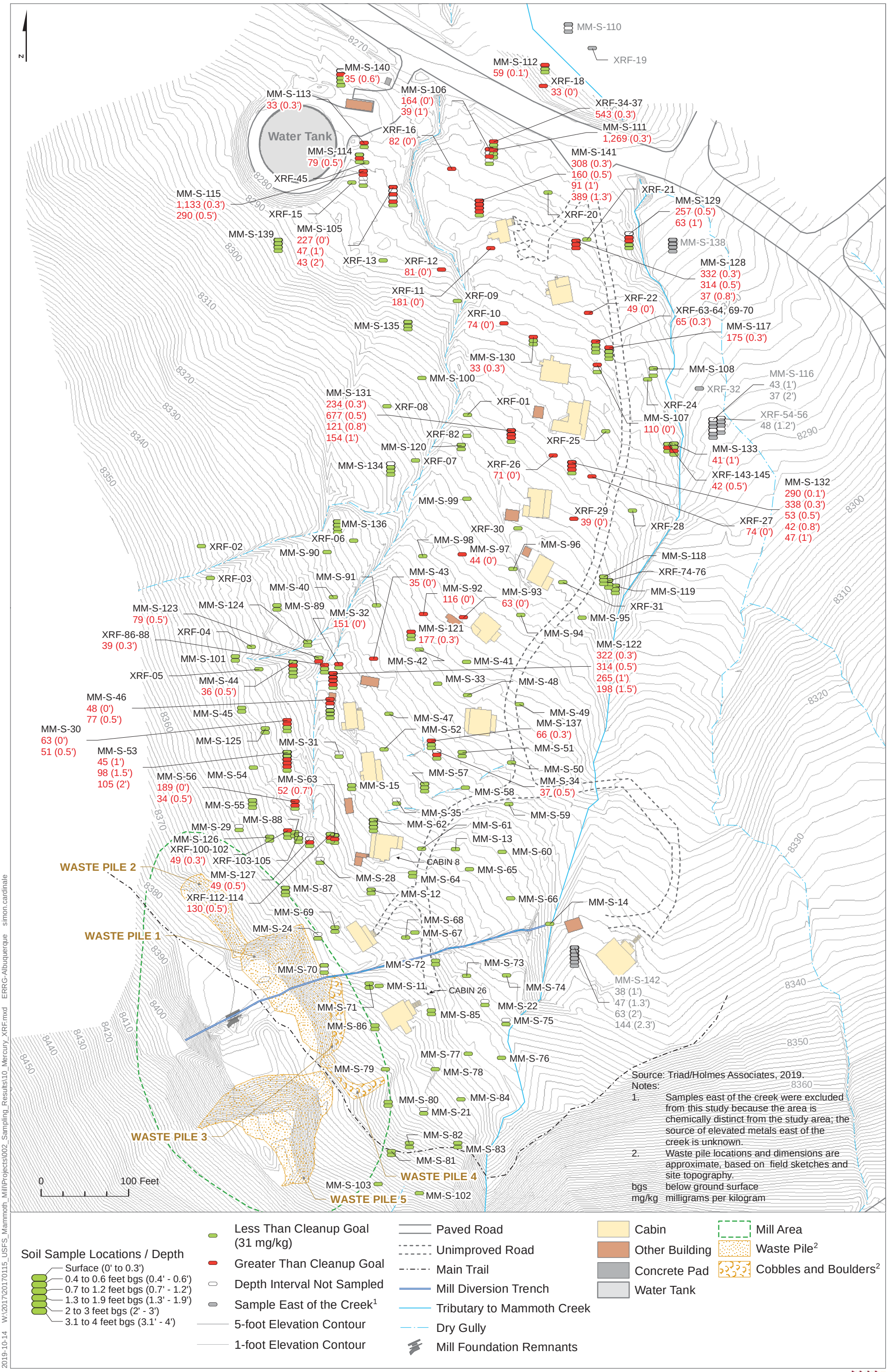
Less Than Cleanup Goal (13.3 mg/kg)
Greater Than Cleanup Goal
Depth Interval Not Sampled
Sample East of the Creek[1]
5-foot Elevation Contour
1-foot Elevation Contour
Paved Road
Unimproved Road
Main Trail
Mill Diversion Trench
Tributary to Mammoth Creek
Dry Gully
Mill Foundation Remnants
Cabin
Other Building
Concrete Pad
Water Tank
Mill Area
Waste Pile[2]
Cobbles and Boulders[2]

2019-10-14 W:\2017\20170115_USFS_Mammoth_Mill\Projects\002_Sampling_Results\09_Arsenic_XRF.mxd ERRG-Albuquerque simon.cardinale

Figure 9. X-Ray Fluorescence Screening Results for Arsenic

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

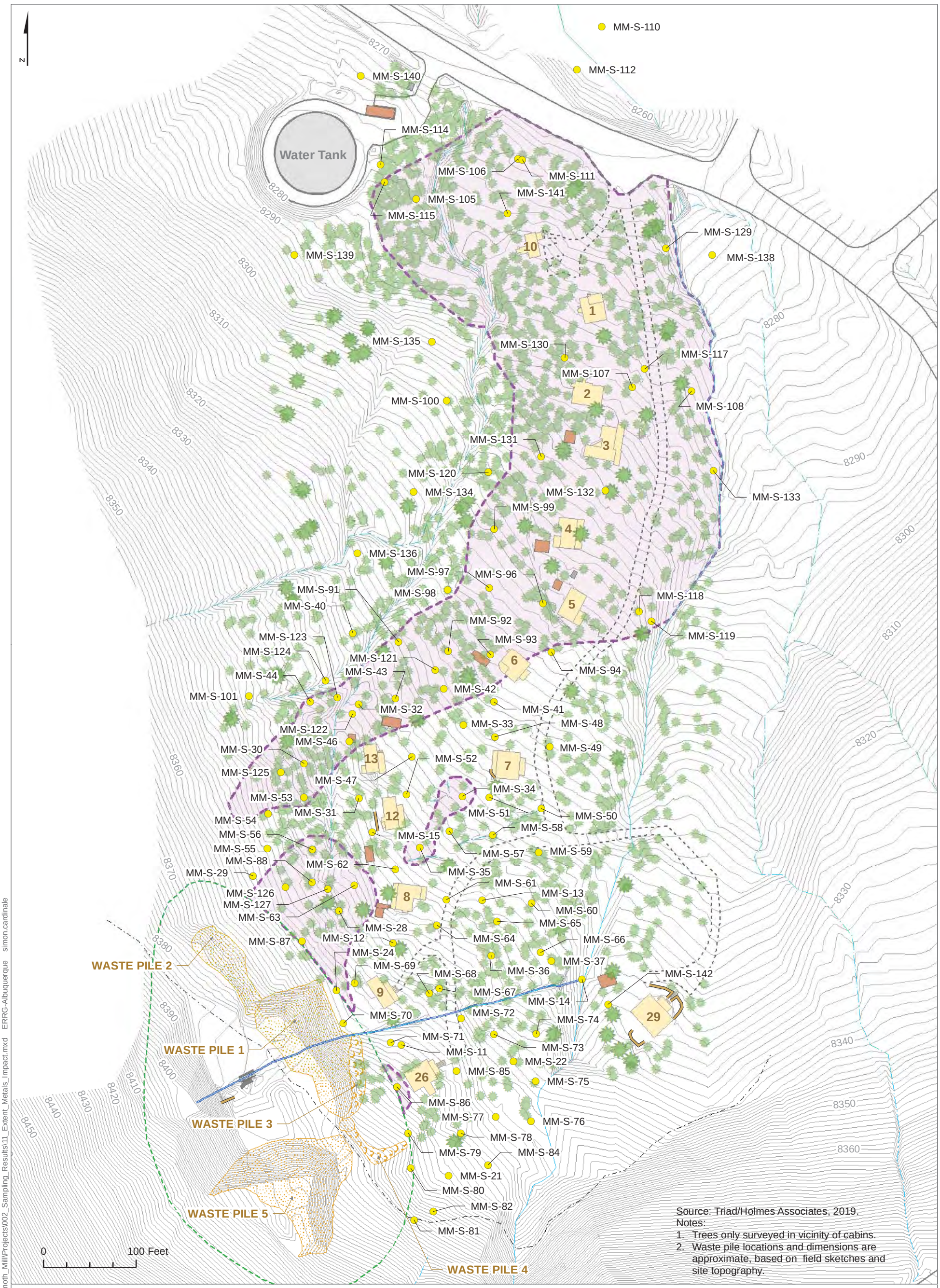


2019-10-14 W:\2017\20170115_USFS_Mammoth_Mill\Projects\002_Sampling_Results\10_Mercury_XRF.mxd ERRG-Albuquerque simon.cardinale

Figure 10. X-Ray Fluorescence Screening Results for Mercury

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG



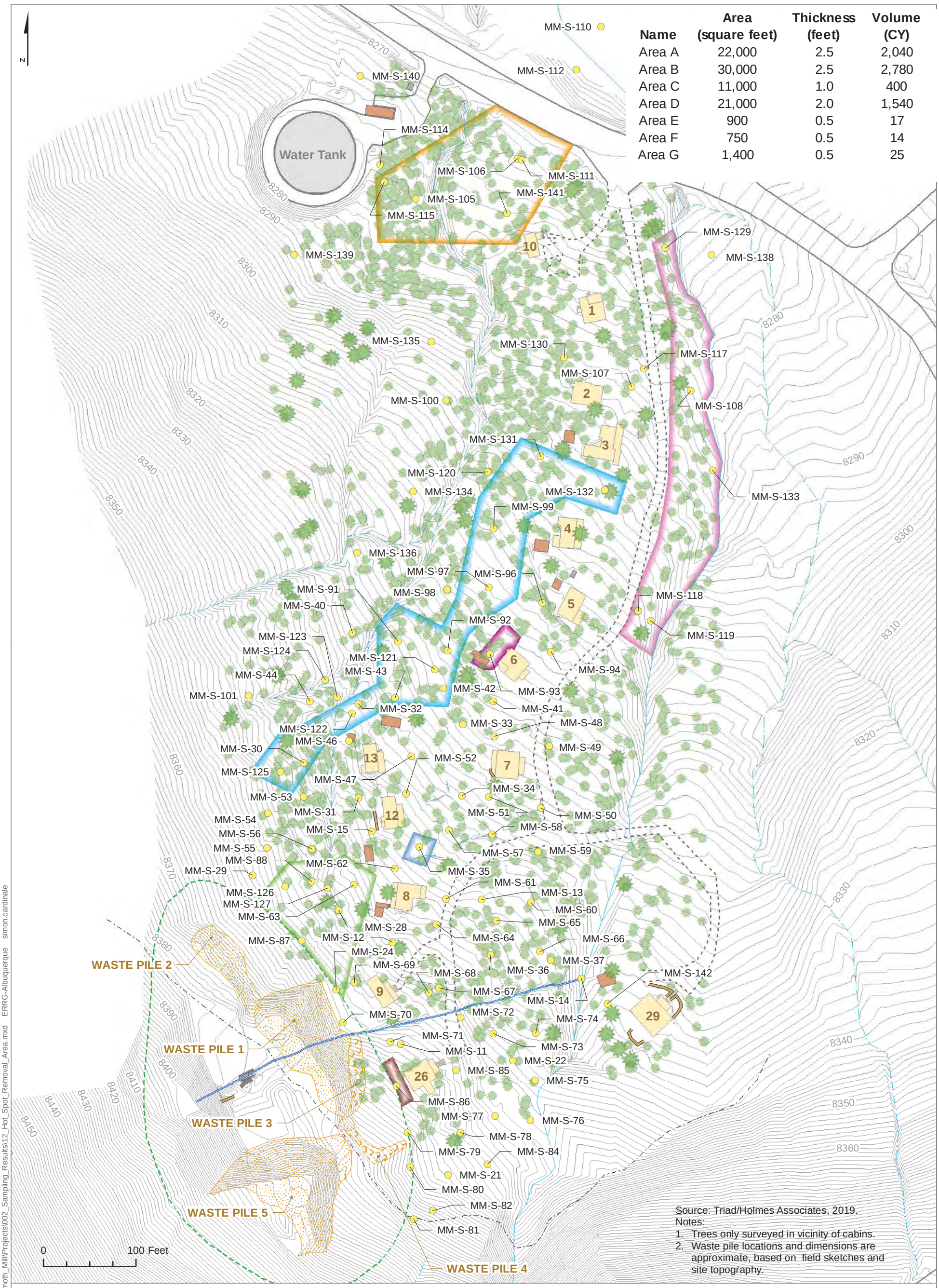
2019-10-14 W:\2017\20170115_USFS_Mammoth_Mill\Projects\002_Sampling_Results\11_Extent_Metals_Impact.mxd ERRG-Albuquerque simon.cardinale

Figure 11. Extent of Metals-Impacted Soil in Cabins Area

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

Name	Area (square feet)	Thickness (feet)	Volume (CY)
Area A	22,000	2.5	2,040
Area B	30,000	2.5	2,780
Area C	11,000	1.0	400
Area D	21,000	2.0	1,540
Area E	900	0.5	17
Area F	750	0.5	14
Area G	1,400	0.5	25

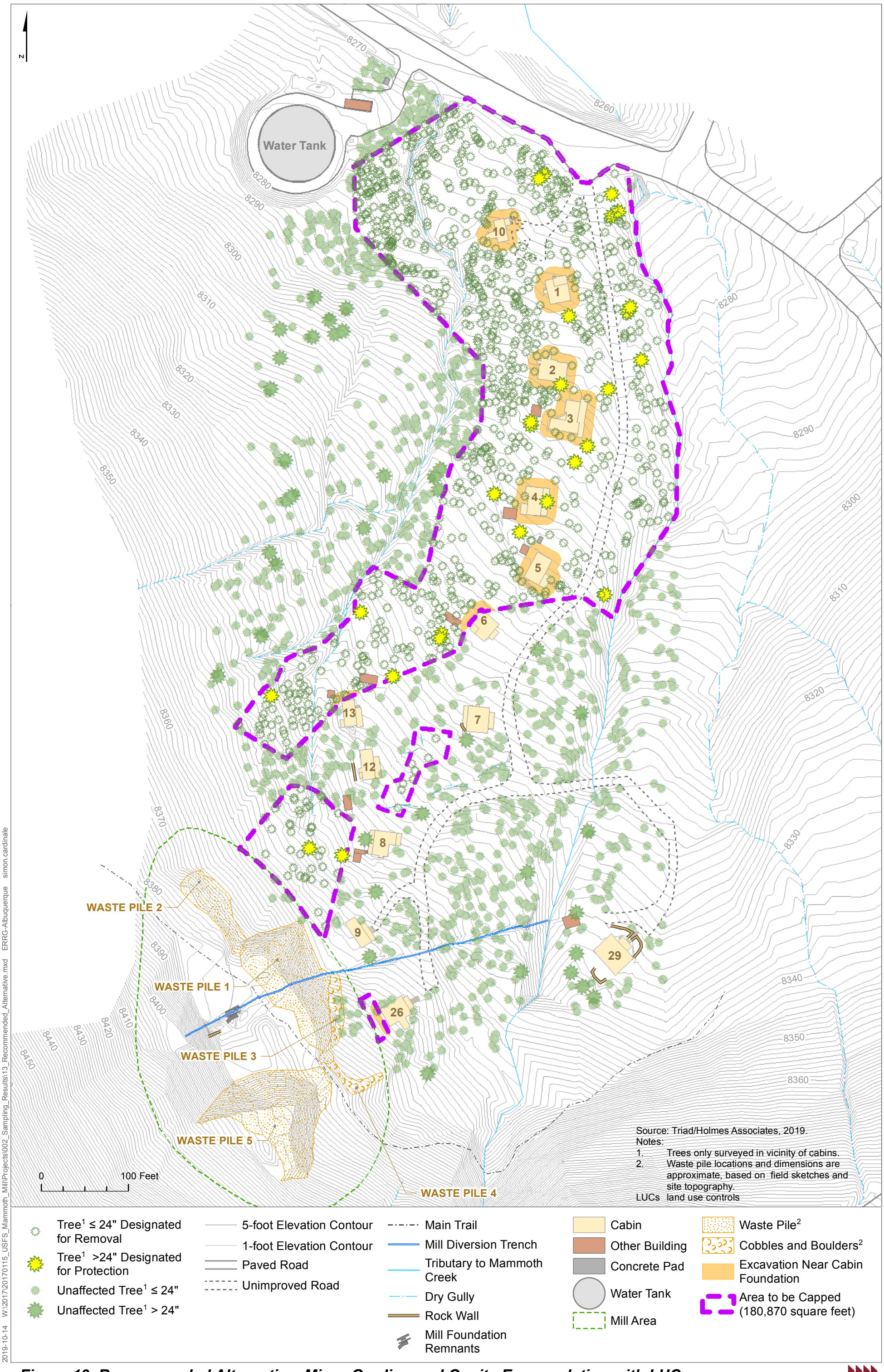


2019-10-14 W:\2017\20170115_USFS_Mammoth_Mill\Projects\002_Sampling_Results\12_Hot_Spot_Removal_Area.mxd ERRG-Albuquerque simon.cardinale

Figure 12. Hotspot Removal Areas

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG



2019-10-14 W:\2017\2017\0115_USFS_Mammoth_Mill\Projects\002_Sampling_Results\13_Recommended_Alternative.mxd ERRG-Albuquerque simon.cardinale

Figure 13. Recommended Alternative, Minor Grading and Onsite Encapsulation with LUCs

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

Tables

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals

Trench No. and End		XRF Sample ID No.	Laboratory Sample ID No.[1]	Laboratory Sample Date	Arsenic Results (mg/kg)		Mercury Results (mg/kg)	
No.	End				XRF[3]	Laboratory	XRF[2]	Laboratory
				Cleanup Goal (mg/kg):	*13.3*		*31*	
--	--	MM-S-11-0.0	MM-S-11-0.0	7/31/2014	**19.2**	4.4	14.4	0.98
--	--	MM-S-12-0.0	MM-S-12-0.0	7/31/2014	9	9.1	30	18
--	--	MM-S-12-0.5	MM-S-12-0.5	10/11/2017	ND	3.8	ND	0.79
--	--	MM-S-13-0.0	MM-S-13-0.0	7/31/2014	**135**	4.0	27	3.9
--	--	MM-S-14-0.0[4]	MM-S-14-0.0[4]	7/31/2014	**27**	**26**	21.8	23
--	--	MM-S-15-0.0	MM-S-15-0.0	7/31/2014	ND	3.3	ND	0.54
--	--	MM-S-15-0.5	--	10/11/2017	ND	--	ND	--
--	--	--	MM-S-21-0.0	6/3/2015	--	6.4	--	0.77
--	--	MM-S-21-0.5	--	10/10/2017	ND	--	ND	--
--	--	--	MM-S-22-0.0	6/3/2015	--	4.6	--	0.58
--	--	MM-S-22-0.5	--	10/10/2017	ND	--	ND	--
--	--	--	MM-S-24-0.0	6/3/2015	--	**30**	--	**120**
--	--	MM-S-24-0.5	MM-S-24-0.5	10/11/2017	ND	3.4	ND	2
--	--	--	MM-S-28-0.0	6/3/2015	--	**25**	--	**42**
--	--	MM-S-28-0.5	MM-S-28-0.5	10/10/2017	ND	5.2	ND	2
--	--	--	MM-S-29-00	6/3/2015	--	4.6	--	2.1
--	--	MM-S-29-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-30-00	MM-S-30-00	6/3/2015	ND	**39**	**63**	**120**
--	--	MM-S-30-0.5	--	10/11/2017	ND	--	**51**	--
--	--	MM-S-30-1.0	--	10/11/2017	ND	--	25	--
--	--	MM-S-30-1.5	MM-S-30-1.5	10/11/2017	ND	4.9	ND	3.1
--	--	--	MM-S-31-0.0	6/3/2015	--	3.1	--	0.88
--	--	MM-S-31-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-32-0.0	MM-S-32-0.0	6/3/2015	ND	10	**151**	**140**
--	--	MM-S-32-0.5	MM-S-32-0.5	10/11/2017	ND	9	ND	**95**
--	--	MM-S-33-0.0	MM-S-33-0.0	6/3/2015	**21**	8.4	ND	14
--	--	--	MM-S-34-0.0	6/3/2015	--	6.8	--	4
--	--	MM-S-34-0.5	--	10/11/2017	ND	--	**37**	--
--	--	MM-S-34-1.0	--	10/11/2017	ND	--	ND	--
--	--	--	MM-S-35-0.0	6/3/2015	--	**24**	--	**72**
--	--	MM-S-35-0.5	MM-S-35-0.5	10/11/2017	ND	5.6	ND	3.2 H
--	--	--	MM-S-36-0.0	6/3/2015	--	4.3	--	0.62
--	--	--	MM-S-37-0.0	6/3/2015	--	6.4	--	2
--	--	MM-S-40-00	MM-S-40-00	10/9/2017	12.8	4.3	13.9	14
--	--	MM-S-41-00	MM-S-41-00	10/9/2017	ND	6.8	ND	13
--	--	MM-S-42-00	MM-S-42-00	10/9/2017	**21**	**75**	19	**270 H**
--	--	MM-S-43-00	MM-S-43-00	10/9/2017	**25**	**17**	**35**	**81 H**
--	--	MM-S-44-00	MM-S-44-00	10/9/2017	ND	11	21	26 H
--	--	MM-S-44-0.5	--	10/11/2017	**23**	--	**36**	--
--	--	MM-S-44-1.0	--	10/11/2017	ND	--	23	--
--	--	MM-S-44-1.5	--	10/11/2017	ND	--	22	--
--	--	MM-S-44-2.0	MM-S-44-2.0	10/11/2017	ND	4.3	ND	21
--	--	MM-S-45-00	--	10/9/2017	ND	--	5	--
--	--	MM-S-45-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-46-00	--	10/13/2017	**24**	--	**48**	--
--	--	MM-S-46-0.5	--	10/13/2017	**29**	--	**77**	--
--	--	MM-S-46-1.5	--	10/13/2017	ND	--	22	--
--	--	MM-S-46-2.0	MM-S-46-2.0	10/11/2017	ND	3.9	23	2.7
--	--	MM-S-46-3.8[5]	MM-S-46-3.8	10/13/2017	13	7	ND	0.77
--	--	MM-S-47-00	MM-S-47-00	10/9/2017	ND	8	ND	0.92
--	--	MM-S-48-00	MM-S-48-00	10/9/2017	ND	5.1	ND	0.93
--	--	MM-S-49-00	MM-S-49-00	10/9/2017	ND	6.7	ND	0.83
--	--	MM-S-50-00	MM-S-50-00	10/9/2017	ND	6.4	ND	1.4
--	--	MM-S-51-00	MM-S-51-00	10/9/2017	**14**	4.5	ND	5
--	--	MM-S-51-0.5	MM-S-51-0.5	10/10/2017	ND	--	ND	--
--	--	MM-S-52-00	MM-S-52-00	10/9/2017	ND	5	ND	4.3
--	--	MM-S-53-00	MM-S-53-00	10/9/2017	ND	5.2	ND	7.4

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals *(continued)*

Trench No. and End		XRF Sample ID No.	Laboratory Sample ID No.[1]	Laboratory Sample Date	Arsenic Results (mg/kg)		Mercury Results (mg/kg)	
No.	End				XRF[3]	Laboratory	XRF[2]	Laboratory
				Cleanup Goal (mg/kg):	*13.3*		*31*	
--	--	MM-S-53-0.5	--	10/11/2017	ND	--	12	--
--	--	MM-S-53-1.0	--	10/11/2017	**21**	--	**45**	--
--	--	MM-S-53-1.5	--	10/11/2017	**20**	--	**98**	--
--	--	MM-S-53-2.0	--	10/11/2017	ND	--	**105**	--
--	--	MM-S-53-2.5	--	10/13/2017	ND	--	ND	--
--	--	MM-S-53-4.0	--	10/13/2017	ND	--	ND	--
--	--	MM-S-54-00	MM-S-54-00	10/9/2017	ND	4.4	ND	1.2
--	--	MM-S-55-00	MM-S-55-00	10/9/2017	ND	4.3	ND	4.6
--	--	MM-S-55-0.5	--	10/10/2017	ND	--	25	--
--	--	MM-S-55-1.0	--	10/10/2017	ND	--	ND	--
--	--	MM-S-56-00	--	10/9/2017	ND	--	**189**	--
--	--	MM-S-56-0.5	--	10/10/2017	ND	--	**34**	--
--	--	MM-S-56-1.0	MM-S-56-1.0	10/10/2017	ND	5.6	ND	14
--	--	MM-S-57-00	MM-S-57-00	10/9/2017	ND	6.2	ND	8.1
--	--	MM-S-57-0.5	--	10/10/2017	ND	--	26	--
--	--	MM-S-57-1.0	--	10/10/2017	ND	--	ND	--
--	--	MM-S-58-00	MM-S-58-00	10/9/2017	ND	9.4	ND	3.8
--	--	MM-S-59-00	MM-S-59-00	10/9/2017	ND	6.1	ND	2.8
--	--	MM-S-60-00	MM-S-60-00	10/9/2017	ND	12	ND	8.8
--	--	MM-S-61-00	MM-S-61-00	10/9/2017	ND	4.7	ND	0.95
--	--	MM-S-62-00	MM-S-62-00	10/9/2017	ND	6.7	ND	3.8
--	--	MM-S-63-00	MM-S-63-00	10/9/2017	ND	3.5	ND	2.9
--	--	MM-S-63-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-64-00	MM-S-64-00	10/9/2017	ND	3.8	ND	1.4
--	--	MM-S-64-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-65-00	MM-S-65-00	10/9/2017	ND	5.1	ND	3.6
--	--	MM-S-66-00	MM-S-66-00	10/9/2017	ND	5	ND	0.95
--	--	MM-S-67-00	MM-S-67-00	10/10/2017	ND	11	ND	0.57
--	--	MM-S-68-00	MM-S-68-00	10/10/2017	ND	7.8	ND	4.3
--	--	MM-S-69-00	MM-S-69-00	10/10/2017	ND	7.4	ND	5.6
--	--	MM-S-69-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-70-00	MM-S-70-00	10/10/2017	**24**	10	ND	7.9
--	--	MM-S-70-1.0	MM-S-70-1.0	10/10/2017	ND	7	ND	11
--	--	MM-S-71-00	MM-S-71-00	10/10/2017	ND	3.8	15	1.5
--	--	MM-S-71-0.5	MM-S-71-0.5	10/10/2017	ND	2.6	ND	0.42
--	--	MM-S-72-00	MM-S-72-00	10/10/2017	ND	4.9	ND	1.2
--	--	MM-S-72-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-73-00	MM-S-73-00	10/10/2017	ND	5.6	ND	1.3
--	--	MM-S-74-00	MM-S-74-00	10/10/2017	ND	6.2	ND	0.44
--	--	MM-S-75-00	MM-S-75-00	10/10/2017	**22**	7.5	NR	0.61
--	--	MM-S-75-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-76-00	MM-S-76-00	10/10/2017	ND	12	ND	0.76
--	--	MM-S-77-00	MM-S-77-00	10/10/2017	ND	2.1	ND	0.84
--	--	MM-S-78-00	MM-S-78-00	10/10/2017	ND	5.5	ND	1.5
--	--	MM-S-79-00	MM-S-79-00	10/10/2017	ND	3.9	ND	0.29
--	--	MM-S-80-00	MM-S-80-00	10/10/2017	**22**	4.5	ND	8
--	--	MM-S-80-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-81-00	MM-S-81-00	10/10/2017	**25**	8.7	ND	2.1
--	--	MM-S-81-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-82-00	MM-S-82-00	10/10/2017	**18**	6.1	ND	0.22
--	--	MM-S-82-0.5	MM-S-82-0.5	10/10/2017	ND	11	ND	0.2
--	--	MM-S-83-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-83-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-84-00	MM-S-84-00	10/10/2017	ND	9.1	ND	3
--	--	MM-S-85-00	MM-S-85-00	10/10/2017	ND	6.8	ND	2.8
--	--	MM-S-85-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-86-00	MM-S-86-00	10/10/2017	**35**	**34**	12	3.6
--	--	MM-S-86-0.5	MM-S-86-0.5	10/10/2017	ND	11	ND	1.4

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals *(continued)*

Trench No. and End		XRF Sample ID No.	Laboratory Sample ID No.[1]	Laboratory Sample Date	Arsenic Results (mg/kg)		Mercury Results (mg/kg)	
No.	End				XRF[3]	Laboratory	XRF[2]	Laboratory
				Cleanup Goal (mg/kg):	*13.3*		*31*	
--	--	MM-S-87-00	MM-S-87-00	10/10/2017	ND	**25**	22	**49**
--	--	MM-S-87-0.5	--	10/10/2017	ND	--	15	--
--	--	MM-S-87-1.0	MM-S-87-1.0	10/10/2017	ND	4.5	ND	7.3
--	--	MM-S-88-00	MM-S-88-00	10/10/2017	ND	9.5	12	**43**
--	--	MM-S-88-0.5	MM-S-88-0.5	10/10/2017	ND	6.7	ND	19 H
--	--	MM-S-89-00	--	10/11/2017	ND	--	ND	--
--	--	MM-S-89-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-90-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-91-00	MM-S-91-00	10/10/2017	ND	10	ND	19 H
--	--	MM-S-92-00	MM-S-92-00	10/10/2017	**47**	**47**	**116**	**400**
--	--	MM-S-93-00	MM-S-93-00	10/10/2017	ND	**48**	**63**	**330**
--	--	MM-S-94-00	MM-S-94-00	10/10/2017	ND	5.9	20	5.7
--	--	MM-S-95-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-96-00	MM-S-96-00	10/10/2017	ND	11	16	**38**
--	--	MM-S-97-00	MM-S-97-00	10/10/2017	ND	**22**	**44**	**88**
--	--	MM-S-98-00	MM-S-98-00	10/10/2017	ND	8	ND	23
--	--	MM-S-99-00	MM-S-99-00	10/10/2017	**32**	**14**	ND	**44**
--	--	MM-S-100-00	MM-S-100-00	10/10/2017	ND	4.1	ND	6
--	--	MM-S-101-00	MM-S-101-00	10/10/2017	**16**	6.8	ND	13
--	--	MM-S-101-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-102-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-103-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-105-00[6]	MM-S-105-00[6]	10/13/2017	**107**	**89**	**227**	**880**
--	--	MM-S-105-1.0[6]	--	10/13/2017	ND	--	**47**	--
--	--	MM-S-105-2.0[6]	--	10/13/2017	ND	--	**43**	--
--	--	MM-S-105-3.0[6]	--	10/13/2017	ND	--	ND	--
--	--	MM-S-105-3.5[6]	MM-S-105-3.5[6]	10/13/2017	ND	7.3	ND	1.1
--	--	MM-S-106-00[6]	MM-S-106-00[6]	10/13/2017	**59**	**38**	**164**	**410**
--	--	MM-S-106-1.0[6]	--	10/13/2017	**29**	--	**39**	--
--	--	MM-S-106-2.0[6]	MM-S-106-2.0[6]	10/13/2017	ND	4.5	ND	1.4
--	--	MM-S-107-00[6]	MM-S-107-00[6]	10/13/2017	ND	11	**110**	**76**
--	--	MM-S-107-1.0[6]	MM-S-107-1.0[6]	10/13/2017	ND	3.6	ND	1
--	--	MM-S-108-00[6]	MM-S-108-00[6]	10/13/2017	**19**	**34**	ND	1.6
--	--	MM-S-108-1.0[6]	MM-S-108-1.0[6]	10/13/2017[7]	**36**	**34**	ND	1.1 H
--	--	XRF-01-0.0	--	10/10/2017	ND	--	30	--
--	--	XRF-02-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-03-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-04-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-05-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-06-0.0	--	10/11/2017	**14**	--	13.6	--
--	--	XRF-07-0.0	--	10/11/2017	ND	--	30	--
--	--	XRF-08-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-09-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-10-0.0	--	10/11/2017	**38**	--	**74**	--
--	--	XRF-11-0.0	--	10/11/2017	**57**	--	**181**	--
--	--	XRF-12-0.0	--	10/11/2017	ND	--	**81**	--
--	--	XRF-13-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-15-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-16-0.0	--	10/11/2017	ND	--	**82**	--
--	--	XRF-18-0.0	--	10/11/2017	ND	--	**33**	--
--	--	XRF-19-0.0	--	10/11/2017	**18**	--	ND	--
--	--	XRF-20-0.0	--	10/11/2017	**29**	--	24	--
--	--	XRF-21-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-22-0.0	--	10/11/2017	ND	--	**49**	--
--	--	XRF-24-0.0	--	10/11/2017	**23**	--	ND	--
--	--	XRF-25-0.0	--	10/11/2017	ND	--	17	--

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals *(continued)*

Trench No. and End		XRF Sample ID No.	Laboratory Sample ID No.[1]	Laboratory Sample Date	Arsenic Results (mg/kg)		Mercury Results (mg/kg)	
No.	End				XRF[3]	Laboratory	XRF[2]	Laboratory
				Cleanup Goal (mg/kg):	*13.3*		*31*	
--	--	XRF-26-0.0	--	10/11/2017	**38**	--	**71**	--
--	--	XRF-27-0.0	--	10/11/2017	**46**	--	**74**	--
--	--	XRF-28-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-29-0.0	--	10/11/2017	**25**	--	**39**	--
--	--	XRF-30-0.0	--	10/11/2017	**17**	--	29	--
--	--	XRF-31-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-32-0.0	--	10/11/2017	**77**	--	ND	--
1	S	XRF-33-0.3	MM-S-111-0.3	10/8/2018	**75**	**110**	**1,269**	**1,100**
1	N	XRF-34-0.3	--	10/8/2018	**51**	--	**543**	--
1	S	XRF-35-0.7	--	10/8/2018	4.1	--	ND	--
1	N	XRF-36-0.7	--	10/8/2018	3.9	--	8.3	--
1	N	XRF-37-1.0	--	10/8/2018	4.7	--	6.3	--
1	S	XRF-38-1.0	MM-S-111-1.0	10/8/2018	7.2	3.4	6.8	0.63
2	PIT	XRF-39-0.1	MM-S-112-0.3	10/8/2018	10.3	9.1	**59**	22
2	PIT	XRF-40-0.5	--	10/8/2018	10.3	--	28	--
2	PIT	XRF-41-1.0	MM-S-112-1.0	10/8/2018	8.1	7.7	8.8	9.7
3	PIT	XRF-42-0.3	MM-S-110-0.3	10/8/2018	9.6	**15**	22	17
3	PIT	XRF-43-1.0	MM-S-110-1.0	10/8/2018	12.1	9.2	8.7	0.33
4	CTR	XRF-45-0.3	--	10/8/2018	ND	--	25	--
4	NW	XRF-46-0.3	--	10/8/2018	4.4	--	ND	--
4	SE	XRF-47-0.3	--	10/8/2018	**140**	--	**1,133**	--
4	NW	XRF-48-0.5	MM-S-114-0.5	10/8/2018	7.2	2.3	**79**	2.8
4	NW	XRF-49-1.2	MM-S-114-1.2	10/8/2018	ND	3.0	5.3	0.22
4	SE	XRF-50-0.5	MM-S-115-0.3	10/8/2018	**24**	**150**	**290**	**870**
4	SE	XRF-51-2.7	MM-S-115-2.7	10/8/2018	5.5	7.0	13.6	20
WEST OF 4	PIT	XRF-52-0.7	MM-S-113-0.7[8]	10/8/2018	ND	--	ND	--
WEST OF 4	PIT	XRF-53-0.3	MM-S-113-0.3[8]	10/8/2018	6.9	--	**33**	--
5	S	XRF-54-0.5	--	10/8/2018	**94.9**	--	22	--
5	S	XRF-55-1.2	--	10/8/2018	**178**	--	**48**	--
5	S	XRF-56-2.4	--	10/8/2018	**233**	--	21	--
5	S	XRF-57-0.5	MM-S-116-0.5[8]	10/9/2018	**93.9**	--	25	--
5	S	XRF-58-1.0	--	10/9/2018	**114.4**	--	**43**	--
5	S	XRF-59-2.0	MM-S-116-2.3[8]	10/9/2018	**233**	--	**37**	--
5	S	XRF-60-3.0	--	10/9/2018	**266**	--	10	--
5	S	XRF-61-4.0	MM-S-116-4.0[8]	10/9/2018	**141**	--	ND	--
5	S	XRF-62-4.03	--	10/9/2018	**85**	--	ND	--
6	NW	XRF-63-0.5	--	10/9/2018	**18.5**	--	6.0	--
6	NW	XRF-64-0.3	--	10/9/2018	**16.7**	--	**65**	--
6	SE	XRF-65-0.5	--	10/9/2018	8.8	--	8.8	--
6	SE	XRF-66-0.3	MM-S-117-0.3	10/9/2018	**20.9**	11	**175**	1.0
6	SE	XRF-67-1.0	--	10/9/2018	**16.1**	--	8.3	--
6	SE	XRF-68-1.5	MM-S-117-1.5	10/9/2018	6.8	10	6.4	0.73
6	NW	XRF-69-1.0	--	10/9/2018	**17.4**	--	ND	--
6	NW	XRF-70-1.5	--	10/9/2018	**15.3**	--	8.6	--
7A	SE	XRF-71-0.3	MM-S-119-0.3	10/9/2018	**27.9**	**35**	22	9.5 H
7A	SE	XRF-72-0.5	MM-S-119-1.0	10/9/2018	**34.9**	**20**	18	1.5 H
7A	SE	XRF-73-1.0	--	10/9/2018	**21.5**	--	9.2	--
7A	NW	XRF-74-0.3	--	10/9/2018	12.3	--	8.2	--
7A	NW	XRF-75-0.5	--	10/9/2018	**25.5**	--	8.9	--
7A	NW	XRF-76-1.0	--	10/9/2018	**19.9**	--	5.9	--
7B	PIT	XRF-77-0.3	MM-S-118-0.3	10/9/2018	**17.0**	**18**	9.7	3.0
7B	PIT	XRF-78-0.5	--	10/9/2018	**27.7**	--	14.2	--
7B	PIT	XRF-79-1.0	MM-S-118-1.0	10/9/2018	**18.2**	**19**	11.3	1.2
8	S	XRF-80-0.3	MM-S-120-0.3	10/9/2018	4.0	3.5	6.0	0.82
8	S	XRF-81-0.5	--	10/9/2018	ND	--	ND	--

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals *(continued)*

Trench No. and End		XRF Sample ID No.	Laboratory Sample ID No.[1]	Laboratory Sample Date	Arsenic Results (mg/kg)		Mercury Results (mg/kg)	
No.	End				XRF[3]	Laboratory	XRF[2]	Laboratory
				Cleanup Goal (mg/kg):	*13.3*		*31*	
8	N	XRF-82-0.5	--	10/9/2018	4.6	--	6.3	--
9	PIT	XRF-83-0.3	MM-S-121-0.3	10/9/2018	**21.6**	**18**	**177**	**80**
9	PIT	XRF-84-0.5	--	10/9/2018	4.5	--	5.5	--
9	PIT	XRF-85-1.0	MM-S-121-1.0	10/9/2018	5.7	6.7	12	2.8
10	CTR	XRF-86-0.3	--	10/9/2018	8.3	--	**39**	--
10	CTR	XRF-87-0.5	--	10/9/2018	ND	--	17	--
10	CTR	XRF-88-1.0	--	10/9/2018	4.4	--	12.4	--
10	SE	XRF-89-0.3	MM-S-122-0.3	10/9/2018	**19.8**	**20**	**322**	**130**
10	SE	XRF-90-0.5	--	10/9/2018	8.4	--	**314**	--
10	SE	XRF-91-1.0	--	10/9/2018	ND	--	**265**	--
10	NW	XRF-92-0.3	--	10/9/2018	6.1	--	29	--
10	NW	XRF-93-0.5	MM-S-123-0.5	10/9/2018	11.4	12	**79**	21
10	SE	XRF-94-1.5	MM-S-122-1.5	10/9/2018	4.0	10	**198**	**100**
10	SE	XRF-95-2.0	MM-S-122-2.0	10/9/2018	3.9	6.5	14.6	1.7
11		XRF-96-0.3	MM-S-124-0.3	10/9/2018	3.7	4.9	24	2.9
11		XRF-97-0.5	--	10/9/2018	3.9	--	8.5	--
12		XRF-98-0.5	MM-S-125-0.6	10/9/2018	ND	**19**	21	**170**
12		XRF-99-0.3	--	10/9/2018	NR	--	11.5	--
13	WNW	XRF-100-0.5	--	10/9/2018	ND	--	31	--
13	WNW	XRF-101-1.0	--	10/9/2018	ND	--	ND	--
13	WNW	XRF-102-0.3	--	10/9/2018	9.2	--	**49**	--
13	CTR	XRF-103-0.4	--	10/9/2018	3.8	--	24	--
13	CTR	XRF-104-0.7	--	10/9/2018	ND	--	16	--
13	CTR	XRF-105-1.0	--	10/9/2018	ND	--	ND	--
14	PIT	XRF-106-0.3	MM-S-126-0.4	10/9/2018	ND	7.9	10	**35**
14	PIT	XRF-107-0.7	--	10/9/2018	4.1	--	ND	--
13	ESE	XRF-108-0.5	MM-S-127-0.5	10/9/2018	9.8	6.3	**49**	14
13	ESE	XRF-109-1.0	MM-S-127-1.0	10/9/2018	ND	4.3	ND	0.63
15	E	XRF-110-0.4	MM-S-63-0.5	10/9/2018	3.4	12	7.7	**71**
15	E	XRF-111-1.0	MM-S-63-1.0	10/9/2018	ND	4.6	8.9	0.43
15	W	XRF-112-0.3	--	10/9/2018	5.6	--	7.1	--
15	W	XRF-113-0.5	--	10/9/2018	**41**	--	**130**	--
15	W	XRF-114-1.2	--	10/9/2018	ND	--	ND	--
15	E	XRF-115-0.7	--	10/9/2018	5.8	--	**52**	--
16	PIT	XRF-116-0.3	--	10/10/2018	9.4	--	5.2	--
16	PIT	XRF-117-0.5	--	10/10/2018	8.7	--	7.1	--
16	PIT	XRF-118-0.8	--	10/10/2018	7.8	--	7.7	--
16	PIT	XRF-119-1.0	--	10/10/2018	ND	--	27	--
16	PIT	XRF-120-1.5	--	10/10/2018	7.6	--	13.7	--
17	W	XRF-121-0.3	--	10/10/2018	**15.4**	--	**332**	--
17	W	XRF-122-0.5	MM-S-128-0.5[8]	10/10/2018	**16.1**	--	**314**	--
17	W	XRF-123-0.8	--	10/10/2018	9.2	--	**37**	--
17	W	XRF-124-1.0	MM-S-128-1.0[8]	10/10/2018	5.6	--	19	--
18	E	XRF-125-0.5	MM-S-129-0.5	10/10/2018	**18.6**	**20**	**257**	**82 H**
18	E	XRF-126-1.0	--	10/10/2018	**19.8**	--	**63**	--
18	E	XRF-127-1.5	MM-S-129-1.5	10/10/2018	**18.5**	**21**	25	1.1 H
18	E	XRF-128-2.0	MM-S-129-2.0	10/10/2018	10.3	13	ND	0.96 H
19	W	XRF-129-0.3	MM-S-130-0.3	10/10/2018	5.5	3.2 J	**33**	4.7 H
19	W	XRF-130-0.5	MM-S-130-0.5	10/10/2018	ND	3.1 J	11.7	0.44 H
19	W	XRF-131-1.0	--	10/10/2018	ND	--	ND	--
20	E	XRF-132-0.3	--	10/10/2018	**16.5**	--	**234**	--
20	E	XRF-133-0.5	MM-S-131-0.5	10/10/2018	**57**	**110**	**677**	**1,200 H**
20	E	XRF-134-0.8	--	10/10/2018	ND	--	**121**	--
20	E	XRF-135-1.0	--	10/10/2018	6.4	--	**154**	--
20	E	XRF-136-1.5	MM-S-131-1.5	10/10/2018	ND	6.2	20.2	1.2 H
21	E	XRF-137-0.1	--	10/10/2018	**52**	--	**290**	--
21	E	XRF-138-0.3	MM-S-132-0.3	10/10/2018	**58**	**77**	**338**	**300 H**

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals *(continued)*

Trench No. and End		XRF Sample ID No.	Laboratory Sample ID No.[1]	Laboratory Sample Date	Arsenic Results (mg/kg)		Mercury Results (mg/kg)	
No.	End				XRF[3]	Laboratory	XRF[2]	Laboratory
				Cleanup Goal (mg/kg):	*13.3*		*31*	
21	E	XRF-139-0.5	--	10/10/2018	10.8	--	**53**	--
21	E	XRF-140-0.8	--	10/10/2018	11.0	--	**42**	--
21	E	XRF-141-1.0	--	10/10/2018	ND	--	**47**	--
21	E	XRF-142-1.5	MM-S-132-1.5	10/10/2018	ND	6.2	6.6	8.5 H
22A	E	XRF-143-0.3	--	10/10/2018	9.6	--	19	--
22A	E	XRF-144-0.5	--	10/10/2018	**23.9**	--	**42**	--
22A	E	XRF-145-0.8	--	10/10/2018	**66.9**	--	7.8	--
22B	E	XRF-146-0.3	MM-S-133-0.3[8]	10/10/2018	**50**	--	16	--
22B	E	XRF-147-0.5	--	10/10/2018	**67.9**	--	17.8	--
22B	E	XRF-148-1.0	MM-S-133-1.0	10/10/2018	**41.7**	**50**	**41**	**40**
22B	E	XRF-149-1.3	MM-S-133-1.3	10/10/2018	**31.6**	**49**	29	24 H
22B	E	XRF-150-1.0 (rerun of XRF-148-1.0)	--	10/10/2018	**29.0**	--	**43**	--
23	PIT	XRF-151-0.4	MM-S-134-0.4	10/10/2018	3.3	2.5 J	14.2	2.5
23	PIT	XRF-152-0.7	--	10/10/2018	ND	--	8.1	--
23	PIT	XRF-153-1.0	--	10/10/2018	ND	--	ND	--
23	PIT	XRF-154-1.5	--	10/10/2018	ND	--	ND	--
24	PIT	XRF-155-0.3	MM-S-135-0.3	10/10/2018	ND	4.1	8.9	2.1 H
24	PIT	XRF-156-0.5	--	10/10/2018	ND	--	ND	--
24	PIT	XRF-157-1.0	--	10/10/2018	ND	--	ND	--
25	PIT	XRF-158-0.3	MM-S-136-0.3	10/10/2018	ND	3.0 J	ND	0.27
25	PIT	XRF-159-0.5	--	10/10/2018	ND	--	ND	--
25	PIT	XRF-160-1.0	--	10/10/2018	3.4	--	6.1	--
25	PIT	XRF-161-1.5	--	10/10/2018	ND	--	8	--
26	PIT	XRF-162-0.3	MM-S-137-0.3[8]	10/10/2018	**14.2**	--	**66**	--
26	PIT	XRF-163-0.5	MM-S-137-0.5[8]	10/10/2018	4.4	--	13.2	--
26	PIT	XRF-164-1.0	--	10/10/2018	ND	--	ND	--
27	PIT	XRF-165-0.3	MM-S-138-0.3	10/11/2018	**21.1**	**22**	ND	4.1
27	PIT	XRF-166-0.5	--	10/11/2018	**18.9**	--	10.2	--
27	PIT	XRF-167-0.8	--	10/11/2018	**54.3**	--	14.2	--
27	PIT	XRF-168-1.0	--	10/11/2018	**82.4**	--	16	--
27	PIT	XRF-169-1.5	--	10/11/2018	**42.3**	--	ND	--
28	PIT	XRF-170-0.3	MM-S-139-0.3	10/11/2018	ND	3.0	6.1	0.61
28	PIT	XRF-171-0.5	--	10/11/2018	ND	--	ND	--
28	PIT	XRF-172-0.8	--	10/11/2018	3.4	--	ND	--
28	PIT	XRF-173-1.0	--	10/11/2018	ND	--	ND	--
28	PIT	XRF-174-1.5	--	10/11/2018	ND	--	ND	--
29	PIT	XRF-175-0.6	MM-S-140-0.6	10/11/2018	5.8	7.0	**35**	25
29	PIT	XRF-176-0.8	MM-S-140-0.8	10/11/2018	ND	2.5	6	0.41
29	PIT	XRF-177-1.1	--	10/11/2018	ND	--	6.5	--
29	PIT	XRF-178-1.3	--	10/11/2018	3.9	--	ND	--
29	PIT	XRF-179-1.8	--	10/11/2018	ND	--	ND	--
30	PIT	XRF-180-0.3	MM-S-141-0.3	10/11/2018	**13.4**	**15**	**308**	**220**
30	PIT	XRF-181-0.5	--	10/11/2018	13.3	--	**160**	--
30	PIT	XRF-182-0.8	--	10/11/2018	5.7	--	26	--
30	PIT	XRF-183-1.0	--	10/11/2018	4.1	--	**91**	--
30	PIT	XRF-184-1.3	MM-S-141-1.3	10/11/2018	6.7	2.8	**389**	1.5
30	PIT	XRF-185-1.5	MM-S-141-1.7	10/11/2018	ND	3.6	6.2	0.84
30	PIT	XRF-186-2.0	--	10/11/2018	ND	--	5.7	--
31	S	XRF-187-0.3	MM-S-142-0.3	10/11/2018	**124**	**140**	17	4.0
31	S	XRF-188-0.6	--	10/11/2018	**151**	--	23	--
31	S	XRF-189-0.8	--	10/11/2018	**189**	--	25	--
31	S	XRF-190-1.0	--	10/11/2018	**166**	--	**38**	--
31	S	XRF-191-1.3	--	10/11/2018	**98**	--	**47**	--
31	S	XRF-192-1.6	--	10/11/2018	**73.1**	--	29	--
31	S	XRF-193-2.0	--	10/11/2018	**27.2**	--	**63**	--
31	S	XRF-194-2.3	MM-S-142-2.3	10/11/2018	**50.3**	**29**	**144**	**58**
31	S	XRF-195-2.8	--	10/11/2018	**13.5**	--	16	--

Table 1. XRF Screening and Laboratory Sample Results Compared Against Cleanup Goals *(continued)*

Notes:

Red concentration exceeds the cleanup goal.

Gray cells indicate XRF and laboratory sample locations are east of the unnamed tributary to Mammoth Creek and excluded from evaluation.

1. Sample depth is indicated as the last component of the Sample ID No. and is expressed in feet bgs (e.g., Sample ID MM-S-11-0.0 was collected at 0 feet bgs).
2. Average instrument error for mercury XRF screening data collected in October 2017 was ± 12.8 mg/kg; average detected concentration was 14.3 mg/kg.
3. Average instrument error for arsenic XRF screening data collected in October 2017 was ± 14.4 mg/kg; average detected concentration was 17.3 mg/kg.
4. Sample MM-S-14-0.0 was collected from within the diversion ditch during the 2014 sampling event. The ditch was excluded from the focus of this supplemental characterization investigation, but this sample is included on the figures and tables for reference.
5. The XRF screening sample corresponding to Sample ID MM-S-46-3.8 was collected at 3.5 feet bgs.
6. Sample locations MM-S-105, MM-S-106, MM-S-107, and MM-S-108 correspond to XRF screening locations XRF-14, XRF-17, XRF-23, and XRF-33, respectively.
7. Sample collection date for MM-S-108-1.0 was erroneously recorded as 10/11/17 on the chain-of-custody record. The correct sample collection date is 10/13/17.
8. The following samples were collected and held for laboratory analysis, but were not analyzed: MM-S-113-0.3, MM-S-113-0.7, MM-S-116-0.5, MM-S-116-2.3, MM-S-116-4.0, MM-S-128-0.5, MM-S-128-1.0, MM-S-133-0.3, MM-S-137-0.3, and MM-S-137-0.5. These sample locations do not have corresponding laboratory data at the listed depths and are included in this table for reference only.
9. BLM median wildlife criteria (BLM, 2004).
10. EPA Eco-SSL (EPA, 2019).

bgs = below ground surface

BLM = Bureau of Land Management

CTR = sample collected in the center of the trench

Eco-SSL = ecological soil screening level

EPA = U.S. Environmental Protection Agency

H = Sample was prepped or analyzed beyond the specified holding time (28 days). The sample was analyzed within 8 days of the holding time expiration and the data is still considered usable (as discussed in Section 2.1.5 of the Supplemental Characterization Report).

J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

mg/kg = milligrams per kilogram

ND = for laboratory samples, not detected above the reporting limit (or method detection limit if shown in the laboratory report); for XRF samples, not detected above instrument detection level

NR = not recorded

PIT = test pit location

XRF = x-ray fluorescence

-- = not applicable

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria

Tab			Laboratory	Laboratory	Arsenic Results		Mercury Results	
No.	End	XRF Sample ID No.	Sample ID No.[1]	Sample Date	XRF[3]	Laboratory	XRF[2]	Laboratory
			Ecological Screening Criteria		*18*[10]		*8*[9]	
--	--	MM-S-11-0.0	MM-S-11-0.0	7/31/2014	**19.2**	4.4	**14.4**	0.98
--	--	MM-S-12-0.0	MM-S-12-0.0	7/31/2014	9	9.1	**30**	**18**
--	--	MM-S-12-0.5	MM-S-12-0.5	10/11/2017	ND	3.8	ND	0.79
--	--	MM-S-13-0.0	MM-S-13-0.0	7/31/2014	**135**	4.0	**27**	3.9
--	--	MM-S-14-0.0[4]	MM-S-14-0.0[4]	7/31/2014	**27**	**26**	**21.8**	**23**
--	--	MM-S-15-0.0	MM-S-15-0.0	7/31/2014	ND	3.3	ND	0.54
--	--	MM-S-15-0.5	--	10/11/2017	ND	--	ND	--
--	--	--	MM-S-21-0.0	6/3/2015	--	6.4	--	0.77
--	--	MM-S-21-0.5	--	10/10/2017	ND	--	ND	--
--	--	--	MM-S-22-0.0	6/3/2015	--	4.6	--	0.58
--	--	MM-S-22-0.5	--	10/10/2017	ND	--	ND	--
--	--	--	MM-S-24-0.0	6/3/2015	--	**30**	--	**120**
--	--	MM-S-24-0.5	MM-S-24-0.5	10/11/2017	ND	3.4	ND	2
--	--	--	MM-S-28-0.0	6/3/2015	--	**25**	--	**42**
--	--	MM-S-28-0.5	MM-S-28-0.5	10/10/2017	ND	5.2	ND	2
--	--	--	MM-S-29-00	6/3/2015	--	4.6	--	2.1
--	--	MM-S-29-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-30-00	MM-S-30-00	6/3/2015	ND	**39**	**63**	**120**
--	--	MM-S-30-0.5	--	10/11/2017	ND	--	**51**	--
--	--	MM-S-30-1.0	--	10/11/2017	ND	--	**25**	--
--	--	MM-S-30-1.5	MM-S-30-1.5	10/11/2017	ND	4.9	ND	3.1
--	--	--	MM-S-31-0.0	6/3/2015	--	3.1	--	0.88
--	--	MM-S-31-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-32-0.0	MM-S-32-0.0	6/3/2015	ND	10	**151**	**140**
--	--	MM-S-32-0.5	MM-S-32-0.5	10/11/2017	ND	9	ND	**95**
--	--	MM-S-33-0.0	MM-S-33-0.0	6/3/2015	**21**	8.4	ND	**14**
--	--	--	MM-S-34-0.0	6/3/2015	--	6.8	--	4
--	--	MM-S-34-0.5	--	10/11/2017	ND	--	**37**	--
--	--	MM-S-34-1.0	--	10/11/2017	ND	--	ND	--
--	--	--	MM-S-35-0.0	6/3/2015	--	**24**	--	**72**
--	--	MM-S-35-0.5	MM-S-35-0.5	10/11/2017	ND	5.6	ND	3.2 H
--	--	--	MM-S-36-0.0	6/3/2015	--	4.3	--	0.62
--	--	--	MM-S-37-0.0	6/3/2015	--	6.4	--	2
--	--	MM-S-40-00	MM-S-40-00	10/9/2017	12.8	4.3	**13.9**	**14**
--	--	MM-S-41-00	MM-S-41-00	10/9/2017	ND	6.8	ND	**13**
--	--	MM-S-42-00	MM-S-42-00	10/9/2017	**21**	**75**	**19**	**270 H**
--	--	MM-S-43-00	MM-S-43-00	10/9/2017	**25**	17	**35**	**81 H**
--	--	MM-S-44-00	MM-S-44-00	10/9/2017	ND	11	**21**	**26 H**
--	--	MM-S-44-0.5	--	10/11/2017	**23**	--	**36**	--
--	--	MM-S-44-1.0	--	10/11/2017	ND	--	**23**	--
--	--	MM-S-44-1.5	--	10/11/2017	ND	--	**22**	--
--	--	MM-S-44-2.0	MM-S-44-2.0	10/11/2017	ND	4.3	ND	**21**
--	--	MM-S-45-00	--	10/9/2017	ND	--	5	--
--	--	MM-S-45-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-46-00	--	10/13/2017	**24**	--	**48**	--
--	--	MM-S-46-0.5	--	10/13/2017	**29**	--	**77**	--
--	--	MM-S-46-1.5	--	10/13/2017	ND	--	**22**	--
--	--	MM-S-46-2.0	MM-S-46-2.0	10/11/2017	ND	3.9	**23**	2.7
--	--	MM-S-46-3.8[5]	MM-S-46-3.8	10/13/2017	13	7	ND	0.77
--	--	MM-S-47-00	MM-S-47-00	10/9/2017	ND	8	ND	0.92
--	--	MM-S-48-00	MM-S-48-00	10/9/2017	ND	5.1	ND	0.93
--	--	MM-S-49-00	MM-S-49-00	10/9/2017	ND	6.7	ND	0.83
--	--	MM-S-50-00	MM-S-50-00	10/9/2017	ND	6.4	ND	1.4
--	--	MM-S-51-00	MM-S-51-00	10/9/2017	14	4.5	ND	5
--	--	MM-S-51-0.5	MM-S-51-0.5	10/10/2017	ND	--	ND	--
--	--	MM-S-52-00	MM-S-52-00	10/9/2017	ND	5	ND	4.3
--	--	MM-S-53-00	MM-S-53-00	10/9/2017	ND	5.2	ND	7.4

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria *(continued)*

Tab			Laboratory	Laboratory	Arsenic Results		Mercury Results	
No.	End	XRF Sample ID No.	Sample ID No.[1]	Sample Date	XRF[3]	Laboratory	XRF[2]	Laboratory
			Ecological Screening Criteria		*18*[10]		*8*[9]	
--	--	MM-S-53-0.5	--	10/11/2017	ND	--	**12**	--
--	--	MM-S-53-1.0	--	10/11/2017	**21**	--	**45**	--
--	--	MM-S-53-1.5	--	10/11/2017	**20**	--	**98**	--
--	--	MM-S-53-2.0	--	10/11/2017	ND	--	**105**	--
--	--	MM-S-53-2.5	--	10/13/2017	ND	--	ND	--
--	--	MM-S-53-4.0	--	10/13/2017	ND	--	ND	--
--	--	MM-S-54-00	MM-S-54-00	10/9/2017	ND	4.4	ND	1.2
--	--	MM-S-55-00	MM-S-55-00	10/9/2017	ND	4.3	ND	4.6
--	--	MM-S-55-0.5	--	10/10/2017	ND	--	**25**	--
--	--	MM-S-55-1.0	--	10/10/2017	ND	--	ND	--
--	--	MM-S-56-00	--	10/9/2017	ND	--	**189**	--
--	--	MM-S-56-0.5	--	10/10/2017	ND	--	**34**	--
--	--	MM-S-56-1.0	MM-S-56-1.0	10/10/2017	ND	5.6	ND	**14**
--	--	MM-S-57-00	MM-S-57-00	10/9/2017	ND	6.2	ND	**8.1**
--	--	MM-S-57-0.5	--	10/10/2017	ND	--	**26**	--
--	--	MM-S-57-1.0	--	10/10/2017	ND	--	ND	--
--	--	MM-S-58-00	MM-S-58-00	10/9/2017	ND	9.4	ND	3.8
--	--	MM-S-59-00	MM-S-59-00	10/9/2017	ND	6.1	ND	2.8
--	--	MM-S-60-00	MM-S-60-00	10/9/2017	ND	12	ND	**8.8**
--	--	MM-S-61-00	MM-S-61-00	10/9/2017	ND	4.7	ND	0.95
--	--	MM-S-62-00	MM-S-62-00	10/9/2017	ND	6.7	ND	3.8
--	--	MM-S-63-00	MM-S-63-00	10/9/2017	ND	3.5	ND	2.9
--	--	MM-S-63-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-64-00	MM-S-64-00	10/9/2017	ND	3.8	ND	1.4
--	--	MM-S-64-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-65-00	MM-S-65-00	10/9/2017	ND	5.1	ND	3.6
--	--	MM-S-66-00	MM-S-66-00	10/9/2017	ND	5	ND	0.95
--	--	MM-S-67-00	MM-S-67-00	10/10/2017	ND	11	ND	0.57
--	--	MM-S-68-00	MM-S-68-00	10/10/2017	ND	7.8	ND	4.3
--	--	MM-S-69-00	MM-S-69-00	10/10/2017	ND	7.4	ND	5.6
--	--	MM-S-69-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-70-00	MM-S-70-00	10/10/2017	**24**	10	ND	7.9
--	--	MM-S-70-1.0	MM-S-70-1.0	10/10/2017	ND	7	ND	**11**
--	--	MM-S-71-00	MM-S-71-00	10/10/2017	ND	3.8	**15**	1.5
--	--	MM-S-71-0.5	MM-S-71-0.5	10/10/2017	ND	2.6	ND	0.42
--	--	MM-S-72-00	MM-S-72-00	10/10/2017	ND	4.9	ND	1.2
--	--	MM-S-72-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-73-00	MM-S-73-00	10/10/2017	ND	5.6	ND	1.3
--	--	MM-S-74-00	MM-S-74-00	10/10/2017	ND	6.2	ND	0.44
--	--	MM-S-75-00	MM-S-75-00	10/10/2017	**22**	7.5	NR	0.61
--	--	MM-S-75-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-76-00	MM-S-76-00	10/10/2017	ND	12	ND	0.76
--	--	MM-S-77-00	MM-S-77-00	10/10/2017	ND	2.1	ND	0.84
--	--	MM-S-78-00	MM-S-78-00	10/10/2017	ND	5.5	ND	1.5
--	--	MM-S-79-00	MM-S-79-00	10/10/2017	ND	3.9	ND	0.29
--	--	MM-S-80-00	MM-S-80-00	10/10/2017	**22**	4.5	ND	8
--	--	MM-S-80-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-81-00	MM-S-81-00	10/10/2017	**25**	8.7	ND	2.1
--	--	MM-S-81-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-82-00	MM-S-82-00	10/10/2017	18	6.1	ND	0.22
--	--	MM-S-82-0.5	MM-S-82-0.5	10/10/2017	ND	11	ND	0.2
--	--	MM-S-83-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-83-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-84-00	MM-S-84-00	10/10/2017	ND	9.1	ND	3
--	--	MM-S-85-00	MM-S-85-00	10/10/2017	ND	6.8	ND	2.8
--	--	MM-S-85-0.5	--	10/10/2017	ND	--	ND	--
--	--	MM-S-86-00	MM-S-86-00	10/10/2017	**35**	**34**	**12**	3.6
--	--	MM-S-86-0.5	MM-S-86-0.5	10/10/2017	ND	11	ND	1.4

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria *(continued)*

Tab			Laboratory	Laboratory	Arsenic Results		Mercury Results	
No.	End	XRF Sample ID No.	Sample ID No.[1]	Sample Date	XRF[3]	Laboratory	XRF[2]	Laboratory
			Ecological Screening Criteria		*18*[10]		*8*[9]	
--	--	MM-S-87-00	MM-S-87-00	10/10/2017	ND	**25**	**22**	**49**
--	--	MM-S-87-0.5	--	10/10/2017	ND	--	**15**	--
--	--	MM-S-87-1.0	MM-S-87-1.0	10/10/2017	ND	4.5	ND	7.3
--	--	MM-S-88-00	MM-S-88-00	10/10/2017	ND	9.5	**12**	**43**
--	--	MM-S-88-0.5	MM-S-88-0.5	10/10/2017	ND	6.7	ND	**19 H**
--	--	MM-S-89-00	--	10/11/2017	ND	--	ND	--
--	--	MM-S-89-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-90-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-91-00	MM-S-91-00	10/10/2017	ND	10	ND	**19 H**
--	--	MM-S-92-00	MM-S-92-00	10/10/2017	**47**	**47**	**116**	**400**
--	--	MM-S-93-00	MM-S-93-00	10/10/2017	ND	**48**	**63**	**330**
--	--	MM-S-94-00	MM-S-94-00	10/10/2017	ND	5.9	**20**	5.7
--	--	MM-S-95-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-96-00	MM-S-96-00	10/10/2017	ND	11	**16**	**38**
--	--	MM-S-97-00	MM-S-97-00	10/10/2017	ND	**22**	**44**	**88**
--	--	MM-S-98-00	MM-S-98-00	10/10/2017	ND	8	ND	**23**
--	--	MM-S-99-00	MM-S-99-00	10/10/2017	**32**	14	ND	**44**
--	--	MM-S-100-00	MM-S-100-00	10/10/2017	ND	4.1	ND	6
--	--	MM-S-101-00	MM-S-101-00	10/10/2017	16	6.8	ND	**13**
--	--	MM-S-101-0.5	--	10/11/2017	ND	--	ND	--
--	--	MM-S-102-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-103-00	--	10/10/2017	ND	--	ND	--
--	--	MM-S-105-00[6]	MM-S-105-00[6]	10/13/2017	**107**	**89**	**227**	**880**
--	--	MM-S-105-1.0[6]	--	10/13/2017	ND	--	**47**	--
--	--	MM-S-105-2.0[6]	--	10/13/2017	ND	--	**43**	--
--	--	MM-S-105-3.0[6]	--	10/13/2017	ND	--	ND	--
--	--	MM-S-105-3.5[6]	MM-S-105-3.5[6]	10/13/2017	ND	7.3	ND	1.1
--	--	MM-S-106-00[6]	MM-S-106-00[6]	10/13/2017	**59**	**38**	**164**	**410**
--	--	MM-S-106-1.0[6]	--	10/13/2017	**29**	--	**39**	--
--	--	MM-S-106-2.0[6]	MM-S-106-2.0[6]	10/13/2017	ND	4.5	ND	1.4
--	--	MM-S-107-00[6]	MM-S-107-00[6]	10/13/2017	ND	11	**110**	**76**
--	--	MM-S-107-1.0[6]	MM-S-107-1.0[6]	10/13/2017	ND	3.6	ND	1
--	--	MM-S-108-00[6]	MM-S-108-00[6]	10/13/2017	**19**	**34**	ND	1.6
--	--	MM-S-108-1.0[6]	MM-S-108-1.0[6]	10/13/2017[7]	**36**	**34**	ND	1.1 H
--	--	XRF-01-0.0	--	10/10/2017	ND	--	**30**	--
--	--	XRF-02-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-03-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-04-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-05-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-06-0.0	--	10/11/2017	14	--	**13.6**	--
--	--	XRF-07-0.0	--	10/11/2017	ND	--	**30**	--
--	--	XRF-08-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-09-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-10-0.0	--	10/11/2017	**38**	--	**74**	--
--	--	XRF-11-0.0	--	10/11/2017	**57**	--	**181**	--
--	--	XRF-12-0.0	--	10/11/2017	ND	--	**81**	--
--	--	XRF-13-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-15-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-16-0.0	--	10/11/2017	ND	--	**82**	--
--	--	XRF-18-0.0	--	10/11/2017	ND	--	**33**	--
--	--	XRF-19-0.0	--	10/11/2017	18	--	ND	--
--	--	XRF-20-0.0	--	10/11/2017	**29**	--	**24**	--
--	--	XRF-21-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-22-0.0	--	10/11/2017	ND	--	**49**	--
--	--	XRF-24-0.0	--	10/11/2017	**23**	--	ND	--
--	--	XRF-25-0.0	--	10/11/2017	ND	--	**17**	--

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria *(continued)*

Tab			Laboratory	Laboratory	Arsenic Results		Mercury Results	
No.	End	XRF Sample ID No.	Sample ID No.[1]	Sample Date	XRF[3]	Laboratory	XRF[2]	Laboratory
			Ecological Screening Criteria		*18*[10]		*8*[9]	
--	--	XRF-26-0.0	--	10/11/2017	**38**	--	**71**	--
--	--	XRF-27-0.0	--	10/11/2017	**46**	--	**74**	--
--	--	XRF-28-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-29-0.0	--	10/11/2017	**25**	--	**39**	--
--	--	XRF-30-0.0	--	10/11/2017	17	--	**29**	--
--	--	XRF-31-0.0	--	10/11/2017	ND	--	ND	--
--	--	XRF-32-0.0	--	10/11/2017	**77**	--	ND	--
1	S	XRF-33-0.3	MM-S-111-0.3	10/8/2018	**75**	**110**	**1,269**	**1,100**
1	N	XRF-34-0.3	--	10/8/2018	**51**	--	**543**	--
1	S	XRF-35-0.7	--	10/8/2018	4.1	--	ND	--
1	N	XRF-36-0.7	--	10/8/2018	3.9	--	**8.3**	--
1	N	XRF-37-1.0	--	10/8/2018	4.7	--	6.3	--
1	S	XRF-38-1.0	MM-S-111-1.0	10/8/2018	7.2	3.4	6.8	0.63
2	PIT	XRF-39-0.1	MM-S-112-0.3	10/8/2018	10.3	9.1	**59**	**22**
2	PIT	XRF-40-0.5	--	10/8/2018	10.3	--	**28**	--
2	PIT	XRF-41-1.0	MM-S-112-1.0	10/8/2018	8.1	7.7	**8.8**	**9.7**
3	PIT	XRF-42-0.3	MM-S-110-0.3	10/8/2018	9.6	15	**22**	**17**
3	PIT	XRF-43-1.0	MM-S-110-1.0	10/8/2018	12.1	9.2	**8.7**	0.33
4	CTR	XRF-45-0.3	--	10/8/2018	ND	--	**25**	--
4	NW	XRF-46-0.3	--	10/8/2018	4.4	--	ND	--
4	SE	XRF-47-0.3	--	10/8/2018	**140**	--	**1,133**	--
4	NW	XRF-48-0.5	MM-S-114-0.5	10/8/2018	7.2	2.3	**79**	2.8
4	NW	XRF-49-1.2	MM-S-114-1.2	10/8/2018	ND	3.0	5.3	0.22
4	SE	XRF-50-0.5	MM-S-115-0.3	10/8/2018	**24**	**150**	**290**	**870**
4	SE	XRF-51-2.7	MM-S-115-2.7	10/8/2018	5.5	7.0	**13.6**	**20**
WEST OF 4	PIT	XRF-52-0.7	MM-S-113-0.7[8]	10/8/2018	ND	--	ND	--
WEST OF 4	PIT	XRF-53-0.3	MM-S-113-0.3[8]	10/8/2018	6.9	--	**33**	--
5	S	XRF-54-0.5	--	10/8/2018	**94.9**	--	**22**	--
5	S	XRF-55-1.2	--	10/8/2018	**178**	--	**48**	--
5	S	XRF-56-2.4	--	10/8/2018	**233**	--	**21**	--
5	S	XRF-57-0.5	MM-S-116-0.5[8]	10/9/2018	**93.9**	--	**25**	--
5	S	XRF-58-1.0		10/9/2018	**114.4**	--	**43**	--
5	S	XRF-59-2.0	MM-S-116-2.3[8]	10/9/2018	**233**	--	**37**	--
5	S	XRF-60-3.0	--	10/9/2018	**266**	--	**10**	--
5	S	XRF-61-4.0	MM-S-116-4.0[8]	10/9/2018	**141**	--	ND	--
5	S	XRF-62-4.03	--	10/9/2018	**85**	--	ND	--
6	NW	XRF-63-0.5	--	10/9/2018	**18.5**	--	6.0	--
6	NW	XRF-64-0.3	--	10/9/2018	**16.7**	--	**65**	--
6	SE	XRF-65-0.5	--	10/9/2018	8.8	--	**8.8**	--
6	SE	XRF-66-0.3	MM-S-117-0.3	10/9/2018	**20.9**	11	**175**	1.0
6	SE	XRF-67-1.0	--	10/9/2018	16.1	--	**8.3**	--
6	SE	XRF-68-1.5	MM-S-117-1.5	10/9/2018	6.8	10	6.4	0.73
6	NW	XRF-69-1.0	--	10/9/2018	**17.4**	--	ND	--
6	NW	XRF-70-1.5	--	10/9/2018	**15.3**	--	**8.6**	--
7A	SE	XRF-71-0.3	MM-S-119-0.3	10/9/2018	**27.9**	**35**	**22**	**9.5 H**
7A	SE	XRF-72-0.5	MM-S-119-1.0	10/9/2018	**34.9**	**20**	**18**	1.5 H
7A	SE	XRF-73-1.0	--	10/9/2018	**21.5**	--	**9.2**	--
7A	NW	XRF-74-0.3	--	10/9/2018	12.3	--	**8.2**	--
7A	NW	XRF-75-0.5	--	10/9/2018	**25.5**	--	**8.9**	--
7A	NW	XRF-76-1.0	--	10/9/2018	**19.9**	--	5.9	--
7B	PIT	XRF-77-0.3	MM-S-118-0.3	10/9/2018	**17.0**	18	**9.7**	3.0
7B	PIT	XRF-78-0.5	--	10/9/2018	**27.7**	--	**14.2**	--
7B	PIT	XRF-79-1.0	MM-S-118-1.0	10/9/2018	**18.2**	**19**	**11.3**	1.2
8	S	XRF-80-0.3	MM-S-120-0.3	10/9/2018	4.0	3.5	6.0	0.82
8	S	XRF-81-0.5	--	10/9/2018	ND	--	ND	--

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria *(continued)*

Tab			Laboratory	Laboratory	Arsenic Results		Mercury Results	
No.	End	XRF Sample ID No.	Sample ID No.[1]	Sample Date	XRF[3]	Laboratory	XRF[2]	Laboratory
			Ecological Screening Criteria		*18*[10]		*8*[9]	
8	N	XRF-82-0.5	--	10/9/2018	4.6	--	6.3	--
9	PIT	XRF-83-0.3	MM-S-121-0.3	10/9/2018	**21.6**	18	**177**	**80**
9	PIT	XRF-84-0.5	--	10/9/2018	4.5	--	5.5	--
9	PIT	XRF-85-1.0	MM-S-121-1.0	10/9/2018	5.7	6.7	**12**	2.8
10	CTR	XRF-86-0.3	--	10/9/2018	8.3	--	**39**	--
10	CTR	XRF-87-0.5	--	10/9/2018	ND	--	**17**	--
10	CTR	XRF-88-1.0	--	10/9/2018	4.4	--	**12.4**	--
10	SE	XRF-89-0.3	MM-S-122-0.3	10/9/2018	**19.8**	**20**	**322**	**130**
10	SE	XRF-90-0.5	--	10/9/2018	8.4	--	**314**	--
10	SE	XRF-91-1.0	--	10/9/2018	ND	--	**265**	--
10	NW	XRF-92-0.3	--	10/9/2018	6.1	--	**29**	--
10	NW	XRF-93-0.5	MM-S-123-0.5	10/9/2018	11.4	12	**79**	**21**
10	SE	XRF-94-1.5	MM-S-122-1.5	10/9/2018	4.0	10	**198**	**100**
10	SE	XRF-95-2.0	MM-S-122-2.0	10/9/2018	3.9	6.5	**14.6**	1.7
11		XRF-96-0.3	MM-S-124-0.3	10/9/2018	3.7	4.9	**24**	2.9
11		XRF-97-0.5	--	10/9/2018	3.9	--	**8.5**	--
12		XRF-98-0.5	MM-S-125-0.6	10/9/2018	ND	**19**	**21**	**170**
12		XRF-99-0.3	--	10/9/2018	NR	--	**11.5**	--
13	WNW	XRF-100-0.5	--	10/9/2018	ND	--	**31**	--
13	WNW	XRF-101-1.0	--	10/9/2018	ND	--	ND	--
13	WNW	XRF-102-0.3	--	10/9/2018	9.2	--	**49**	--
13	CTR	XRF-103-0.4	--	10/9/2018	3.8	--	**24**	--
13	CTR	XRF-104-0.7	--	10/9/2018	ND	--	**16**	--
13	CTR	XRF-105-1.0	--	10/9/2018	ND	--	ND	--
14	PIT	XRF-106-0.3	MM-S-126-0.4	10/9/2018	ND	7.9	**10**	**35**
14	PIT	XRF-107-0.7	--	10/9/2018	4.1	--	ND	--
13	ESE	XRF-108-0.5	MM-S-127-0.5	10/9/2018	9.8	6.3	**49**	**14**
13	ESE	XRF-109-1.0	MM-S-127-1.0	10/9/2018	ND	4.3	ND	0.63
15	E	XRF-110-0.4	MM-S-63-0.5	10/9/2018	3.4	12	7.7	**71**
15	E	XRF-111-1.0	MM-S-63-1.0	10/9/2018	ND	4.6	**8.9**	0.43
15	W	XRF-112-0.3	--	10/9/2018	5.6	--	7.1	--
15	W	XRF-113-0.5	--	10/9/2018	**41**	--	**130**	--
15	W	XRF-114-1.2	--	10/9/2018	ND	--	ND	--
15	E	XRF-115-0.7	--	10/9/2018	5.8	--	**52**	--
16	PIT	XRF-116-0.3	--	10/10/2018	9.4	--	5.2	--
16	PIT	XRF-117-0.5	--	10/10/2018	8.7	--	7.1	--
16	PIT	XRF-118-0.8	--	10/10/2018	7.8	--	7.7	--
16	PIT	XRF-119-1.0	--	10/10/2018	ND	--	**27**	--
16	PIT	XRF-120-1.5	--	10/10/2018	7.6	--	**13.7**	--
17	W	XRF-121-0.3	--	10/10/2018	15.4	--	**332**	--
17	W	XRF-122-0.5	MM-S-128-0.5[8]	10/10/2018	16.1	--	**314**	--
17	W	XRF-123-0.8	--	10/10/2018	9.2	--	**37**	--
17	W	XRF-124-1.0	MM-S-128-1.0[8]	10/10/2018	5.6	--	**19**	--
18	E	XRF-125-0.5	--	10/10/2018	**18.6**	--	**257**	--
18	E	XRF-126-1.0	MM-S-129-0.5	10/10/2018	**19.8**	**20**	**63**	**82 H**
18	E	XRF-127-1.5	MM-S-129-1.5	10/10/2018	**18.5**	**21**	**25**	1.1 H
18	E	XRF-128-2.0	MM-S-129-2.0	10/10/2018	10.3	13	ND	0.96 H
19	W	XRF-129-0.3	MM-S-130-0.3	10/10/2018	5.5	3.2 J	**33**	4.7 H
19	W	XRF-130-0.5	MM-S-130-0.5	10/10/2018	ND	3.1 J	**11.7**	0.44 H
19	W	XRF-131-1.0	--	10/10/2018	ND	--	ND	--
20	E	XRF-132-0.3	--	10/10/2018	16.5	--	**234**	--
20	E	XRF-133-0.5	MM-S-131-0.5	10/10/2018	**57**	**110**	**677**	**1,200 H**
20	E	XRF-134-0.8	--	10/10/2018	ND	--	**121**	--
20	E	XRF-135-1.0	--	10/10/2018	6.4	--	**154**	--
20	E	XRF-136-1.5	MM-S-131-1.5	10/10/2018	ND	6.2	**20.2**	1.2 H
21	E	XRF-137-0.1	--	10/10/2018	**52**	--	**290**	--
21	E	XRF-138-0.3	MM-S-132-0.3	10/10/2018	**58**	**77**	**338**	**300 H**

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria *(continued)*

Tab			Laboratory	Laboratory	Arsenic Results		Mercury Results	
No.	End	XRF Sample ID No.	Sample ID No.[1]	Sample Date	XRF[3]	Laboratory	XRF[2]	Laboratory
			Ecological Screening Criteria		*18*[10]		*8*[9]	
21	E	XRF-139-0.5	--	10/10/2018	10.8	--	**53**	--
21	E	XRF-140-0.8	--	10/10/2018	11.0	--	**42**	--
21	E	XRF-141-1.0	--	10/10/2018	ND	--	**47**	--
21	E	XRF-142-1.5	MM-S-132-1.5	10/10/2018	ND	6.2	6.6	**8.5 H**
22A	E	XRF-143-0.3	--	10/10/2018	9.6	--	**19**	--
22A	E	XRF-144-0.5	--	10/10/2018	**23.9**	--	**42**	--
22A	E	XRF-145-0.8	--	10/10/2018	**66.9**	--	7.8	--
22B	E	XRF-146-0.3	MM-S-133-0.3[8]	10/10/2018	**50**	--	**16**	--
22B	E	XRF-147-0.5	--	10/10/2018	**67.9**	--	**17.8**	--
22B	E	XRF-148-1.0	MM-S-133-1.0	10/10/2018	**41.7**	**50**	**41**	**40**
22B	E	XRF-149-1.3	MM-S-133-1.3	10/10/2018	**31.6**	**49**	**29**	**24 H**
22B	E	XRF-150-1.0 (rerun of XRF-148-1.0)	--	10/10/2018	**29.0**	--	**43**	--
23	PIT	XRF-151-0.4	MM-S-134-0.4	10/10/2018	3.3	2.5 J	**14.2**	2.5
23	PIT	XRF-152-0.7	--	10/10/2018	ND	--	**8.1**	--
23	PIT	XRF-153-1.0	--	10/10/2018	ND	--	ND	--
23	PIT	XRF-154-1.5	--	10/10/2018	ND	--	ND	--
24	PIT	XRF-155-0.3	MM-S-135-0.3	10/10/2018	ND	4.1	**8.9**	2.1 H
24	PIT	XRF-156-0.5	--	10/10/2018	ND	--	ND	--
24	PIT	XRF-157-1.0	--	10/10/2018	ND	--	ND	--
25	PIT	XRF-158-0.3	MM-S-136-0.3	10/10/2018	ND	3.0 J	ND	0.27
25	PIT	XRF-159-0.5	--	10/10/2018	ND	--	ND	--
25	PIT	XRF-160-1.0	--	10/10/2018	3.4	--	6.1	--
25	PIT	XRF-161-1.5	--	10/10/2018	ND	--	8	--
26	PIT	XRF-162-0.3	MM-S-137-0.3[8]	10/10/2018	14.2	--	**66**	--
26	PIT	XRF-163-0.5	MM-S-137-0.5[8]	10/10/2018	4.4	--	**13.2**	--
26	PIT	XRF-164-1.0	--	10/10/2018	ND	--	ND	--
27	PIT	XRF-165-0.3	MM-S-138-0.3	10/11/2018	**21.1**	**22**	ND	4.1
27	PIT	XRF-166-0.5	--	10/11/2018	**18.9**	--	**10.2**	--
27	PIT	XRF-167-0.8	--	10/11/2018	**54.3**	--	**14.2**	--
27	PIT	XRF-168-1.0	--	10/11/2018	**82.4**	--	**16**	--
27	PIT	XRF-169-1.5	--	10/11/2018	**42.3**	--	ND	--
28	PIT	XRF-170-0.3	MM-S-139-0.3	10/11/2018	ND	3.0	6.1	0.61
28	PIT	XRF-171-0.5	--	10/11/2018	ND	--	ND	--
28	PIT	XRF-172-0.8	--	10/11/2018	3.4	--	ND	--
28	PIT	XRF-173-1.0	--	10/11/2018	ND	--	ND	--
28	PIT	XRF-174-1.5	--	10/11/2018	ND	--	ND	--
29	PIT	XRF-175-0.6	MM-S-140-0.6	10/11/2018	5.8	7.0	**35**	**25**
29	PIT	XRF-176-0.8	MM-S-140-0.8	10/11/2018	ND	2.5	6	0.41
29	PIT	XRF-177-1.1	--	10/11/2018	ND	--	6.5	--
29	PIT	XRF-178-1.3	--	10/11/2018	3.9	--	ND	--
29	PIT	XRF-179-1.8	--	10/11/2018	ND	--	ND	--
30	PIT	XRF-180-0.3	MM-S-141-0.3	10/11/2018	13.4	15	**308**	**220**
30	PIT	XRF-181-0.5	--	10/11/2018	13.3	--	**160**	--
30	PIT	XRF-182-0.8	--	10/11/2018	5.7	--	**26**	--
30	PIT	XRF-183-1.0	--	10/11/2018	4.1	--	**91**	--
30	PIT	XRF-184-1.3	MM-S-141-1.3	10/11/2018	6.7	2.8	**389**	1.5
30	PIT	XRF-185-1.5	MM-S-141-1.7	10/11/2018	ND	3.6	6.2	0.84
30	PIT	XRF-186-2.0	--	10/11/2018	ND	--	5.7	--
31	S	XRF-187-0.3	MM-S-142-0.3	10/11/2018	**124**	**140**	**17**	4.0
31	S	XRF-188-0.6	--	10/11/2018	**151**	--	**23**	--
31	S	XRF-189-0.8	--	10/11/2018	**189**	--	**25**	--
31	S	XRF-190-1.0	--	10/11/2018	**166**	--	**38**	--
31	S	XRF-191-1.3	--	10/11/2018	**98**	--	**47**	--
31	S	XRF-192-1.6	--	10/11/2018	**73.1**	--	**29**	--
31	S	XRF-193-2.0	--	10/11/2018	**27.2**	--	**63**	--
31	S	XRF-194-2.3	MM-S-142-2.3	10/11/2018	**50.3**	**29**	**144**	**58**
31	S	XRF-195-2.8	--	10/11/2018	13.5	--	**16**	--

Table 2. XRF Screening and Laboratory Sample Results Compared Against Ecological Screening Criteria *(continued)*

Notes:

Red concentration exceeds the ecological screening criterion.

Gray cells indicate XRF and laboratory sample locations are east of the unnamed tributary to Mammoth Creek and excluded from evaluation.

1. Sample depth is indicated as the last component of the Sample ID No. and is expressed in feet bgs (e.g., Sample ID MM-S-11-0.0 was collected at 0 feet bgs).
2. Average instrument error for mercury XRF screening data collected in October 2017 was ± 12.8 mg/kg; average detected concentration was 14.3 mg/kg.
3. Average instrument error for arsenic XRF screening data collected in October 2017 was ± 14.4 mg/kg; average detected concentration was 17.3 mg/kg.
4. Sample MM-S-14-0.0 was collected from within the diversion ditch during the 2014 sampling event. The ditch was excluded from the focus of this supplemental characterization investigation, but this sample is included on the figures and tables for reference.
5. The XRF screening sample corresponding to Sample ID MM-S-46-3.8 was collected at 3.5 feet bgs.
6. Sample locations MM-S-105, MM-S-106, MM-S-107, and MM-S-108 correspond to XRF screening locations XRF-14, XRF-17, XRF-23, and XRF-33, respectively.
7. Sample collection date for MM-S-108-1.0 was erroneously recorded as 10/11/17 on the chain-of-custody record. The correct sample collection date is 10/13/17.
8. The following samples were collected and held for laboratory analysis, but were not analyzed: MM-S-113-0.3, MM-S-113-0.7, MM-S-116-0.5, MM-S-116-2.3, MM-S-116-4.0, MM-S-128-0.5, MM-S-128-1.0, MM-S-133-0.3, MM-S-137-0.3, and MM-S-137-0.5. These sample locations do not have corresponding laboratory data at the listed depths and are included in this table for reference only.
9. BLM median wildlife criteria (BLM, 2004).
10. EPA Eco-SSL (EPA, 2019).

bgs = below ground surface

BLM = Bureau of Land Management

CTR = sample collected in the center of the trench

Eco-SSL = ecological soil screening level

EPA = U.S. Environmental Protection Agency

H = Sample was prepped or analyzed beyond the specified holding time (28 days). The sample was analyzed within 8 days of the holding time expiration and the data is still considered usable (as discussed in Section 2.1.5 of the Supplemental Characterization Report).

J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

mg/kg = milligrams per kilogram

ND = for laboratory samples, not detected above the reporting limit (or method detection limit if shown in the laboratory report); for XRF samples, not detected above instrument detection level

NR = not recorded

PIT = test pit location

XRF = x-ray fluorescence

-- = not applicable

Table 3. Basis of Assumptions for Risk Evaluation

Receptor	Variable	Assumed Value	Basis of Assumption
Cabin Occupant (adult)	Exposure Frequency	100 days/year	Site-specific value[1]
	Exposure Duration	34 years	Site-specific value[2]; exposure duration for child + adult = 40 years
	Exposure Time	24 hours/day	CalEPA[3] and EPA[4] default value
Cabin Occupant (Child)	Exposure Frequency	100 days/year	Site-specific value[1]
	Exposure Duration	6 years	CalEPA[3] and EPA[4] default value
	Exposure Time	24 hours/day	CalEPA[3] and EPA[4] default value
Recreational User (Adult)	Exposure Frequency	40 days/year	EPA default value[5]
	Exposure Duration	20 years	CalEPA[3] and EPA[4] default value; exposure duration for child + adult = 26 years
	Exposure Time	24 hours/day	CalEPA[3] and EPA[4] default value
Recreational User (Child)	Exposure Frequency	40 days/year	USEPA default value[5]
	Exposure Duration	6 years	CalEPA[3] and EPA[4] default value
	Exposure Time	24 hours/day	CalEPA[3] and EPA[4] default value
Construction Worker (Adult only)	Exposure Frequency	30 days/year	Site-specific value[6]
	Exposure Duration	1 year	CalEPA[3] and EPA[4] default value
	Exposure Time	8 hours/day	CalEPA[3] and EPA[4] default value

Notes:

1 = Site-specific exposure frequency of 100 days per year based on Forest Service definition of a typical summer recreational cabin user who would use the site from June through September (Forest Service, 2016a).

2 = Site-specific exposure duration of 40 years based on Forest Service internal records and site knowledge (Forest Service 2016b). Forty years represents the 90th percentile of cabin ownership based on internal records summarizing years individual owners have owned cabins (for reference, the average duration is 20.5 years and maximum duration is 55 years). Using the 40-year total, this translates to an adult exposure duration of 34 years and a child exposure duration of 6 years).

3 = CalEPA, 2019. "California Department of Toxic Substances Control (DTSC) Office of Human and Ecological Risk (HERO) - Recommended DTSC Default Exposure Factors for Use in Risk Assessment at California Hazardous Waste Sites and Permitted Facilities. HHRA Note Number 1 – Default HHRA Exposure Parameters." April 9. Available Online at: <https://dtsc.ca.gov/wp-content/uploads/sites/31/2019/04/HHRA-Note-1-April-2019.pdf>.

4 = EPA, 2019. "Regional Screening Levels (RSLs) – Equations." May. Available Online at: <https://www.epa.gov/risk/regional-screening-levels-rsls-equations>.

5 = From EPA, 1992. "Dermal Exposure Assessment: Principles and Application. Interim Report." EPA/600/8-91/011B. Office of Research and Development. Washington, DC. Available Online at: <https://rais.ornl.gov/documents/DERM_EXP.PDF>.

6 = Site-specific exposure frequency for construction workers based on Forest Service site knowledge—limited construction season at site and limited actual historical or planned future construction (Forest Service, 2019b).

CalEPA = California Environmental Protection Agency

EPA = U.S. Environmental Protection Agency

Forest Service = U.S. Department of Agriculture Forest Service

HHRA = human health risk assessment

Table 4. Comparative Analysis of Alternatives

Alternative	Effectiveness			Implementability				Estimated Total Cost, including O&M	Overall Rating by Alternative
	Overall Protection of Human Health and the Environment	Short-Term Effectiveness	Long-Term Effectiveness and Permanence	Technical Feasibility	Administrative Feasibility	Availability of Services and Materials	Acceptance		
Alternative 1, Complete LUCs – ICs and Fencing	Poor	Poor	Poor	Excellent	Very Good	Excellent	Not acceptable	$609,491	Poor
Alternative 2, Minor Grading and Onsite Encapsulation with LUCs	Poor	Poor	Very Good	Poor	Very Good	Very Good	Very Good	$5,750,000	Very Good
Alternative 3A, Hotspot Excavation and Onsite Repository with LUCs	Very Good	Poor	Poor	Poor	Poor	Very Good	Poor	$4,404,587	Poor
Alternative 3B, Hotspot Excavation and Offsite Disposal with LUCs	Very Good	Poor	Very Good	Poor	Very Good	Very Good	Poor	$3,346,576	Poor
Alternative 4A, Complete Excavation and Onsite Repository with LUCs	Very Good	Poor	Very Good	Poor	Poor	Poor	Very Good	$9,263,878	Very Good
Alternative 4B, Complete Excavation and Offsite Disposal	Excellent	Poor	Excellent	Poor	Very Good	Poor	Very Good	$8,786,587	Very Good

Notes:

ICs = institutional controls

LUCs = land use controls

O&M = operation and maintenance

Legend:

Not acceptable — Good — Excellent

Poor — Very Good

Table 5. Comparison of Major Assumptions, Alternatives 2 and 3B

Item	Major Assumption	Effect of Changing Assumption	Alternative 2 (Assumed Cost)	Alternative 3B (Assumed Cost)	Alternative 2 Potential Cost Change	Alternative 3B Potential Cost Change
Design plans and preparation	Alternative 2 assumes additional design effort to evaluate architecture of each cabin. Alternative 3 assumes average design effort	Additional design for Alternative 2 may not be required, in which case these costs would be more equivalent, resulting in a cost savings of $102,000 for Alternative 2	$153,000	$27,000	-$126,000	$0
Protections for trees	Alternative 2 includes protection of 26 trees at $1,600 per tree. No trees are protected under Alternative 3B.	These costs would be more equivalent if trees were to be protected under Alternative 3B, resulting in a cost increase of $41,600 for Alternative 3B	$41,600	NA	$0	$41,600
Import clean cover material	Both alternatives assume purchase of clean fill at $57.76 per ton and import fill costs of $67.16 per cubic yard, which accounts for a large proportion of the overall costs.	If a local borrow source were identified on Forest Service land within a mile of the site, the cost per cubic yard would be significantly reduced and may be closer to $10 per cubic yard.	$2,264,000	$827,000	-$1,965,000	-$717,000
Offsite disposal	Alternative 3B assumes the landfill will accept Bevill-exempt waste (based on preliminary information obtained from the landfill).	If the local landfill does not accept site waste, the disposal costs for Alternative 3B could expand to double this value, resulting in a significant cost increase for Alternative 3B.	NA	$777,900	NA	+$777,900
Summary						
				Overall Potential Increase/Decrease	-$2,082,000	+$102,500

Appendix A. Focused Risk Analysis for Cabins Area

Abbreviations and Acronyms

95% UCL	95% upper confidence level of the mean concentration
BLM	Bureau of Land Management
BTV	background threshold value
CalEPA	California Environmental Protection Agency
COPCs	chemicals of potential concern
EF	exposure frequency
ERRG	Engineering/Remediation Resources Group, Inc.
FRA	focused risk analysis
ft bgs	feet below ground surface
HI	hazard index
ILCR	incremental lifetime cancer risk
mg/kg	milligrams per kilogram
RBA	relative bioavailability of arsenic
$RBC_{C,As}$	cancer endpoint RBC for arsenic
$RBC_{NC,As}$	noncancer endpoint RBC for arsenic
$RBC_{NC,Hg}$	noncancer endpoint RBC for mercury
RBCs	risk-based concentrations
USFS	U.S. Forest Service

Thomas Harder & Co.
Groundwater Consulting

September 30, 2019

Caitlin Gorman, PG
Regional Manager
Engineering/Remediation Resources Group, Inc. (ERRG)
456 Montgomery St., Suite 900
San Francisco, California 94104

Re: Focused Risk Analysis for Human Health in the Cabins Area
Mammoth Mining Company Stamp Mill Site
Inyo National Forest
Mono County, California

Dear Ms. Gorman:

The focused risk analysis (FRA) presented here is based on a revised dataset for the Cabins Area of the Mammoth Mining Company Stamp Mill Site located in the Inyo National Forest within Mono County, California (the Site; **Attachment A**[1]). This analysis supplements the Preliminary Assessment/Site Inspection Report[2] and the Technical Memorandum for Refinement of Streamlined Human Health Risk Assessment[3].

The focused risk analysis presented herein is based on a revised dataset for the Cabins Area. The original Cabins Area dataset, which was used in a previous risk assessment, was (a) expanded via the inclusion of soil samples collected in October 2017 and October 2018 and (b) reduced to not include samples east of the unnamed onsite creek, nor any sediment samples, nor samples north of Old Mammoth Road[4]. The recent samples were analyzed exclusively for arsenic and

[1] Draft Figure 4, Arsenic Laboratory Results provided by Engineering/Remediation Resources Group, Inc. (ERRG), June 7, 2019, via electronic mail.
[2] ERRG, 2016. "Preliminary Assessment/Site Inspection Report for the Mammoth Mining Company Stamp Mill Site, Inyo National Forest, Mono County, California." November.
[3] ERRG, 2017. "Technical Memorandum for Refinement of Streamlined Human Health Risk Assessment, Mammoth Mining Company Stamp Mill Site, Inyo National Forest, Mono County, California." January 23.
[4] The reasoning for excluding samples from each of these areas is as follows:

- The area east of the creek was considered chemically distinct from the area impacted by activities at the Mammoth Mill Site

mercury—the two risk-driving analytes identified in the previous risk assessment[5]. The dataset used for this analysis ("risk dataset") is provided in **Table 1**. In addition to the various "hot spot" removal scenarios considered in the FRA, this analysis also includes a sensitivity analysis that considers different values of exposure frequency (EF) and arsenic relative bioavailability.

The 95% upper confidence level of the mean concentration (95% UCL) of the arsenic and mercury concentrations in the upper 2 feet (i.e., 0 to 2 feet below ground surface [ft bgs]) and over all depths (i.e., 0 to 3.8 ft bgs) for the risk dataset are listed below.

<u>All depths (0 to 3.8 ft bgs)</u>

- arsenic 95% UCL = 22.26 milligrams per kilogram (mg/kg); and
- mercury 95% UCL = 122.8 mg/kg.

<u>0 to 2 ft bgs</u>

- arsenic 95% UCL = 22.58 mg/kg; and
- mercury 95% UCL = 125.2 mg/kg.

CABIN OCCUPANT RECEPTOR

Previous risk assessments established risk-based concentrations (RBCs) for the 100-day per year cabin occupant receptor as follows:

- cancer endpoint RBC for arsenic ($RBC_{C,As}$) = 3.1 mg/kg;
- noncancer endpoint RBC for arsenic ($RBC_{NC,As}$) = 1.4 mg/kg; and
- noncancer endpoint RBC for mercury ($RBC_{NC,Hg}$)[6] = 31 mg/kg.

Given a recent modification by the California Environmental Protection Agency (CalEPA) for the exposed skin surface area for the child receptor[7], these RBCs have been slightly modified and are now:

- cancer endpoint RBC for arsenic ($RBC_{C,As}$) = 3.2 mg/kg;
- noncancer endpoint RBC for arsenic ($RBC_{NC,As}$) = 1.4 mg/kg; and
- noncancer endpoint RBC for mercury ($RBC_{NC,Hg}$) = 33 mg/kg.

- Sediment samples were collected from within the onsite diversion ditch and within the unnamed creek. Both of these areas are outside of the boundary of the Cabins Area.
- Two samples collected north of Old Mammoth Road (MM-S-110 and MM-S-112) were removed because this area is also outside of the boundary of the Cabins Area.

[5] Arsenic and mercury are hereafter referred to as chemicals of potential concern (COPCs).
[6] As mercury is noncarcinogenic, there is no RBC associated with the cancer endpoint for mercury.
[7] Because the child receptor is also considered for the recreational user receptor, the RBCs were also slightly modified for that receptor. The modification has no effect on the construction worker RBCs as that receptor is exclusively an adult.

The RBC calculation spreadsheets for the cabin occupant receptor are included as **Attachment B**. The parameter values shown in these calculation spreadsheets are based on Bureau of Land Management (BLM) guidance[8,9] and site-specific considerations obtained through discussions with the U.S. Forest Service (USFS).

The incremental lifetime cancer risk (ILCR) and noncancer hazard index (HI), hereafter referred to as "risk values", are calculated as follows:

Equation 1:

$$ILCR = RR \times \left(\frac{95\%\ UCL_{As}}{RBC_{C,As}}\right)$$

Equation 2:

$$HI = RHQ \times \left(\frac{95\%\ UCL_{As}}{RBC_{NC,As}} + \frac{95\%\ UCL_{Hg}}{RBC_{NC,Hg}}\right)$$

where:

ILCR	incremental lifetime cancer risk (unitless);
RR	reference incremental lifetime cancer risk (1E-05; unitless);
HI	hazard index (unitless);
RHQ	reference hazard quotient (1.0; unitless)[10];
95% UCL_{As}	exposure point concentration for arsenic (mg/kg);
95% UCL_{Hg}	exposure point concentration for mercury (mg/kg);
$RBC_{C,As}$	cancer endpoint RBC for arsenic (mg/kg);
$RBC_{NC,As}$	noncancer endpoint RBC for arsenic (mg/kg); and
$RBC_{NC,Hg}$	noncancer endpoint RBC for mercury (mg/kg).

When the values above are substituted into these equations and using the conventions for "low", "moderate", and "high" risk presented in the previous risk assessment, the risk values are as follows:

- ILCR = 7E-05 (moderate risk); and
- HI $\simeq$ 20 (high risk).

[8] BLM, 2004. "Risk Management Criteria for Metals at BLM Mining Sites, Technical Note 390 Revised." BLM/RS/ST-97/001+1703. October. Available Online at: https://www.blm.gov/documents/national-office/blm-library/technical-note/risk-management-criteria-metals-blm-mining

[9] BLM, 2017. "BLM Technical Memorandum: Screening Assessment Approaches for Metals in Soil at BLM HazMat/AML Sites." September Update.

[10] The ratios in the parenthetical term of Eq. 2 are referred to as the hazard quotient.

Therefore, a roughly 7-fold reduction in EF would be required to bring the ILCR value down to the low risk value of 1E-5, whereas a roughly 20-fold reduction in EF would be required to bring the HI value down to the low risk value of 1. That is, for the ILCR, the low risk EF would be approximately 14 days per year (100 / 7 days per year ≃ 14 days per year) whereas for the HI, the low risk EF would be approximately 5 days per year (100 / 20 days per year ≃ 5 days per year).

Given the inconvenience that would be imposed on cabin owners should these reductions in EF be implemented, seven hot spot removal areas (Areas A through G, as shown on the **Attachment A** figure) are being contemplated to target the highest COPC concentrations. A total of 13 removal scenarios involving various combinations of these removal areas—but all of which involve removal of Areas A and B—are evaluated herein. The soil samples associated with these removal areas are shown in **Table 1**. For this analysis, the 95% UCL values were recalculated for these scenarios under the assumption that each "excavated concentration" was not replaced by some value (which would not be known until post-remediation laboratory results are received). In short, the excavated concentration effectively 'disappeared' and the smaller resulting dataset was used to calculate the scenario-specific 95% UCLs and associated risk values. Another assumption in this analysis is that the sample results were equally weighted with respect to areal extent. That is, no spatial interpolation technique (e.g., kriging, inverse-distance, etc.) was used to derive a spatially weighted dataset on which the calculations were conducted. However, given the extensive lateral coverage afforded by the dataset, this latter assumption is not expected to significantly affect the analysis presented herein.

The results for the removal scenarios are presented in **Table 2**. As shown in this table, an important requirement for whatever removal scenario is ultimately selected is that it should reduce the 95% UCL for arsenic to a value at or below the background threshold value (BTV) established in the previous risk assessment, thereby eliminating it as a COPC. Once arsenic is eliminated as a COPC:

- there is no calculated ILCR;
- arsenic no longer contributes to the HI; and
- mercury, with its comparatively higher RBC, becomes the only COPC and therefore the sole risk-driver.

As shown in **Table 2**, when considering only those removal scenarios that result in low risk:

- if exposure is assumed to be limited to the upper 2 feet for the cabin occupant, Scenario 2 (removal of Areas A, B, C, and D) provides the lowest risk values whereas Scenario 6 (removal of Areas A, B, D, E, and F) provides the highest risk values; and

- if exposure is assumed to occur over the entire sampled depth interval (i.e., the upper 3.8 feet), Scenario 3[11] (removal of Areas A, B, C, and G) provides the lowest risk values whereas Scenario 6 (removal of Areas A, B, D, E, F) again provides the highest risk values.

The "Maximum Days" values along the righthand edge of this table are calculated as the ratio of the EF to the HI value and represent the number of days per year the receptor could theoretically be present and still be at low risk. As such, it represents an "allowable" EF. This value is shown only for those removal scenarios in which mercury is the only COPC. For those removal scenarios, the HI value is less than 1; therefore, the "Maximum Days" values exceed the 100 days per year EF on which the RBC is based for this receptor.

RECREATIONAL USER AND CONSTRUCTION WORKER RECEPTORS

The analysis conducted above for the cabin occupant receptor was also conducted for the recreational user and construction worker receptors as presented in **Table 3** and **Table 4**, respectively. The risk values in these tables differ from those presented for the cabin occupant receptor due to the different associated RBCs (the RBC calculation spreadsheets for these receptors are included as **Attachment C** and **Attachment D**, respectively)[12]. Similarly, the "Maximum Days" column reflects the different exposure frequencies on which the RBCs are based. The EF for the construction worker used in this analysis (30 days per year) is significantly lower than that used in previous analyses (250 days per year) at the direction of the USFS to provide a more likely value for the removal scenarios being considered.

As shown in these tables, the "Maximum Days" values (111 to 259 days per year) for the low risk scenarios exceed the EF (40 days per year) used to calculate the RBCs for the recreational user receptor. Similarly, for the construction worker receptor, the "Maximum Days" values (136 to 318 days per year) exceed the EF (30 days per year) used to calculate the RBCs. The low risk scenarios are Scenarios 2, 4 through 9, 11, and 13. The "No Removal Action" scenario, along with Scenarios 1, 3, 10, and 12 result in moderate risk. When one considers an exposure depth of 0 to 2 ft bgs, the low risk scenario that results in the lowest risk is the one associated with the largest value of "Maximum Days"; that is, Scenario 2. The low risk scenario that minimizes the volume of soil to be excavated is Scenario 11.

[11] It is noted that Scenario 3 provides moderate cancer risk and high HI values for the upper 2-foot interval because arsenic is retained as a COPC.

[12] As for the cabin occupant spreadsheets in **Attachment B**, the parameter values shown in these calculation spreadsheets are based on BLM guidance and site-specific considerations obtained through discussions with USFS.

SENSITIVITY ANALYSIS

The sensitivity analysis presented here considers different values for the EF and relative bioavailability of arsenic (RBA)[13] for the Cabin Occupant Receptor. Specifically, EF and RBA values lower than those used in previous analyses are evaluated.

EF Sensitivity

For this sensitivity analysis, the values of EF (in units of days per year) were varied between 15 and 100 days per year. As shown in the plot below, the cancer and noncancer RBC values are inversely proportional to EF. That is, higher values of EF yield lower values of the RBCs.

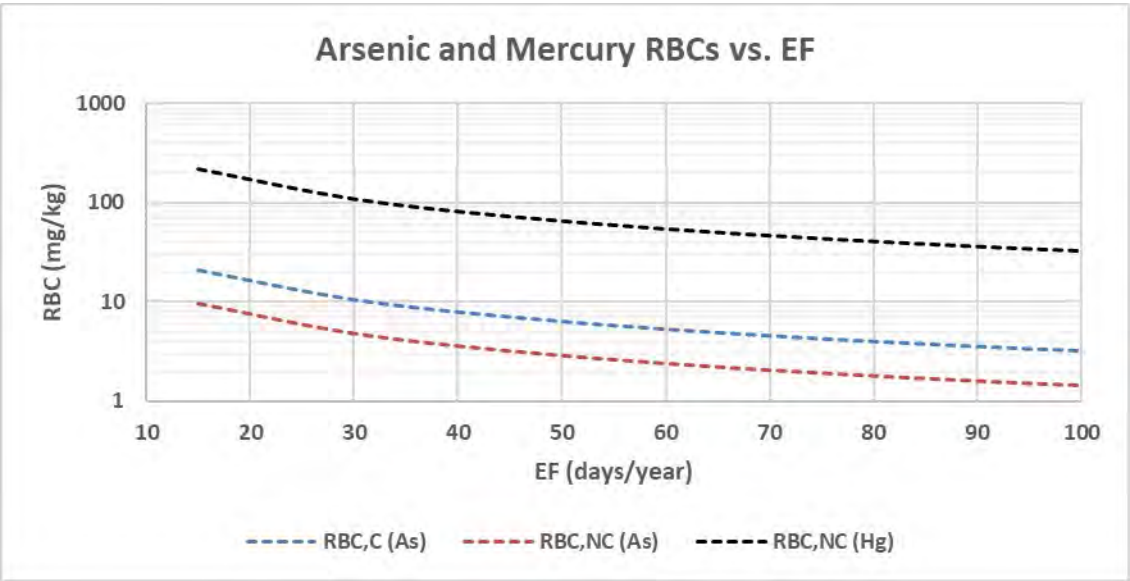
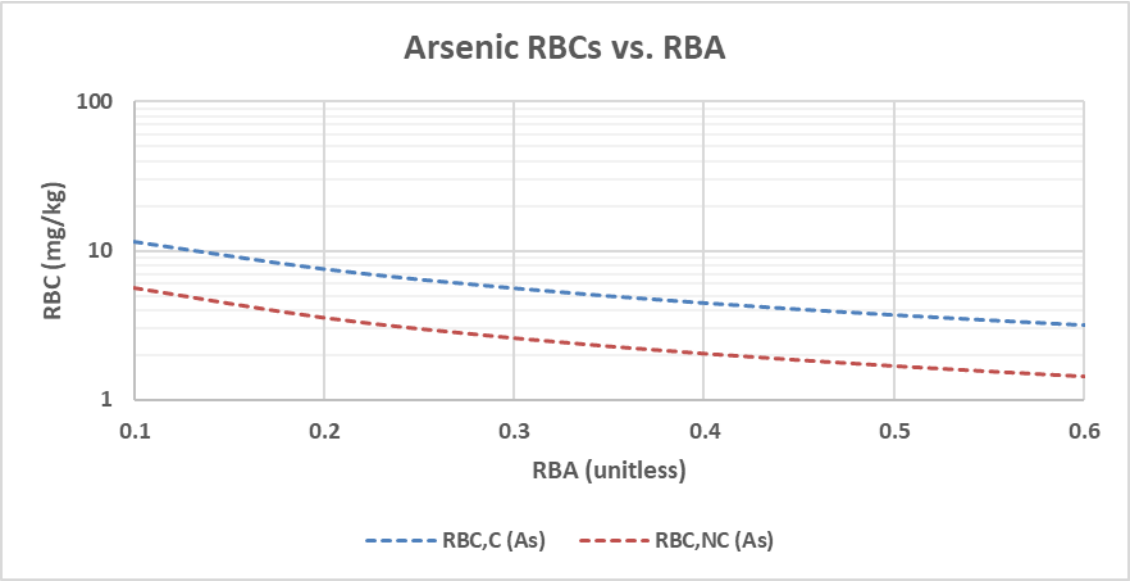


Table 5a shows the sensitivity of the risk values to EF for the default RBA of 0.6. As shown in the table, the risk values decrease with a decrease in EF. Of note is the fact that the removal scenarios that are moderate risk or high risk at an EF of 100 days per year remain as moderate risk at the lowest EF of 15 days per year.

RBA Sensitivity

For this sensitivity analysis, the values of the RBA for arsenic—which is a unitless value—were varied between 0.1 and 0.5. As shown in the plot below, the cancer and noncancer RBC values are inversely proportional to RBA. That is, higher values of RBA yield lower values of the RBCs.

[13] RBA is a ratio that compares the bioavailability of arsenic in soil to that of arsenic in water. https://dtsc.ca.gov/wp-content/uploads/sites/31/2018/01/HHRA-Note-6-CAB-Method.pdf



Combined Sensitivity

The combined sensitivity to RBA and EF, expressed in terms of the risk values for the cabin occupant receptor are presented in **Table 5b** through **Table 5g**. Given the inverse relationship of both RBA and EF to the RBCs and the inverse relationship between RBCs and risk values, the combined effect is that the highest risk values are associated with the lowest values of RBA and EF.

When these sensitivities are considered with respect to the "viability" of the removal scenarios—where a "viable scenario" is defined as one that results in low risk—the number of viable scenarios increases for lower values of RBA and EF. In the interest of brevity, the list below considers the situation where the cabin occupant receptors are assumed to access only the upper 2 feet of soil (i.e., the 0-to-2-ft-bgs exposure depth):

- the No Removal Action scenario is not viable under any set of RBA and EF values considered in this analysis;
- conversely, Scenarios 2, 4 through 9, 11, and 13 are viable for all sets of RBA and EF values considered in this analysis;
- Scenarios 1, 3, 10, and 12 are not viable for any EF considered in this analysis for RBA $\geq$ 0.4;
- for RBA $\leq$ 0.3 and EF $\leq$ 15 days per year, Scenarios 1, 3, 10, and 12 are viable; and
- for RBA $\leq$ 0.1 and EF $\leq$ 30 days per year, Scenarios 3 and 12 are viable.

CLOSING

The inherent assumption of this analysis is that excavated samples are not replaced in the risk dataset (i.e., the dataset provided in **Table 1**) by post-remediation sample results. That is, the post-remediation datasets considered in this analysis consist of *fewer* samples than the pre-

remediation dataset on which this analysis is based. In reality, the post-remediation dataset will likely be larger than the pre-remediation dataset and yield different risk results than those reported herein. Therefore, it is recommended that, upon implementation of any removal action scenario evaluated here or otherwise:

1. post-remediation samples should be used to update the risk dataset; and
2. the resulting post-remediation dataset should be used to recalculate the risk values presented herein to guide the removal action.

TH&Co appreciates the opportunity to provide our services to ERRG. If you have any questions, please contact Jim Van de Water at 949 795-0855 (cell), 714 779-3875 (office), or via electronic mail at jimvdw@thomashardercompany.com.

Sincerely,

Jim Van de Water

Jim Van de Water, P.G., C.HG.
Principal Hydrogeologist

Attachments
Attachment A: RBCs for Cabin Occupant Receptor
Attachment B: RBCs for Recreational User Receptor
Attachment C: RBCs for Construction Worker Receptor

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TABLES

TABLE 1

Concentrations of Arsenic and Mercury in the Cabins Area and Associated Removal Areas

				Concentration (mg/kg)		
Sample ID	Sample Type	Collection Date	Sample Depth (ft bgs)	Arsenic	Mercury	Removal Area
MM-S-11	Soil	July 2014	0 to 0.5	4.4	0.98	-
MM-S-12	Soil	July 2014	0 to 0.5	9.1	18	-
MM-S-12-0.5	Soil	October 2017	0.5	3.8	0.79	-
MM-S-13	Soil	July 2014	0 to 0.5	4.0	3.9	-
MM-S-14	Soil	July 2014	0 to 0.5	26	23	-
MM-S-15	Soil	July 2014	0 to 0.5	3.3	0.54	-
MM-S-21	Soil	June 2015	0 to 0.5	6.4	0.77	-
MM-S-22	Soil	June 2015	0 to 0.5	4.6	0.58	-
MM-S-24	Soil	June 2015	0 to 0.5	30	120	Area C (1' thick)
MM-S-24-0.5	Soil	October 2017	0.5	3.4	2.0	Area C (1' thick)
MM-S-28	Soil	June 2015	0 to 0.5	25	42	Area C (1' thick)
MM-S-28-0.5	Soil	October 2017	0.5	5.2	2.0	Area C (1' thick)
MM-S-29	Soil	June 2015	0 to 0.5	4.6	2.1	-
MM-S-30	Soil	June 2015	0 to 0.5	39	120	Area B (2.5' thick)
MM-S-30-1.5	Soil	October 2017	1.5	4.9	3.1	Area B (2.5' thick)
MM-S-31	Soil	June 2015	0 to 0.5	3.1	0.88	-
MM-S-32	Soil	June 2015	0 to 0.5	10	140	Area B (2.5' thick)
MM-S-32-0.5	Soil	October 2017	0.5	9.0	95	Area B (2.5' thick)
MM-S-33	Soil	June 2015	0 to 0.5	8.4	14	-
MM-S-34	Soil	June 2015	0 to 0.5	6.8	4.0	-
MM-S-35	Soil	June 2015	0 to 0.5	24	72	Area E (0.5' thick)
MM-S-35-0.5	Soil	October 2017	0.5	5.6	3.2	Area E (0.5' thick)
MM-S-36	Soil	June 2015	0 to 0.5	4.3	0.62	-
MM-S-37	Soil	June 2015	0 to 0.5	6.4	2.0	-
MM-S-100-00	Soil	October 2017	0.0	4.1	6.0	-
MM-S-101-00	Soil	October 2017	0.0	6.8	13	-
MM-S-105-00	Soil	October 2017	0.0	89	880	Area A (2.5' thick)
MM-S-105-3.5	Soil	October 2017	3.5	7.3	1.1	-
MM-S-106-00	Soil	October 2017	0.0	38	410	Area A (2.5' thick)
MM-S-106-2.0	Soil	October 2017	2.0	4.5	1.4	Area A (2.5' thick)
MM-S-107-00	Soil	October 2017	0.0	11	76	-
MM-S-107-1.0	Soil	October 2017	1.0	3.6	1.0	-
MM-S-108-00	Soil	October 2017	0.0	34	1.6	Area D (2' thick)
MM-S-108-1.0	Soil	October 2017	1.0	34	1.1	Area D (2' thick)
MM-S-40-00	Soil	October 2017	0.0	4.3	14	-
MM-S-41-00	Soil	October 2017	0.0	6.8	13	-
MM-S-42-00	Soil	October 2017	0.0	75	270	Area B (2.5' thick)
MM-S-43-00	Soil	October 2017	0.0	17	81	Area B (2.5' thick)

TABLE 1

Concentrations of Arsenic and Mercury in the Cabins Area and Associated Removal Areas

				Concentration (mg/kg)		
Sample ID	Sample Type	Collection Date	Sample Depth (ft bgs)	Arsenic	Mercury	Removal Area
MM-S-44-00	Soil	October 2017	0.0	11	26	-
MM-S-44-2.0	Soil	October 2017	2.0	4.3	21	-
MM-S-46-2.0	Soil	October 2017	2.0	3.9	2.7	-
MM-S-46-3.8	Soil	October 2017	3.8	7.0	0.77	-
MM-S-47-00	Soil	October 2017	0.0	8.0	0.92	-
MM-S-48-00	Soil	October 2017	0.0	5.1	0.93	-
MM-S-49-00	Soil	October 2017	0.0	6.7	0.83	-
MM-S-50-00	Soil	October 2017	0.0	6.4	1.4	-
MM-S-51-00	Soil	October 2017	0.0	4.5	5.0	-
MM-S-52-00	Soil	October 2017	0.0	5.0	4.3	-
MM-S-53-00	Soil	October 2017	0.0	5.2	7.4	-
MM-S-54-00	Soil	October 2017	0.0	4.4	1.2	-
MM-S-55-00	Soil	October 2017	0.0	4.3	4.6	-
MM-S-56-1.0	Soil	October 2017	1.0	5.6	14	-
MM-S-57-00	Soil	October 2017	0.0	6.2	8.1	-
MM-S-58-00	Soil	October 2017	0.0	9.4	3.8	-
MM-S-59-00	Soil	October 2017	0.0	6.1	2.8	-
MM-S-60-00	Soil	October 2017	0.0	12	8.8	-
MM-S-61-00	Soil	October 2017	0.0	4.7	0.95	-
MM-S-62-00	Soil	October 2017	0.0	6.7	3.8	-
MM-S-63-00	Soil	October 2017	0.0	3.5	2.9	Area C (1' thick)
MM-S-63-0.5	Soil	October 2018	0.5	12	71	Area C (1' thick)
MM-S-63-1.0	Soil	October 2018	1.0	4.6	0.43	Area C (1' thick)
MM-S-64-00	Soil	October 2017	0.0	3.8	1.4	-
MM-S-65-00	Soil	October 2017	0.0	5.1	3.6	-
MM-S-66-00	Soil	October 2017	0.0	5.0	0.95	-
MM-S-67-00	Soil	October 2017	0.0	11	0.57	-
MM-S-68-00	Soil	October 2017	0.0	7.8	4.3	-
MM-S-69-00	Soil	October 2017	0.0	7.4	5.6	-
MM-S-70-00	Soil	October 2017	0.0	10	7.9	-
MM-S-70-1.0	Soil	October 2017	1.0	7.0	11	-
MM-S-71-00	Soil	October 2017	0.0	3.8	1.5	-
MM-S-71-0.5	Soil	October 2017	0.5	2.6	0.42	-
MM-S-72-00	Soil	October 2017	0.0	4.9	1.2	-
MM-S-73-00	Soil	October 2017	0.0	5.6	1.3	-
MM-S-74-00	Soil	October 2017	0.0	6.2	0.44	-
MM-S-75-00	Soil	October 2017	0.0	7.5	0.61	-
MM-S-76-00	Soil	October 2017	0.0	12	0.76	-

TABLE 1

Concentrations of Arsenic and Mercury in the Cabins Area and Associated Removal Areas

				Concentration (mg/kg)		
Sample ID	Sample Type	Collection Date	Sample Depth (ft bgs)	Arsenic	Mercury	Removal Area
MM-S-77-00	Soil	October 2017	0.0	2.1	0.84	-
MM-S-78-00	Soil	October 2017	0.0	5.5	1.5	-
MM-S-79-00	Soil	October 2017	0.0	3.9	0.29	-
MM-S-80-00	Soil	October 2017	0.0	4.5	8.0	-
MM-S-81-00	Soil	October 2017	0.0	8.7	2.1	-
MM-S-82-00	Soil	October 2017	0.0	6.1	0.22	-
MM-S-82-0.5	Soil	October 2017	0.5	11	0.20	-
MM-S-84-00	Soil	October 2017	0.0	9.1	3.0	-
MM-S-85-00	Soil	October 2017	0.0	6.8	2.8	-
MM-S-86-00	Soil	October 2017	0.0	34	3.6	Area F (0.5' thick)
MM-S-86-0.5	Soil	October 2017	0.5	11	1.4	Area F (0.5' thick)
MM-S-87-00	Soil	October 2017	0.0	25	49	Area C (1' thick)
MM-S-87-1.0	Soil	October 2017	1.0	4.5	7.3	Area C (1' thick)
MM-S-88-00	Soil	October 2017	0.0	9.5	43	Area C (1' thick)
MM-S-88-0.5	Soil	October 2017	0.5	6.7	19	Area C (1' thick)
MM-S-91-00	Soil	October 2017	0.0	10	19	Area B (2.5' thick)
MM-S-92-00	Soil	October 2017	0.0	47	400	Area B (2.5' thick)
MM-S-93-00	Soil	October 2017	0.0	48	330	Area G (0.5' thick)
MM-S-94-00	Soil	October 2017	0.0	5.9	5.7	-
MM-S-96-00	Soil	October 2017	0.0	11	38	-
MM-S-97-00	Soil	October 2017	0.0	22	88	Area B (2.5' thick)
MM-S-98-00	Soil	October 2017	0.0	8.0	23	-
MM-S-99-00	Soil	October 2017	0.0	14	44	Area B (2.5' thick)
MM-S-111-0.3	Soil	October 2018	0.3	110	1100	Area A (2.5' thick)
MM-S-111-1.0	Soil	October 2018	1.0	3.4	0.63	Area A (2.5' thick)
MM-S-114-0.5	Soil	October 2018	0.5	2.3	2.8	-
MM-S-114-1.2	Soil	October 2018	1.2	3.0	0.22	-
MM-S-115-0.3	Soil	October 2018	0.3	150	870	Area A (2.5' thick)
MM-S-115-2.7	Soil	October 2018	2.7	7.0	20	-
MM-S-117-0.3	Soil	October 2018	0.3	11	1.0	-
MM-S-117-1.5	Soil	October 2018	1.5	10	0.73	-
MM-S-118-0.3	Soil	October 2018	0.3	18	3.0	Area D (2' thick)
MM-S-118-1.0	Soil	October 2018	1.0	19	1.2	Area D (2' thick)
MM-S-119-0.3	Soil	October 2018	0.3	35	9.5	Area D (2' thick)
MM-S-119-1.0	Soil	October 2018	1.0	20	1.5	Area D (2' thick)
MM-S-120-0.3	Soil	October 2018	0.3	3.5	0.82	-
MM-S-121-0.3	Soil	October 2018	0.3	18	80	Area B (2.5' thick)
MM-S-121-1.0	Soil	October 2018	1.0	6.7	2.8	Area B (2.5' thick)

TABLE 1

Concentrations of Arsenic and Mercury in the Cabins Area and Associated Removal Areas

				Concentration (mg/kg)		
Sample ID	Sample Type	Collection Date	Sample Depth (ft bgs)	Arsenic	Mercury	Removal Area
MM-S-122-0.3	Soil	October 2018	0.3	20	130	Area B (2.5' thick)
MM-S-122-1.5	Soil	October 2018	1.5	10	100	Area B (2.5' thick)
MM-S-122-2.0	Soil	October 2018	2.0	6.5	1.7	Area B (2.5' thick)
MM-S-123-0.5	Soil	October 2018	0.5	12	21	-
MM-S-124-0.3	Soil	October 2018	0.3	4.9	2.9	-
MM-S-125-0.6	Soil	October 2018	0.6	19	170	Area B (2.5' thick)
MM-S-126-0.4	Soil	October 2018	0.4	7.9	35	Area C (1' thick)
MM-S-127-0.5	Soil	October 2018	0.5	6.3	14	Area C (1' thick)
MM-S-127-1.0	Soil	October 2018	1.0	4.3	0.63	Area C (1' thick)
MM-S-129-0.5	Soil	October 2018	0.5	20	82	Area D (2' thick)
MM-S-129-1.5	Soil	October 2018	1.5	21	1.1	Area D (2' thick)
MM-S-129-2.0	Soil	October 2018	2.0	13	0.96	Area D (2' thick)
MM-S-130-0.3	Soil	October 2018	0.3	3.2	4.7	-
MM-S-130-0.5	Soil	October 2018	0.5	3.1	0.44	-
MM-S-131-0.5	Soil	October 2018	0.5	110	1200	Area B (2.5' thick)
MM-S-131-1.5	Soil	October 2018	1.5	6.2	1.2	Area B (2.5' thick)
MM-S-132-0.3	Soil	October 2018	0.3	77	300	Area B (2.5' thick)
MM-S-132-1.5	Soil	October 2018	1.5	6.2	8.5	Area B (2.5' thick)
MM-S-133-1.0	Soil	October 2018	1.0	50	40	Area D (2' thick)
MM-S-133-1.3	Soil	October 2018	1.3	49	24	Area D (2' thick)
MM-S-134-0.4	Soil	October 2018	0.4	2.5	2.5	-
MM-S-135-0.3	Soil	October 2018	0.3	4.1	2.1	-
MM-S-136-0.3	Soil	October 2018	0.3	3.0	0.27	-
MM-S-139-0.3	Soil	October 2018	0.3	3.0	0.61	-
MM-S-140-0.6	Soil	October 2018	0.6	7.0	25	-
MM-S-140-0.8	Soil	October 2018	0.8	2.5	0.41	-
MM-S-141-0.3	Soil	October 2018	0.3	15	220	Area A (2.5' thick)
MM-S-141-1.3	Soil	October 2018	1.3	2.8	1.5	Area A (2.5' thick)
MM-S-141-1.7	Soil	October 2018	1.7	3.6	0.84	Area A (2.5' thick)

ft bgs - feet below ground surface
mg/kg - milligrams per kilogram

TABLE 2

Analysis of Soil Removal Scenarios for Cabins Area (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	95% UCL		BTV		COPCs		Cabin Occupant RBCs (mg/kg)				Risk Values (unitless)						Maximum Days*
									Arsenic		Mercury		Arsenic		Mercury		Totals		
			Arsenic	Mercury	Arsenic	Mercury	Arsenic	Mercury	Cancer Endpoint	Noncancer Endpoint	Cancer Endpoint	Noncancer Endpoint	ILCR	HQ	ILCR	HQ	Σ ILCR	Σ HQ = HI	
No Removal Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	22.26	122.8	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	7E-05	2E+01	-	4E+00	7E-05	2E+01	5
	0 to 2 ft bgs		22.58	125.2	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	7E-05	2E+01	-	4E+00	7E-05	2E+01	5
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	13.97	26.46	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	1E+01	-	8E-01	4E-05	1E+01	9
	0 to 2 ft bgs		14.18	27.04	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	1E+01	-	8E-01	4E-05	1E+01	9
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	7.92	27.40	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	8E-01	0E+00	8E-01	119
	0 to 2 ft bgs		7.95	12.64	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	4E-01	0E+00	4E-01	259
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	13.28	14.25	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	4E-01	0E+00	4E-01	230
	0 to 2 ft bgs		13.47	14.43	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	9E+00	-	4E-01	4E-05	1E+01	10
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	10.75	28.80	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	9E-01	0E+00	9E-01	114
	0 to 2 ft bgs		10.86	18.62	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	6E-01	0E+00	6E-01	176
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	10.59	28.42	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	9E-01	0E+00	9E-01	115
	0 to 2 ft bgs		10.69	29.04	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	9E-01	0E+00	9E-01	113
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	10.10	28.93	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	9E-01	0E+00	9E-01	113
	0 to 2 ft bgs		10.20	29.59	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	9E-01	0E+00	9E-01	111
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	7.50	17.46	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	5E-01	0E+00	5E-01	187
	0 to 2 ft bgs		7.51	17.75	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	5E-01	0E+00	5E-01	184
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	7.83	17.18	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	5E-01	0E+00	5E-01	190
	0 to 2 ft bgs		7.85	17.45	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	5E-01	0E+00	5E-01	187
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	9.84	18.04	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	6E-01	0E+00	6E-01	181
	0 to 2 ft bgs		9.92	18.33	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	6E-01	0E+00	6E-01	178
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	13.70	27.45	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	1E+01	-	8E-01	4E-05	1E+01	10
	0 to 2 ft bgs		13.87	27.99	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	1E+01	-	9E-01	4E-05	1E+01	9
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	13.09	17.69	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	5E-01	0E+00	5E-01	185
	0 to 2 ft bgs		13.26	17.95	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	5E-01	0E+00	5E-01	182
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	13.49	28.25	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	9E+00	-	9E-01	4E-05	1E+01	10
	0 to 2 ft bgs		13.66	28.81	13.34	0.42	Yes	Yes	3.2E+00	1.4E+00	-	3.3E+01	4E-05	1E+01	-	9E-01	4E-05	1E+01	10
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	12.87	18.69	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	6E-01	0E+00	6E-01	175
	0 to 2 ft bgs		13.03	18.98	13.34	0.42	No	Yes	NA	NA	-	3.3E+01	-	-	-	6E-01	0E+00	6E-01	172

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

**** 'Maximum Days' based on assumed EF (100 days per year) and the higher of the two risk values relative to their respective "low risk" benchmark levels***

ft bgs - feet below ground surface; 95% UCL - 95 percentile upper confidence limit of the mean concentration; BTV - background threshold concentration;
COPC - chemical of potential concern; mgkg - milligram per kilogram; ILCR - incremental lifetime cancer risk; HQ - hazard quotient; HI - hazard index

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TABLE 3

Analysis of Soil Removal Scenarios for Cabins Area (Recreational User Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	95% UCL		BTV		COPCs		Recreational User RBCs (mg/kg)				Risk Values (unitless)						Maximum Days*
									Arsenic		Mercury		Arsenic		Mercury		Totals		
			Arsenic	Mercury	Arsenic	Mercury	Arsenic	Mercury	Cancer Endpoint	Noncancer Endpoint	Cancer Endpoint	Noncancer Endpoint	ILCR	HQ	ILCR	HQ	Σ ILCR	Σ HQ = HI	
No Removal Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	22.26	122.8	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	2E-05	6E+00	-	2E+00	2E-05	8E+00	5
	0 to 2 ft bgs		22.58	125.2	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	2E-05	6E+00	-	2E+00	2E-05	8E+00	5
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	13.97	26.46	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	1E-05	4E+00	-	3E-01	1E-05	4E+00	9
	0 to 2 ft bgs		14.18	27.04	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	2E-05	4E+00	-	3E-01	2E-05	4E+00	9
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	7.92	27.40	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	3E-01	0E+00	3E-01	119
	0 to 2 ft bgs		7.95	12.64	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	259
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	13.28	14.25	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	230
	0 to 2 ft bgs		13.47	14.43	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	1E-05	4E+00	-	2E-01	1E-05	4E+00	10
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	10.75	28.80	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	4E-01	0E+00	4E-01	114
	0 to 2 ft bgs		10.86	18.62	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	176
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	10.59	28.42	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	3E-01	0E+00	3E-01	115
	0 to 2 ft bgs		10.69	29.04	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	4E-01	0E+00	4E-01	113
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	10.10	28.93	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	4E-01	0E+00	4E-01	113
	0 to 2 ft bgs		10.20	29.59	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	4E-01	0E+00	4E-01	111
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	7.50	17.46	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	187
	0 to 2 ft bgs		7.51	17.75	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	184
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	7.83	17.18	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	190
	0 to 2 ft bgs		7.85	17.45	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	187
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	9.84	18.04	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	181
	0 to 2 ft bgs		9.92	18.33	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	178
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	13.70	27.45	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	1E-05	4E+00	-	3E-01	1E-05	4E+00	10
	0 to 2 ft bgs		13.87	27.99	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	1E-05	4E+00	-	3E-01	1E-05	4E+00	9
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	13.09	17.69	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	185
	0 to 2 ft bgs		13.26	17.95	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	182
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	13.49	28.25	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	1E-05	4E+00	-	3E-01	1E-05	4E+00	10
	0 to 2 ft bgs		13.66	28.81	13.34	0.42	Yes	Yes	9.4E+00	3.6E+00	-	8.2E+01	1E-05	4E+00	-	4E-01	1E-05	4E+00	10
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	12.87	18.69	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	175
	0 to 2 ft bgs		13.03	18.98	13.34	0.42	No	Yes	NA	NA	-	8.2E+01	-	-	-	2E-01	0E+00	2E-01	172

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

**** 'Maximum Days' based on assumed EF (40 days per year) and the higher of the two risk values relative to their respective "low risk" benchmark levels.***

ft bgs - feet below ground surface; 95% UCL - 95 percentile upper confidence limit of the mean concentration; BTV - background threshold concentration;
COPC - chemical of potential concern; mgkg - milligram per kilogram; ILCR - incremental lifetime cancer risk; HQ - hazard quotient; HI - hazard index

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TABLE 4

Analysis of Soil Removal Scenarios for Cabins Area (Construction Worker Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	95% UCL		BTV		COPCs		Construction Worker RBCs (mg/kg)				Risk Values (unitless)						Maximum Days*
									Arsenic		Mercury		Arsenic		Mercury		Totals		
			Arsenic	Mercury	Arsenic	Mercury	Arsenic	Mercury	Cancer Endpoint	Noncancer Endpoint	Cancer Endpoint	Noncancer Endpoint	ILCR	HQ	ILCR	HQ	Σ ILCR	Σ HQ = HI	
No Removal Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	22.26	122.8	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	1E-06	2E+00	-	9E-01	1E-06	3E+00	9
	0 to 2 ft bgs		22.58	125.2	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	1E-06	2E+00	-	9E-01	1E-06	3E+00	9
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	13.97	26.46	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	2E-01	7E-07	2E+00	18
	0 to 2 ft bgs		14.18	27.04	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	2E-01	7E-07	2E+00	18
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	7.92	27.40	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	2E-01	0E+00	2E-01	147
	0 to 2 ft bgs		7.95	12.64	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	9E-02	0E+00	9E-02	318
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	13.28	14.25	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	282
	0 to 2 ft bgs		13.47	14.43	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	1E-01	7E-07	1E+00	20
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	10.75	28.80	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	2E-01	0E+00	2E-01	140
	0 to 2 ft bgs		10.86	18.62	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	216
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	10.59	28.42	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	2E-01	0E+00	2E-01	142
	0 to 2 ft bgs		10.69	29.04	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	2E-01	0E+00	2E-01	139
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	10.10	28.93	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	2E-01	0E+00	2E-01	139
	0 to 2 ft bgs		10.20	29.59	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	2E-01	0E+00	2E-01	136
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	7.50	17.46	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	230
	0 to 2 ft bgs		7.51	17.75	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	227
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	7.83	17.18	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	234
	0 to 2 ft bgs		7.85	17.45	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	230
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	9.84	18.04	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	223
	0 to 2 ft bgs		9.92	18.33	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	219
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	13.70	27.45	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	2E-01	7E-07	2E+00	19
	0 to 2 ft bgs		13.87	27.99	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	2E-01	7E-07	2E+00	18
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	13.09	17.69	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	227
	0 to 2 ft bgs		13.26	17.95	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	224
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	13.49	28.25	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	2E-01	7E-07	2E+00	19
	0 to 2 ft bgs		13.66	28.81	13.34	0.42	Yes	Yes	2.0E+02	9.8E+00	-	1.3E+02	7E-07	1E+00	-	2E-01	7E-07	2E+00	19
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	12.87	18.69	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	215
	0 to 2 ft bgs		13.03	18.98	13.34	0.42	No	Yes	NA	NA	-	1.3E+02	-	-	-	1E-01	0E+00	1E-01	212

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

**** 'Maximum Days' based on assumed EF (30 days per year) and the higher of the two risk values relative to their respective "low risk" benchmark levels.***

ft bgs - feet below ground surface; 95% UCL - 95 percentile upper confidence limit of the mean concentration; BTV - background threshold concentration;
COPC - chemical of potential concern; mgkg - milligram per kilogram; ILCR - incremental lifetime cancer risk; HQ - hazard quotient; HI - hazard index

Thomas Harder & Co.
Groundwater Consulting

TABLE 5a (RBA = 0.6)

Summary of Risk Values (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	Risk Values													
			100 Days		90 Days		75 Days		60 Days		45 Days		30 Days		15 Days	
			Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI
No Removal Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	7E-05	2E+01	6E-05	2E+01	5E-05	1E+01	4E-05	1E+01	3E-05	9E+00	2E-05	6E+00	1E-05	3E+00
	0 to 2 ft bgs		7E-05	2E+01	6E-05	2E+01	5E-05	1E+01	4E-05	1E+01	3E-05	9E+00	2E-05	6E+00	1E-05	3E+00
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	4E-05	1E+01	4E-05	1E+01	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	1E-05	3E+00	7E-06	2E+00
	0 to 2 ft bgs		4E-05	1E+01	4E-05	1E+01	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	1E-05	3E+00	7E-06	2E+00
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	0E+00	8E-01	0E+00	8E-01	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	1E-01	0E+00	6E-02
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	0E+00	4E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	1E-01	0E+00	7E-02
	0 to 2 ft bgs		4E-05	1E+01	4E-05	9E+00	3E-05	7E+00	3E-05	6E+00	2E-05	4E+00	1E-05	3E+00	6E-06	1E+00
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	8E-02
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	4E-05	1E+01	4E-05	9E+00	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	1E-05	3E+00	6E-06	2E+00
	0 to 2 ft bgs		4E-05	1E+01	4E-05	1E+01	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	1E-05	3E+00	7E-06	2E+00
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	4E-05	1E+01	4E-05	9E+00	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	1E-05	3E+00	6E-06	2E+00
	0 to 2 ft bgs		4E-05	1E+01	4E-05	9E+00	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	1E-05	3E+00	6E-06	2E+00
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

ft bgs - feet below ground surface
ILCR - incremental lifetime cancer risk
HQ - hazard quotient
HI - hazard index

Thomas Harder & Co.
Groundwater Consulting

TABLE 5b (RBA = 0.5)

Summary of Risk Values (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	Risk Values													
			100 Days		90 Days		75 Days		60 Days		45 Days		30 Days		15 Days	
			Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI
No Further Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	6E-05	2E+01	5E-05	2E+01	4E-05	1E+01	4E-05	1E+01	3E-05	8E+00	2E-05	5E+00	9E-06	3E+00
	0 to 2 ft bgs		6E-05	2E+01	5E-05	2E+01	5E-05	1E+01	4E-05	1E+01	3E-05	8E+00	2E-05	5E+00	9E-06	3E+00
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	4E-05	9E+00	3E-05	8E+00	3E-05	7E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	6E-06	1E+00
	0 to 2 ft bgs		4E-05	9E+00	3E-05	8E+00	3E-05	7E+00	2E-05	6E+00	2E-05	4E+00	1E-05	3E+00	6E-06	1E+00
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	0E+00	8E-01	0E+00	8E-01	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	1E-01	0E+00	6E-02
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	0E+00	4E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	1E-01	0E+00	7E-02
	0 to 2 ft bgs		4E-05	8E+00	3E-05	8E+00	3E-05	6E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	5E-06	1E+00
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	8E-02
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	4E-05	9E+00	3E-05	8E+00	3E-05	7E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	6E-06	1E+00
	0 to 2 ft bgs		4E-05	9E+00	3E-05	8E+00	3E-05	7E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	6E-06	1E+00
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	4E-05	9E+00	3E-05	8E+00	3E-05	7E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	5E-06	1E+00
	0 to 2 ft bgs		4E-05	9E+00	3E-05	8E+00	3E-05	7E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	6E-06	1E+00
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

ft bgs - feet below ground surface
ILCR - incremental lifetime cancer risk
HQ - hazard quotient
HI - hazard index

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Groundwater Consulting

TABLE 5c (RBA = 0.4)

Summary of Risk Values (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	Risk Values													
			100 Days		90 Days		75 Days		60 Days		45 Days		30 Days		15 Days	
			Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI
No Further Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	5E-05	1E+01	4E-05	1E+01	4E-05	1E+01	3E-05	9E+00	2E-05	7E+00	1E-05	4E+00	7E-06	2E+00
	0 to 2 ft bgs		5E-05	1E+01	5E-05	1E+01	4E-05	1E+01	3E-05	9E+00	2E-05	7E+00	2E-05	4E+00	8E-06	2E+00
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	3E-05	8E+00	3E-05	7E+00	2E-05	6E+00	2E-05	5E+00	1E-05	3E+00	9E-06	2E+00	5E-06	1E+00
	0 to 2 ft bgs		3E-05	8E+00	3E-05	7E+00	2E-05	6E+00	2E-05	5E+00	1E-05	4E+00	1E-05	2E+00	5E-06	1E+00
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	0E+00	8E-01	0E+00	8E-01	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	1E-01	0E+00	6E-02
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	0E+00	4E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	1E-01	0E+00	7E-02
	0 to 2 ft bgs		3E-05	7E+00	3E-05	6E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	9E-06	2E+00	5E-06	1E+00
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	8E-02
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	3E-05	8E+00	3E-05	7E+00	2E-05	6E+00	2E-05	5E+00	1E-05	3E+00	9E-06	2E+00	5E-06	1E+00
	0 to 2 ft bgs		3E-05	8E+00	3E-05	7E+00	2E-05	6E+00	2E-05	5E+00	1E-05	3E+00	9E-06	2E+00	5E-06	1E+00
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	3E-05	7E+00	3E-05	7E+00	2E-05	6E+00	2E-05	4E+00	1E-05	3E+00	9E-06	2E+00	5E-06	1E+00
	0 to 2 ft bgs		3E-05	8E+00	3E-05	7E+00	2E-05	6E+00	2E-05	5E+00	1E-05	3E+00	9E-06	2E+00	5E-06	1E+00
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

ft bgs - feet below ground surface
ILCR - incremental lifetime cancer risk
HQ - hazard quotient
HI - hazard index

TABLE 5d (RBA = 0.3)

Summary of Risk Values (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	Risk Values													
			100 Days		90 Days		75 Days		60 Days		45 Days		30 Days		15 Days	
			Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI
No Further Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	4E-05	1E+01	4E-05	1E+01	3E-05	9E+00	2E-05	7E+00	2E-05	6E+00	1E-05	4E+00	6E-06	2E+00
	0 to 2 ft bgs		4E-05	1E+01	4E-05	1E+01	3E-05	9E+00	2E-05	8E+00	2E-05	6E+00	1E-05	4E+00	6E-06	2E+00
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	2E-05	6E+00	2E-05	6E+00	2E-05	5E+00	1E-05	4E+00	1E-05	3E+00	7E-06	2E+00	4E-06	9E-01
	0 to 2 ft bgs		3E-05	6E+00	2E-05	6E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	8E-06	2E+00	4E-06	9E-01
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	0E+00	8E-01	0E+00	8E-01	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	1E-01	0E+00	6E-02
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	0E+00	4E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	1E-01	0E+00	7E-02
	0 to 2 ft bgs		2E-05	6E+00	2E-05	5E+00	2E-05	4E+00	1E-05	3E+00	1E-05	3E+00	7E-06	2E+00	4E-06	8E-01
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	8E-02
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	2E-05	6E+00	2E-05	6E+00	2E-05	5E+00	1E-05	4E+00	1E-05	3E+00	7E-06	2E+00	4E-06	9E-01
	0 to 2 ft bgs		2E-05	6E+00	2E-05	6E+00	2E-05	5E+00	1E-05	4E+00	1E-05	3E+00	7E-06	2E+00	4E-06	9E-01
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	2E-05	6E+00	2E-05	5E+00	2E-05	5E+00	1E-05	4E+00	1E-05	3E+00	7E-06	2E+00	4E-06	9E-01
	0 to 2 ft bgs		2E-05	6E+00	2E-05	6E+00	2E-05	5E+00	1E-05	4E+00	1E-05	3E+00	7E-06	2E+00	4E-06	9E-01
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

ft bgs - feet below ground surface
ILCR - incremental lifetime cancer risk
HQ - hazard quotient
HI - hazard index

TABLE 5e (RBA = 0.2)

Summary of Risk Values (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	Risk Values													
			100 Days		90 Days		75 Days		60 Days		45 Days		30 Days		15 Days	
			Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI
No Further Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	3E-05	1E+01	3E-05	9E+00	2E-05	8E+00	2E-05	6E+00	1E-05	5E+00	9E-06	3E+00	4E-06	2E+00
	0 to 2 ft bgs		3E-05	1E+01	3E-05	9E+00	2E-05	8E+00	2E-05	6E+00	1E-05	5E+00	9E-06	3E+00	4E-06	2E+00
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	2E-05	5E+00	2E-05	4E+00	1E-05	4E+00	1E-05	3E+00	8E-06	2E+00	6E-06	1E+00	3E-06	7E-01
	0 to 2 ft bgs		2E-05	5E+00	2E-05	4E+00	1E-05	4E+00	1E-05	3E+00	8E-06	2E+00	6E-06	1E+00	3E-06	7E-01
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	0E+00	8E-01	0E+00	8E-01	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	1E-01	0E+00	6E-02
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	0E+00	4E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	1E-01	0E+00	7E-02
	0 to 2 ft bgs		2E-05	4E+00	2E-05	4E+00	1E-05	3E+00	1E-05	3E+00	8E-06	2E+00	5E-06	1E+00	3E-06	6E-01
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	8E-02
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	2E-05	5E+00	2E-05	4E+00	1E-05	4E+00	1E-05	3E+00	8E-06	2E+00	5E-06	1E+00	3E-06	7E-01
	0 to 2 ft bgs		2E-05	5E+00	2E-05	4E+00	1E-05	4E+00	1E-05	3E+00	8E-06	2E+00	6E-06	1E+00	3E-06	7E-01
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	2E-05	5E+00	2E-05	4E+00	1E-05	4E+00	1E-05	3E+00	8E-06	2E+00	5E-06	1E+00	3E-06	7E-01
	0 to 2 ft bgs		2E-05	5E+00	2E-05	4E+00	1E-05	4E+00	1E-05	3E+00	8E-06	2E+00	5E-06	1E+00	3E-06	7E-01
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

Non-highlighted values are "low risk"

ft bgs - feet below ground surface
ILCR - incremental lifetime cancer risk
HQ - hazard quotient
HI - hazard index

Thomas Harder & Co.
Groundwater Consulting

TABLE 5f (RBA = 0.1)

Summary of Risk Values (Cabin Occupant Receptor)

Removal Area Description	Exposure Depth	Remaining Removal Areas	Risk Values													
			100 Days		90 Days		75 Days		60 Days		45 Days		30 Days		15 Days	
			Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI	Σ ILCR	Σ HQ = HI
No Further Action	All depths (0 to 3.8 ft bgs)	Areas A, B, C, D, E, F, G (all areas)	2E-05	8E+00	2E-05	7E+00	1E-05	6E+00	1E-05	5E+00	9E-06	3E+00	6E-06	2E+00	3E-06	1E+00
	0 to 2 ft bgs		2E-05	8E+00	2E-05	7E+00	1E-05	6E+00	1E-05	5E+00	9E-06	4E+00	6E-06	2E+00	3E-06	1E+00
Scenario 1 (remove A, B, C)	All depths (0 to 3.8 ft bgs)	Areas D, E, F, G	1E-05	3E+00	1E-05	3E+00	9E-06	2E+00	7E-06	2E+00	5E-06	1E+00	4E-06	1E+00	2E-06	5E-01
	0 to 2 ft bgs		1E-05	3E+00	1E-05	3E+00	9E-06	3E+00	7E-06	2E+00	6E-06	2E+00	4E-06	1E+00	2E-06	5E-01
Scenario 2 (remove A, B, C, D)	All depths (0 to 3.8 ft bgs)	Areas E, F, G	0E+00	8E-01	0E+00	8E-01	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	1E-01	0E+00	6E-02
Scenario 3 (remove A, B, C, G)	All depths (0 to 3.8 ft bgs)	Areas D, E, F	0E+00	4E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	1E-01	0E+00	7E-02
	0 to 2 ft bgs		1E-05	3E+00	1E-05	3E+00	9E-06	2E+00	7E-06	2E+00	5E-06	1E+00	4E-06	9E-01	2E-06	4E-01
Scenario 4 (remove A, B, D)	All depths (0 to 3.8 ft bgs)	Areas C, E, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
Scenario 5 (remove A, B, D, E)	All depths (0 to 3.8 ft bgs)	Areas C, F, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 6 (remove A, B, D, E, F)	All depths (0 to 3.8 ft bgs)	Areas C, G	0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
	0 to 2 ft bgs		0E+00	9E-01	0E+00	8E-01	0E+00	7E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	1E-01
Scenario 7 (remove A, B, D, E, F, G)	All depths (0 to 3.8 ft bgs)	Area C	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 8 (remove A, B, D, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 9 (remove A, B, D, G)	All depths (0 to 3.8 ft bgs)	Areas C, E, F	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	8E-02
Scenario 10 (remove A, B, E)	All depths (0 to 3.8 ft bgs)	Areas C, D, F, G	1E-05	3E+00	1E-05	3E+00	9E-06	2E+00	7E-06	2E+00	5E-06	1E+00	4E-06	1E+00	2E-06	5E-01
	0 to 2 ft bgs		1E-05	3E+00	1E-05	3E+00	9E-06	3E+00	7E-06	2E+00	5E-06	2E+00	4E-06	1E+00	2E-06	5E-01
Scenario 11 (remove A, B, E, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, F	0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
	0 to 2 ft bgs		0E+00	5E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	2E-01	0E+00	2E-01	0E+00	8E-02
Scenario 12 (remove A, B, F)	All depths (0 to 3.8 ft bgs)	Areas C, D, E, G	1E-05	3E+00	1E-05	3E+00	9E-06	2E+00	7E-06	2E+00	5E-06	1E+00	4E-06	1E+00	2E-06	5E-01
	0 to 2 ft bgs		1E-05	3E+00	1E-05	3E+00	9E-06	2E+00	7E-06	2E+00	5E-06	1E+00	4E-06	1E+00	2E-06	5E-01
Scenario 13 (remove A, B, F, G)	All depths (0 to 3.8 ft bgs)	Areas C, D, E	0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02
	0 to 2 ft bgs		0E+00	6E-01	0E+00	5E-01	0E+00	4E-01	0E+00	3E-01	0E+00	3E-01	0E+00	2E-01	0E+00	9E-02

Highlighted values

1E-05 ≤ ILCR ≤ 1E-04; 1E+00 ≤ HI ≤ 1E+01	"moderate risk"
1E-04 < ILCR ≤ 1E-03; 1E+01 < HI ≤ 1E+02	"high risk"
ILCR > 1E-03; HI > 1E+02	"extremely high risk"

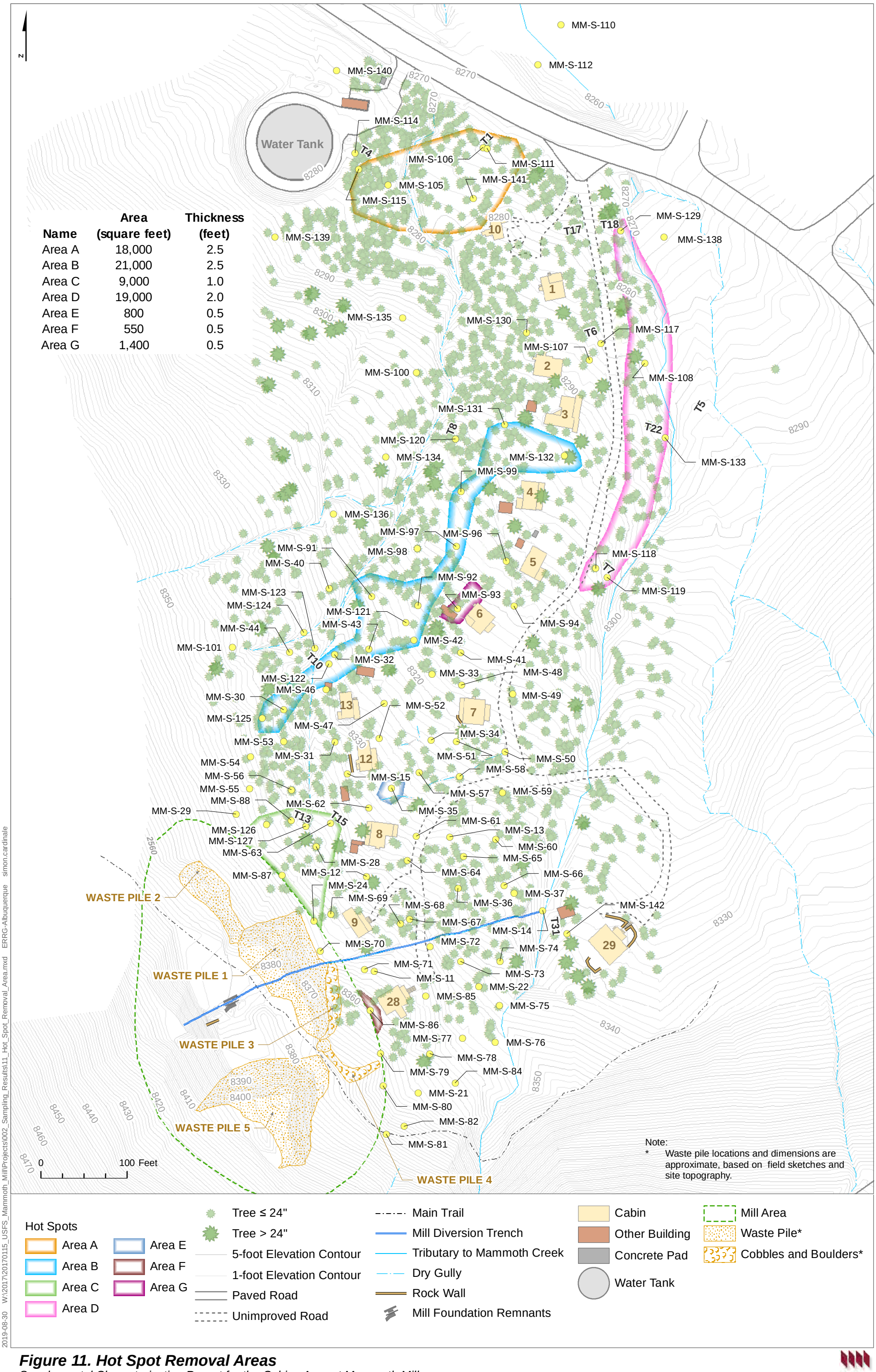
Non-highlighted values are "low risk"

ft bgs - feet below ground surface
ILCR - incremental lifetime cancer risk
HQ - hazard quotient
HI - hazard index

Thomas Harder & Co.
Groundwater Consulting

Attachment A

Cabins Area



Name	Area (square feet)	Thickness (feet)
Area A	18,000	2.5
Area B	21,000	2.5
Area C	9,000	1.0
Area D	19,000	2.0
Area E	800	0.5
Area F	550	0.5
Area G	1,400	0.5

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Figure 11. Hot Spot Removal Areas

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

Attachment B

Cabin Occupant RBCs

ABBREVIATIONS

COPC	chemical of potential concern
TR	target incremental lifetime cancer risk (1E-05 per BLM, 2004)
THQ	target hazard quotient (1E+00 per BLM, 2004)
AT (d)	averaging time (days)
BW (kg)	body weight (kilograms)
RfDo (mg/kg-d)	oral reference dose (milligram per kilogram per day)
EF (d/yr)	exposure frequency (days per year)
ED (yr)	exposure duration (years)
IR (mg/d)	ingestion rate (milligrams per day)
RBA oral (-)	relative bioavailability (dimensionless)
FI (-)	fraction ingested (dimensionless)
CF (kg/mg)	conversion factor (kilogram per milligram)
RBC (mg/kg)	risk-based concentration (milligram per kilogram)
GIABS	gastrointestinal absorption factor (dimensionless)
SA (cm2)	surface area (square centimeters)
AF (mg/cm2)	adherence factor (milligram per square centimeter)
ABS (-)	absorption factor (dimensionless)
RfC (mg/m3)	reference concentration (milligram per cubic meter)
REL (mg/m3)	reference exposure level (milligram per cubic meter)
PEF (m3/kg)	particulate emission factor (cubic meters per kilogram)
ET (hr/d)	exposure time (hours per day)
IFS (mg/kg)	receptor-weighted ingestion factor for soil (milligrams per kilogram)
DFS (mg/kg)	receptor-weighted dermal factor for soil (milligrams per kilogram)

ATTACHMENT B

ARSENIC (Cancer Endpoint)

Recreational Cabin Occupant RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs and 7-40 yrs)

COPC	TR	AT (d)	BW (kg)	SFo (mg/kg-d)$^{-1}$	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	**IFS (mg/kg)**	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	15 80	*9.5E+00*	100	6 34	200 100	0.6	1	**12250**	1E-06	**3.7E+00**

Dermal Contact (age 0-6 yrs and 7-40 yrs)

COPC	TR	AT (d)	BW (kg)	SFo (mg/kg-d)$^{-1}$	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	**DFS (mg/kg)**	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	15 80	*9.5E+00*	1.0E+00	100	6 34	2373 6032	0.2 0.07	3.0E-02	**36929**	1E-06	**2.4E+01**

Inhalation of Particulates (age 0-6 yrs and 7-40 yrs)

COPC	TR	AT (d)	IUR (ug/m3)$^{-1}$	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF1 (hr/day)	CF2 (ug/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	*3.3E-03*	1.36E+09	24	100	40	24	1000	**2.6E+04**

Total RBC => 3.2E+00

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

ATTACHMENT B

ARSENIC (Non-Cancer Endpoint)

Recreational Cabin Occupant RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1	2190	15	*3.5E-06*	100	6	200	0.6	1	1E-06	**1.6E+00**

Dermal Contact (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1	2190	15	*3.5E-06*	1.0E+00	100	6	2373	0.2	3.0E-02	1E-06	**1.3E+01**

Inhalation of Particulates (age 0-6 yrs)

COPC	THQ	AT (d)	RfC or REL (mg/m3)	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF (hr/day)	**RBC (mg/kg)**
Arsenic	1	2190	*1.5E-05*	1.36E+09	24	100	6	24	**7.4E+04**

Total RBC => 1.4E+00

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

ATTACHMENT B

MERCURY (Non-Cancer Endpoint)

Recreational Cabin Occupant RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Mercury	1	2190	15	*1.6E-04*	100	6	200	1	1	1E-06	**4.4E+01**

Dermal Contact (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Mercury	1	2190	15	*1.6E-04*	7.0E-02	100	6	2373	0.2	1.0E-02	1E-06	**1.3E+02**

Inhalation of Particulates (age 0-6 yrs)

COPC	THQ	AT (d)	RfC or REL (mg/m3)	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF (hr/day)	**RBC (mg/kg)**
Mercury	1	2190	*3.0E-05*	1.36E+09	24	100	6	24	**1.5E+05**

Total RBC => 3.3E+01

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

Attachment C

Recreational User RBCs

ABBREVIATIONS

COPC	chemical of potential concern
TR	target incremental lifetime cancer risk (1E-05 per BLM, 2004)
THQ	target hazard quotient (1E+00 per BLM, 2004)
AT (d)	averaging time (days)
BW (kg)	body weight (kilograms)
RfDo (mg/kg-d)	oral reference dose (milligram per kilogram per day)
EF (d/yr)	exposure frequency (days per year)
ED (yr)	exposure duration (years)
IR (mg/d)	ingestion rate (milligrams per day)
RBA oral (-)	relative bioavailability (dimensionless)
FI (-)	fraction ingested (dimensionless)
CF (kg/mg)	conversion factor (kilogram per milligram)
RBC (mg/kg)	risk-based concentration (milligram per kilogram)
GIABS	gastrointestinal absorption factor (dimensionless)
SA (cm2)	surface area (square centimeters)
AF (mg/cm2)	adherence factor (milligram per square centimeter)
ABS (-)	absorption factor (dimensionless)
RfC (mg/m3)	reference concentration (milligram per cubic meter)
REL (mg/m3)	reference exposure level (milligram per cubic meter)
PEF (m3/kg)	particulate emission factor (cubic meters per kilogram)
ET (hr/d)	exposure time (hours per day)
IFS (mg/kg)	receptor-weighted ingestion factor for soil (milligrams per kilogram)
DFS (mg/kg)	receptor-weighted dermal factor for soil (milligrams per kilogram)

ATTACHMENT C

ARSENIC (Cancer Endpoint)

Recreational User RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs and 7-26 yrs)

COPC	TR	AT (d)	BW (kg)	SFo (mg/kg-d)$^{-1}$	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	**IFS (mg/kg)**	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	15 80	*9.5E+00*	40	6 20	200 100	0.6	1	**4200**	1E-06	**1.1E+01**

Dermal Contact (age 0-6 yrs and 7-26 yrs)

COPC	TR	AT (d)	BW (kg)	SFo (mg/kg-d)$^{-1}$	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	**DFS (mg/kg)**	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	15 80	*9.5E+00*	1.0E+00	40	6 20	2373 6032	0.2 0.07	3.0E-02	**11816**	1E-06	**7.6E+01**

Inhalation of Particulates (age 0-6 yrs and 7-26 yrs)

COPC	TR	AT (d)	IUR (ug/m3)$^{-1}$	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF1 (hr/day)	CF2 (ug/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	*3.3E-03*	1.36E+09	24	40	26	24	1000	**1.0E+05**

Total RBC => 9.4E+00

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

ATTACHMENT C

ARSENIC (Non-Cancer Endpoint)

Recreational User RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1	2190	15	*3.5E-06*	40	6	200	0.6	1	1E-06	**4.0E+00**

Dermal Contact (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1	2190	15	*3.5E-06*	1.0E+00	40	6	2373	0.2	3.0E-02	1E-06	**3.4E+01**

Inhalation of Particulates (age 0-6 yrs)

COPC	THQ	AT (d)	RfC or REL (mg/m3)	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF (hr/day)	**RBC (mg/kg)**
Arsenic	1	2190	*1.5E-05*	1.36E+09	24	40	6	24	**1.9E+05**

Total RBC => 3.6E+00

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

ATTACHMENT C

MERCURY (Non-Cancer Endpoint)

Recreational User RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Mercury	1	2190	15	*1.6E-04*	40	6	200	1	1	1E-06	**1.1E+02**

Dermal Contact (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Mercury	1	2190	15	*1.6E-04*	7.0E-02	40	6	2373	0.2	1.0E-02	1E-06	**3.2E+02**

Inhalation of Particulates (age 0-6 yrs)

COPC	THQ	AT (d)	RfC or REL (mg/m3)	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF (hr/day)	**RBC (mg/kg)**
Mercury	1	2190	*3.0E-05*	1.36E+09	24	40	6	24	**3.7E+05**

Total RBC => 8.2E+01

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

Attachment D

Construction Worker RBCs

ABBREVIATIONS

COPC	chemical of potential concern
TR	target incremental lifetime cancer risk (1E-05 per BLM, 2004)
THQ	target hazard quotient (1E+00 per BLM, 2004)
AT (d)	averaging time (days)
BW (kg)	body weight (kilograms)
RfDo (mg/kg-d)	oral reference dose (milligram per kilogram per day)
EF (d/yr)	exposure frequency (days per year)
ED (yr)	exposure duration (years)
IR (mg/d)	ingestion rate (milligrams per day)
RBA oral (-)	relative bioavailability (dimensionless)
FI (-)	fraction ingested (dimensionless)
CF (kg/mg)	conversion factor (kilogram per milligram)
RBC (mg/kg)	risk-based concentration (milligram per kilogram)
GIABS	gastrointestinal absorption factor (dimensionless)
SA (cm2)	surface area (square centimeters)
AF (mg/cm2)	adherence factor (milligram per square centimeter)
ABS (-)	absorption factor (dimensionless)
RfC (mg/m3)	reference concentration (milligram per cubic meter)
REL (mg/m3)	reference exposure level (milligram per cubic meter)
PEF (m3/kg)	particulate emission factor (cubic meters per kilogram)
ET (hr/d)	exposure time (hours per day)
IFS (mg/kg)	receptor-weighted ingestion factor for soil (milligrams per kilogram)
DFS (mg/kg)	receptor-weighted dermal factor for soil (milligrams per kilogram)

ATTACHMENT D

ARSENIC (Cancer Endpoint)

Construction Worker RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs and 7-26 yrs)

COPC	TR	AT (d)	BW (kg)	SFo (mg/kg-d)$^{-1}$	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	80	*9.5E+00*	30	1	330	0.6	1	1E-06	**3.6E+02**

Dermal Contact (age 0-6 yrs and 7-26 yrs)

COPC	TR	AT (d)	BW (kg)	SFo (mg/kg-d)$^{-1}$	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	80	*9.5E+00*	1.0E+00	30	1	6032	0.8	3.0E-02	1E-06	**5.0E+02**

Inhalation of Particulates (age 0-6 yrs and 7-26 yrs)

COPC	TR	AT (d)	IUR (ug/m3)$^{-1}$	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF1 (hr/day)	CF2 (ug/mg)	**RBC (mg/kg)**
Arsenic	1E-05	25550	*3.3E-03*	1E+06	8	30	1	24	1000	**7.7E+03**

Total RBC => 2.0E+02

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

ATTACHMENT D

ARSENIC (Non-Cancer Endpoint)

Construction Worker RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1	365	80	*3.5E-06*	30	1	330	0.6	1	1E-06	**1.7E+01**

Dermal Contact (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Arsenic	1	365	80	*3.5E-06*	1.0E+00	30	1	6032	0.8	3.0E-02	1E-06	**2.4E+01**

Inhalation of Particulates (age 0-6 yrs)

COPC	THQ	AT (d)	RfC or REL (mg/m3)	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF (hr/day)	**RBC (mg/kg)**
Arsenic	1	365	*1.5E-05*	1E+06	8	30	1	24	**5.5E+02**

Total RBC =>	**9.8E+00**

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

ATTACHMENT D

MERCURY (Non-Cancer Endpoint)

Construction Worker RBCs (Pathway-specific and total; in mg/kg)

Soil Ingestion (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	EF (d/yr)	ED (yr)	IR (mg/d)	RBA (-)	FI (-)	CF (kg/mg)	**RBC (mg/kg)**
Mercury	1	365	80	*1.6E-04*	30	1	330	1	1	1E-06	**4.7E+02**

Dermal Contact (age 0-6 yrs)

COPC	THQ	AT (d)	BW (kg)	RfDo (mg/kg-d)	GIABS	EF (d/yr)	ED (yr)	SA (cm^2)	AF (mg/cm^2)	ABS (-)	CF (kg/mg)	**RBC (mg/kg)**
Mercury	1	365	80	*1.6E-04*	7.0E-02	30	1	6032	0.8	1.0E-02	1E-06	**2.3E+02**

Inhalation of Particulates (age 0-6 yrs)

COPC	THQ	AT (d)	RfC or REL (mg/m3)	PEF (m^3/kg)	ET (hr/d)	EF (d/yr)	ED (yr)	CF (hr/day)	**RBC (mg/kg)**
Mercury	1	365	*3.0E-05*	1E+06	8	30	1	24	**1.1E+03**

Total RBC =>	**1.3E+02**

Chemical-specific values are gray-shaded.
Italicized values are CalEPA values that differ from those used by USEPA to derive RSLs.
Receptor-specific EF value is yellow-shaded. All other values are default values for residential receptor.

Appendix B. Alternatives Analysis

Alternatives Analysis for Time-Critical Removal Action at the Cabins Area at Mammoth Mill Site Inyo National Forest Mono County, California

October 2019

ERRG Project No. 20170115

Prepared for:

U.S. Department of Agriculture
Forest Service Region 5
Inyo National Forest

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Appendix B1. Cost Estimate Tables

Acronyms and Abbreviations

ARIC	area requiring institutional controls
BCY	bank cubic yards
BMPs	best management practices
COCs	chemicals of concern
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
ERRG	Engineering/Remediation Resources Group, Inc.
Forest Service	U.S. Department of Agriculture Forest Service
HDPE	high-density polyethylene
ICs	institutional controls
LCY	loose cubic yards
LUCs	land use controls
O&M	operation and maintenance
PPE	personal protective equipment
SY	square yards
TCRA	time-critical removal action
THA	Triad/Holmes Associates
XRF	x-ray fluorescence
§	Section

Section 1. Introduction

Engineering/Remediation Resources Group, Inc. (ERRG) has prepared this appendix to evaluate potential removal action alternatives in support of a time-critical removal action (TCRA) being carried out by the U.S. Department of Agriculture Forest Service (Forest Service), Region 5. The TCRA is necessary to clean up metals-impacted soil within the Cabins Area at the Mammoth Mill Site in Mono County, California.

On April 14, 2017, the Forest Service signed a Removal Action Memorandum documenting that a TCRA was selected to address the presence and continuing release of metals from mill tailings and waste piles at the Mammoth Mill Site (Forest Service, 2017). The objective of the TCRA is to mitigate (i.e., eliminate or minimize) exposure of humans and wildlife to site chemicals of concern (COCs)—primarily arsenic and mercury—in tailings and soil within the Cabins Area. The Removal Action Memorandum also established the cleanup goals for the site COCs (see Table B-1).

The following subsections discuss the objective of this alternatives analysis and present the organization of this appendix.

1.1. ALTERNATIVES ANALYSIS OBJECTIVE

The objective of this alternatives analysis is to identify and evaluate potential alternatives to address metals-impacted soil within the Cabins Area and to use the results to guide remedy selection for the TCRA. Section 5 of the Supplemental Characterization Report (to which this document is appended) incorporates the information included in this analysis to evaluate and select a recommended removal action alternative. This alternatives analysis does not include an evaluation of waste piles associated with the upgradient Mill Area. As discussed in the Supplemental Characterization Report, cleanup of the Mill Area will be handled separately.

This analysis used currently available site data to evaluate potential alternatives to eliminate or minimize risks posed to humans and wildlife from metals-impacted soil at the Cabins Area. Alternatives were evaluated qualitatively against three criteria: effectiveness, implementability, and relative cost. The qualitative evaluation was not intended to weigh or rank each alternative quantitatively, but is rather intended to show how each alternative may or may not meet the TCRA objectives (i.e., to mitigate exposure of humans and wildlife to site COCs in tailings and soil within the Cabins Area), taking into consideration each aspect of implementing the TCRA. The cost estimates developed for the analysis generally follow cost estimation guidance from the U.S. Environmental Protection Agency (EPA) (2000) and are considered order-of-magnitude estimates with an intended accuracy of +50 to -30 percent. Final project costs will depend on actual labor and material costs, actual engineering design costs, actual site conditions (including

actual earthwork quantities and waste classification), competitive market conditions (including prices of commodities such as fuel), the final project scope, the final project schedule, and other variables.

Following the evaluation of each alternative against the three criteria, the alternatives were compared with one another and combined, if appropriate, to determine which alternative or combination of alternatives would best meet the TCRA objectives.

1.2. DOCUMENT ORGANIZATION

The remainder of this appendix is organized as follows:

- Section 2 describes the criteria used to evaluate each alternative.
- Section 3 identifies each alternative and presents the detailed qualitative evaluation of each alternative against the evaluation criteria.
- Section 4 provides a comparative analysis of each alternative with one another.
- Section 5 lists the documents and guidance used to prepare this alternatives analysis.

Supporting figures and tables are presented after Section 5. In addition, the following supplemental information is appended to this document:

- Appendix B1 includes a series of tables detailing the cost estimates generated for each alternative, including the assumptions made in estimating the costs. These tables include:
  - an Alternatives Cost Estimate Summary that summarizes the estimated capital, operation and maintenance (O&M), periodic, and present value costs of each evaluated alternative;
  - a Cost Detail sheet for each alternative with a breakdown of each alternative's cost elements and assumptions made in estimating each cost element; and
  - a Cash Flow Analysis sheet presenting the annualized costs for each alternative over a period of 30 years.

Section 2. Evaluation Criteria

Alternatives are analyzed in a qualitative manner based on the following three evaluation criteria: effectiveness, implementability, and relative cost. The following subsections summarize each criterion used in this alternatives analysis.

2.1. EFFECTIVENESS

The following three general factors are considered in evaluating alternatives for effectiveness:

- Overall Protection of Human Health and the Environment: Assesses the ability of the alternative to be protective of human health and the environment under present and future land use conditions, including ability to meet cleanup goals or remove the exposure pathway for COCs.
- Short-Term Effectiveness: Evaluates the effects of an alternative during the construction and implementation phase until cleanup goals are met. This criterion includes the time in which the remedy achieves protectiveness and the potential to create adverse impacts on human health or the environment during implementation of the remedy.
- Long-Term Effectiveness and Permanence: Assesses the magnitude of residual risk remaining after implementation of the remedy and the adequacy and reliability of controls established by the remedy to maintain reliable protection of human health and the environment over time (i.e., a period of 30 years).

2.2. IMPLEMENTABILITY

The following general factors are considered in evaluating alternatives for implementability:

- Technical Feasibility: Evaluates the ease or difficulty of implementing the alternative under existing site conditions, including constructability and operational considerations, and the reliability of the technology.
- Administrative Feasibility: Evaluates activities such as statutory limits, permitting requirements, easements and rights-of-way, and impacts on adjoining property.
- Availability of Services and Materials: Evaluates the availability of qualified contractors to provide the necessary services, materials, and equipment (with the preferred technologies being those that are commercially developed and readily available or have been field-tested with documented results). Also evaluates the availability of disposal facilities licensed to accept solid and liquid wastes classified as hazardous and nonhazardous.
- Acceptance: Evaluates acceptance of the proposed alternative by regulatory agencies, stakeholders, and community members.

2.3. RELATIVE COST

Alternatives are evaluated based on qualitative costs; alternatives with lower costs are preferred if their effectiveness and implementability are judged to be similar. Cost estimates are prepared to aid in the evaluation of alternatives using currently available information. The costs are order-of-magnitude estimates with an intended accuracy of +50 to -30 percent (EPA, 2000). These costs are not construction bid costs, nor are they final project costs. Final project costs will depend on actual labor and material costs, actual engineering design costs, actual site conditions (including actual earthwork quantities and waste classification), competitive market conditions (including prices of commodities, such as fuel), the final project scope, the final project schedule, and other variables. As a result, the final project costs may vary from the estimates presented herein.

The costs estimates for the analysis of each alternative include the following components:

- Capital Costs: Costs incurred as part of the physical construction of the alternative, including costs for planning, professional and technical services, construction activities (site work), institutional controls, and reporting.
- Annual O&M Costs: Costs incurred for O&M of the alternative over a defined time period (e.g., 30 years), including costs for inspections and minor repairs.
- Periodic Costs: Costs incurred over fixed, regular intervals following construction of the alternative, including expected asset lifecycle replacement/repair costs (significant or major), periodic reporting, and other costs incurred only for the year(s) in which they occur.

Section 3. Identification and Evaluation of Alternatives

This section describes the identification and selection of alternatives for the Cabins Area and summarizes the detailed evaluation of each alternative against the three criteria (effectiveness, implementability, and relative cost). Appendix B1 provides additional detail on the assumptions and cost estimates for each alternative.

3.1. IDENTIFICATION OF ALTERNATIVES

Potential alternatives for the Cabins Area were identified and selected based on their ability to mitigate risk to human health and the environment, their technical feasibility, and professional experience with projects of a similar size and scope. Cleanup goals for the site COCs and EPA guidance (EPA, 2000) were also considered during the initial identification process.

The following alternatives were identified and selected to address metals-impacted soil at the Cabins Area:

- **Alternative 1, Complete Land Use Controls (LUCs)[1] – Institutional Controls (ICs) and Fencing:** This alternative completely prohibits access to the site by both cabin occupants and recreational users; site access is restricted by instituting legal and administrative access prohibitions in conjunction with engineering controls (i.e., chain link fencing and a locking gate) as shown on Figure B-1.
- **Alternative 2, Minor Grading and Onsite Encapsulation with LUCs:** This alternative involves import and placement of 2 feet of clean cover material to encapsulate the extent of metals-impacted soil within the Cabins Area, as shown on Figure B-2. LUCs (i.e., legal and administrative digging restrictions and signage) will also be implemented to limit exposure of cabin occupants and recreational users to onsite contamination and to maintain the integrity of the cap.
- **Alternative 3, Selective Hotspot Removal:** This pair of alternatives (3A and 3B) involves selective removal of material that presents the greatest risk to human health (i.e., hot spots) within the Cabins Area, while taking into consideration the maximum number of days cabin occupants would be allowed on site per year. A series of 13 hotspot removal scenarios were evaluated and are presented in the Remedial Scenario Risk Analysis for the Cabins Area (presented in Appendix A). Scenario 11 was deemed most protective of human health, while allowing for the

[1] Per EPA, LUCs may consist of non-engineered instruments, such as administrative and legal controls (i.e., ICs) and/or engineered and physical barriers, such as fences and guards, to minimize the potential for exposure to contamination and/or protect the integrity of a response action. LUCs are typically designed to work by limiting land and/or resource use or by providing information that helps modify or guide human behavior at a site.

most days on site per year, and was evaluated further under Alternative 3. Hotspot removal areas would be excavated and disposed of (either on site or off site), and removal areas would be backfilled with clean import fill material under both hotspot alternatives. Following implementation of either of these alternatives, site access for both cabin occupants and recreational users would be restricted to no more than 182 days (approximately 6 months) per year to maintain low risk to human health. Figure B-3 shows the hotspot areas (Areas A, B, E, and G) to be excavated and removed under this alternative.

- ***Alternative 3A, Hotspot Excavation and Onsite Repository with LUCs:*** This alternative includes removal of selected hot spots in Areas A, B, E, and G and consolidation of excavated waste in an onsite lined repository encapsulated with a clean soil cover. LUCs (i.e., legal and administrative digging restrictions and signage) will also be implemented to limit exposure of cabin occupants and recreational users to onsite contamination and to maintain the integrity of the cap.
- ***Alternative 3B, Hotspot Excavation and Offsite Disposal with LUCs:*** This alternative includes removal of selected hot spots in Areas A, B, E, and G and transportation of the excavated waste to an offsite licensed facility for disposal. LUCs (i.e., legal and administrative digging restrictions and signage) will also be implemented to limit exposure of cabin occupants and recreational users to onsite contamination.

- **Alternative 4, Complete Removal of Contamination:** This pair of alternatives (4A and 4B) removes the entire extent of metals-impacted soil from the Cabins Area, as shown on Figure B-4. Removal areas would be backfilled with clean import fill material under both alternatives.
  - ***Alternative 4A, Complete Excavation and Onsite Repository with LUCs:*** This alternative includes removal and consolidation of excavated waste in an onsite lined repository encapsulated with clean soil cover. LUCs (i.e., legal and administrative digging restrictions and signage) will also be implemented to limit exposure of cabin occupants and recreational users to onsite contamination.
  - ***Alternative 4B, Complete Excavation and Offsite Disposal:*** This alternative includes removal and transportation of excavated waste to an offsite licensed facility for disposal.

3.2. DETAILED EVALUATION OF ALTERNATIVES

This section describes each alternative, including major assumptions, and evaluates them with respect to their effectiveness, implementability, and relative cost (see Section 2). Table B-2 summarizes the key findings for each alternative with respect to the evaluation criteria. Section 4 presents the comparative analysis of alternatives. Table B-3 summarizes the comparative analysis with respect to the evaluation criteria.

3.2.1. Alternative 1, Complete LUCs – ICs and Fencing

This alternative prohibits use of the Cabins Area by implementing LUCs. The Forest Service would establish the area requiring institutional controls (ARIC) based on the need to prohibit land use in the metals-impacted area (e.g., an area similar to the current closure area). To discourage trespassers,

approximately 320 linear feet of industrial chain-link fence would be installed along Old Mammoth Road at the north end of the site. A single locking gate would be installed at the junction with Mill City Tract Road to allow for authorized access to the site for maintenance and inspection purposes only (see Figure B-1). Signs would be installed along the perimeter of the ARIC to alert passersby that access is prohibited. No other site modifications would be made; the cabins and all existing soil contamination would remain at the site.

Under this alternative, a LUC design document would be developed that would include, at a minimum, a legal description of the ARIC, a discussion of the LUC performance objectives and associated land use activity restrictions and monitoring/maintenance actions, and a description of the legal mechanisms to implement land use restrictions.

Long-term maintenance of this alternative would require patrols of the area once per week to ensure the LUCs effectively restrict site access and that signs and fencing remain fully functional. For the purposes of this evaluation, weekly patrols are assumed to occur seasonally during periods of the year when the site is accessible (i.e., approximately 8 months, or 35 weeks, of the year). For the purposes of this evaluation, a total of 35 patrols, plus 2 inspections, are assumed per year, with a duration of 3 hours to conduct the patrols (including travel to and from the site).

3.2.1.1. Effectiveness

This alternative would be moderately effective in the short-term because it results in minimal impacts to human health or the environment during implementation. The minimal impacts of implementing this alternative would likely include minor soil disturbance during installation of fence and gate posts. Worker protection for anyone who may be exposed to contaminated soil would be required through adherence to a site-specific health and safety plan. Any persons working in contaminated areas would be required to wear the appropriate personal protective equipment (PPE).

This alternative would be somewhat effective in the long-term. Although contaminated soil would remain on site indefinitely, human health would be protected by prohibiting site access. The risk of offsite migration of contamination would remain, thus risks to recreational users and occupants downgradient of the closure area would remain. This alternative would not be protective of the environment because wildlife would not be prevented from accessing the waste or waste that erodes off site into the surface water pathway. Risks to current and future ecological receptors would not be reduced. In practice, it may be difficult to enforce this alternative because cabin occupants and recreational users could still enter the restricted area and be exposed to contamination after implementation of the LUCs. The effectiveness of this alternative to minimize risk to cabin occupants and recreational users is based on the ability of the fencing and patrol to deter trespassing.

The overall effectiveness of this alternative is considered good, with short-term effectiveness considered good and long-term effectiveness considered poor.

3.2.1.2. Implementability

This alternative is considered technically and administratively feasible, and services and materials to construct the site restrictions (fencing and gate) are readily available in the local community. This alternative would also require a moderate level of effort for weekly site inspections and periodic maintenance. No trees would be removed under this alternative, thus limiting negative impacts on the local environment. Acceptance of this alternative by regulators, stakeholders, and community members is unlikely, because metals-impacted soil would remain onsite and because cabin occupants would not be permitted to use their cabins in the future.

3.2.1.3. Cost

The estimated total capital cost for implementing the alternative is approximately $76,241. The long-term total cost for implementing this alternative, including annual O&M and periodic costs, is approximately $609,491, with a present-value cost of approximately $441,794. Appendix B1 provides the detailed cost estimate for this alternative. The following major assumptions were used to estimate costs for Alternative 1:

- To construct the fence and gate, site personnel would consist of two craft laborers, one site superintendent (providing construction management), and one technical staff member (providing technical and health and safety oversight). The duration of site activities is estimated to be approximately 6 days and will be conducted during a single field event.
- An estimated 320 linear feet of industrial chain link fencing would be installed, in addition to a locking gate at the junction of Old Mammoth Road and Mill City Tract Road.
- Cabin occupants and recreational users would be prohibited from using or visiting the site.
- Local Forest Service personnel (or local contractors) would conduct 3-hour weekly inspections during 8 months (i.e., 35 weeks) of the year when the site is accessible.
- Biannual inspections would be conducted to identify minor repairs of the fencing, locking gate, and/or signage that may have degraded, and repairs would be made annually. Major repairs to the fence, gate, and/or signage would be necessary every 5 years.

3.2.2. Alternative 2, Minor Grading and Onsite Encapsulation with LUCs

This alternative involves encapsulating all metals-impacted soil in the Cabins Area beneath 2 feet of clean fill. To avoid the need to modify cabin foundations and to ensure ground surface elevations adjacent to the cabins remain relatively unchanged, minor grading would be required around each of the nine cabins (i.e., 1, 2, 3, 4, 5, 6, 10, 13, and 26) located inside or directly adjacent to the affected area before the cap could be installed (Figure B-2). Approximately 2 feet of soil would be removed surrounding each cabin's foundation; the removal area would be graded to match the existing grade away from the cabin foundations.

A 2-foot clean cap would then be placed over the entire impacted area and ICs (i.e., digging restrictions) and engineering controls (i.e., signage) would be implemented to protect current and future site users and ensure the integrity of the cap.

This alternative would impact approximately 961 existing trees (see Figure B-2). According to the Forest Service (2019), most trees at the site are Sierra lodge pole pines (*Pinus contorta var. murrayana*), with a lesser component of red and white fir (*Abies magnifica var. magnifica* and *Abies concolor*, respectively). All of these trees have long life cycles (300 years or more), with some Sierra lodge pole pines living upward of 600 years (Forest Service, 2019). The total number of trees to be preserved is currently unknown. Additional evaluation and stakeholder input are needed to identify which trees to preserve and which trees to remove in the area to be capped. For the purposes of this evaluation, it is arbitrarily assumed that "large" trees (i.e., with trunks larger than 24 inches in diameter) would be preserved and "small" trees (i.e., with trunks less than or equal to 24 inches in diameter) would be removed. Removal would include felling each tree and removing its stump. Based on available tree survey data (Triad/Holmes Associates [THA], 2019), approximately 935 small trees would require removal and approximately 26 large trees would require protection from the effects of increasing grade adjacent to the trees (i.e., protection from suffocation, fungal growth, etc.). Large trees would be protected by constructing a dry well around the base of each tree.[2] To construct the dry wells, a barrier wall (typically brick or stone) with a radius of approximately 18 feet will be installed and the dry well will be filled with 2-inch-diameter drain rock to promote drainage within the root structure, while allowing backfill to grade outside the dry well.

A bulldozer would be used to grade an area around each affected cabin to a depth of 2 feet immediately adjacent to the cabin. The 2-foot cut would be gradually decreased away from each cabin until it intersects the existing grade (i.e., approximately 10 feet away from the cabin). Following grading, brightly colored demarcation fabric would be placed over the area to be capped to discourage digging beneath the cap. Clean material would then be imported to the site, stockpiled, and spread to cap the extent of metals-impacted soil in the Cabins Area. The cap would be compacted to a total thickness of 2 feet and graded, and silt fence would be installed along the western bank of the creek (approximately 530 linear feet) to prevent water-based erosion of the cap. The entire disturbed area (approximately 19,971 square yards [SY]) would be hydroseeded to restore the site. Dust would be suppressed during earthmoving activities. The duration of site activities is estimated to be approximately 98 days.

Under this alternative, an engineering study and design would be required to establish and maintain requirements for the cap, surface water drainage, and erosion control. An architectural assessment of each affected cabin would also need to be performed to determine how best to protect the affected cabins, outbuildings, and utilities during and after excavation and capping. The design should consider the need for sloping or shoring adjacent to the cabins or alternate methods (e.g., modified foundation headers) to

[2] If significantly more than 26 trees are to be protected, costs for this alternative would increase substantially (approximately $1,600 per tree to be protected) and the technical feasibility of this alternative would decrease significantly.

provide structural support during excavation and long-term protection of the cabins after the cap is installed. The design should also consider the need for perimeter surface water drainage systems or French drains, as appropriate, to ensure the final installed cap provides positive surface water drainage away from each cabin's foundation. Engineering controls such as grading, drainage ditches, and culverts would be used where needed to ensure the integrity of the cap. Additionally, because archaeological resources are present at the site, all earthmoving work should be evaluated during the planning phase to identify whether archaeological oversight would be required. Finally, ecological resources should be evaluated to ensure that any sensitive habitat (e.g., the area directly adjacent to and within the unnamed creek) is protected during grading and cap installation.

ICs (i.e., digging restrictions) and engineering controls (i.e., signage) would be required to limit the exposure of cabin occupants and recreational users to onsite contamination and to maintain the integrity of the cap. A LUC design document would be developed that would include, at a minimum, a legal description of the ARIC, a discussion of the LUC performance objectives and associated land use activity restrictions and monitoring/maintenance actions, and a description of the legal mechanisms to implement land use restrictions.

Long-term maintenance of this alternative would require biannual inspections of the capped area to ensure the remedy's effectiveness and annual repairs to the cap, site best management practices (BMPs), and any signage in need of repair or replacement.

3.2.2.1. Effectiveness

This alternative would be moderately effective in the short-term. Engineering controls and BMPs would be required during execution to minimize potential short-term impacts to humans (including site construction workers and nearby residents) and the environment. All workers that could be exposed to contaminated soil would require protection through adherence to a site-specific health and safety plan. Any persons working in contaminated areas would be required to wear the appropriate PPE. Engineering controls and BMPs (e.g., dust suppression, truck decontamination, street sweeping, and erosion control measures) would be implemented to minimize potential offsite migration of contamination.

This alternative would be effective in the long-term because it would minimize exposure of cabin occupants, recreational site users, and ecological receptors to contaminated soil within the Cabins Area. All contaminated material within the Cabins Area would be buried beneath a 2-foot-thick clean cap, thus eliminating the direct exposure pathway to humans and wildlife. Risks to wildlife would be eliminated within the capped area. However, some risk would be posed to wildlife outside of the capped area (including the potential for downgradient migration of contaminants to the surface water pathway). Post-removal monitoring would be required to evaluate residual risks to wildlife following implementation of this alternative.

The long-term effectiveness of Alternative 2 is contingent on the integrity of the cap. Periodic inspections and maintenance would be required to ensure the integrity of the cap and signage. The eastern edge of the cap, where it abuts the creek, would be prone to erosion and require regular maintenance of BMPs (e.g., silt fence) and repair. The long-term integrity of the cap would also be protected by ICs that would limit digging into or beneath the clean cap.

The overall effectiveness of this alternative is considered good, with good short-term and very good long-term effectiveness.

3.2.2.2. Implementability

Alternative 2 would be moderately feasible to implement. The contractors, equipment, and materials required to enact the alternative are readily available, which increases the potential for their substitution, if needed, and the technical feasibility of this alternative. Planning for this alternative would require an above-average level of effort to ensure (1) the areas around the cabins are properly protected during excavation/grading and capping; (2) tree protections are properly designed; (3) the cap design is robust, particularly in the area along the creek, which will be prone to erosion; and (4) all appropriate archaeological and ecological considerations are addressed. This alternative would also require a minor administrative effort to establish ICs (i.e., digging restrictions) throughout the capped areas. Procuring and importing 16,642 loose cubic yards (LCY) of clean material for construction of the 2-foot-thick cap could be difficult, reducing the implementability of this alternative. A pre-design study of nearby fill sources on Forest Service land (with limited sampling) could be conducted to identify a local borrow source. Establishing a local fill source would greatly simplify this alternative, increasing the implementability and reducing the cost. The entire extent of metals-impacted soil would be disturbed under this alternative, and a large number of trees would require removal or protection, which decreases the implementability.

Acceptance of this alternative by regulators, stakeholders, and community members is likely, because it addresses site risks while allowing continued use of the site with minimal restrictions (i.e., ICs). Cabin occupants would be likely to accept this alternative because they would be permitted to return to the site and reoccupy their cabins with no access limitations. However, some cabin occupants and recreational users may not accept this alternative because contamination would remain at the site beneath the cap. Acceptance of this alternative may also be reduced because of the large number of trees to be removed.

3.2.2.3. Cost

The estimated total capital cost for implementing Alternative 2 is approximately $5,196,200. The long-term total cost for implementing this alternative, including annual O&M and periodic costs, is approximately $5,750,000, with a present-value cost of approximately $5,570,251. Appendix B1 provides the detailed

cost estimate for this alternative. The following major assumptions were used to estimate costs for Alternative 2:

- Planning and design costs for this alternative assume an above-average level of effort.
- For construction, full-time site personnel would consist of four craft laborers, one site superintendent (providing construction management), and one technical staff member (providing technical and health and safety oversight). A project manager would also be at the site part time.
- The duration of site activities is estimated to be approximately 98 days; all site activites are expected to be conducted during the same mobilization (i.e., one construction season).
- Approximately 935 small trees would be removed from the area to be capped, and dry wells would be installed around approximately 26 large trees to be protected. Costs do not account for any potential savings resulting from a timber sale.
- A bulldozer would be used to shape an estimated total of 350 bank cubic yards (BCY), which reflects a radius of approximately 10 feet around each of the affected cabins to a depth of 2 feet. Note: Additional cabin footing preparation costs are included for this alternative because design considerations may require additional effort to protect cabins during and after construction (e.g., shoring, sloping, foundation headers, or other means of protecting cabins; see Appendix B1).
- Brightly colored demarcation fabric would be placed over the entire area to be capped.
- An estimated 16,642 LCY of clean material would be imported to the site, stockpiled, and used to encapsulate the full extent of metals-impacted soil to a thickness of 2 feet. Note: The cost of this alternative may be significantly reduced if a local source of clean fill can be identified.
- Approximately 530 linear feet of silt fence would be installed along the western bank of the creek to prevent water-based erosion of the cap.
- Final grading and hydroseeding would occur throughout the entire disturbed area (approximately 4 acres) to restore the site.
- Biannual inspections would be conducted to evaluate whether the cap, BMPs, and/or signage have degraded, and minor repairs would be made annually. Major repairs to the cap, BMPs, and/or signage would be necessary every 5 years.

3.2.3. Alternative 3A, Hotspot Excavation and Onsite Repository with LUCs

Alternative 3A involves removal of select hot spots in Areas A, B, E, and G (see Figure B-3), encapsulation within an onsite repository, and implementation of ICs (i.e., digging restrictions) and engineering controls (i.e., fencing, gate, and signage) to protect current and future site users and ensure the integrity of the cap. As discussed in the Supplemental Characterization Report (Section 4.5), removal of Areas A, B, E, and G (i.e., Scenario 11) was the selected because it is (1) protective of cabin occupants who spend a total of up to 182 days per year at the site and (2) involves removal of a smaller volume of material than other similarly protective scenarios.

This alternative would impact approximately 630 trees (i.e., 362 trees within the excavation areas and 268 trees to clear space for the repository). Additional evaluation and stakeholder input would be required to identify whether some trees should be preserved. For the purposes of this evaluation, it was arbitrarily assumed that all trees within the excavation and repository footprints would be removed. Removal would include felling each tree and removing its stump. Based on available tree survey data (THA, 2019), approximately 623 small trees and approximately 7 large trees would require removal under this alternative.[3] The number and size of trees in the excavation area was determined using survey data at the site, and the number and size of trees in the repository footprint was approximated by extrapolating from the average tree density at the site (i.e., approximately 227 trees per acre, with 2 percent being large).

Following site preparation, an excavator would be used to remove contaminated material (approximately 4,862 BCY) from the hot spots and directly load the waste into haul trucks for transportation to the onsite repository. For the purposes of this evaluation, the repository location is assumed to be on Forest Service land in the northeast quadrant of the site, south and upslope of the nearby water tank. To confirm the limits of each hot spot, a handheld x-ray fluorescence (XRF) analyzer would be used as a screening tool to establish the initial limits and samples would be collected for laboratory analysis based on the XRF readings. Approximately 20 confirmation samples would be collected for laboratory analysis of arsenic and mercury (one from each sidewall and one from each excavation bottom).

At the repository location, a bulldozer would be used to grade and compact the consolidated waste to the designed repository parameters. A total volume of approximately 6,078 LCY of contaminated material would be excavated and consolidated in the onsite repository (assuming 1.25 LCY per BCY). After grading the waste, the repository would be covered with a high-density polyethylene (HDPE) liner and a geotextile subsurface drainage filter fabric prior to encapsulation to prevent water infiltrating through contaminated soil. Approximately 10,358 LCY of clean material would be imported to the site, stockpiled, and then used to backfill the hotspot excavations (approximately 6,078 LCY) and to encapsulate the repository with a 2-foot-thick clean cover (approximately 4,280 LCY). To backfill the hotspot excavations, the imported backfill material would be placed and compacted in lifts. To encapsulate the repository, the clean cover material would be placed and compacted to achieve a final cover thickness of 2 feet over the repository. Finally, erosion control fabric (5,725 SY) would be installed over the repository to stabilize the surface.

Site restoration activities would include final grading in the Cabins Area to match the existing topography and hydroseeding of the entire disturbed area (approximately 6,033 SY in the Cabins Area and approximately 5,725 SY at the repository) for erosion control. Dust suppression (i.e., spraying with water using a water truck) would be performed throughout all soil-disturbing activities. The duration of site activities is estimated to be approximately 98 days.

[3] The purpose of distinguishing between small and large trees in this analysis is due to the greater cost and level of effort required to remove trees of a larger size.

This alternative would require an engineering study and design to establish and maintain requirements for the hotspot removals, repository construction, surface water drainage, and erosion control. As with Alternative 2, engineering controls such as grading, drainage ditches, and culverts would be used, where needed, to ensure the repository and/or backfilled areas are not impacted by drainage across the site. Samples should be collected prior to the start of site work to fully delineate the extent of each hot spot.[4] Additionally, because archaeological resources are present at the site, all earthmoving work should be evaluated during the planning phase to identify whether archaeological oversight would be required. Finally, ecological resources should be evaluated to ensure that any sensitive habitat (e.g., the area directly adjacent to and within the unnamed creek) is protected during grading and cap installation.

ICs (i.e., access restrictions, digging restrictions, and restrictions on interacting with shallow soil in areas where elevated metals still remain at the site) would be required to limit the exposure of cabin occupants and recreational users to remaining onsite contamination and to maintain the integrity of the capped repository. A LUC design document would be developed that would include, at a minimum, a legal description of the ARIC, a discussion of the LUC performance objectives and associated land use activity restrictions and monitoring/maintenance actions, and a description of the legal mechanisms to implement land use restrictions.

Following implementation of this alternative, cabin occupants and recreational users would be prohibited from using or visiting the site for more than 182 days (approximately 26 weeks, or 6 months) per year to maintain a low risk to human health. As with Alternative 1, a 320-linear-foot industrial chain-link fence would be installed along Old Mammoth Road at the north end of the site. A single locking gate would be installed at the junction with Mill City Tract Road to allow for authorized access to the site during permitted occupancy periods and for maintenance and inspection purposes during periods of site restriction. Signs would also be installed along the perimeter of the ARIC to alert passersby that access is prohibited.

Long-term maintenance of this alternative would require patrols of the area once per week to ensure site access is effectively restricted. The weekly patrols would only occur during periods when site use is prohibited and during periods of the year when the site is accessible. Because the site is accessible approximately 8 months of the year and 6 of those months would be times when occupants were allowed access, weekly patrols are only assumed to be required for 2 months (or 8 weeks) of the year. Biannual inspections of the capped repository would also be required to ensure the remedy's effectiveness. The biannual inspections would be conducted during the 8 remaining months of the year when the site is accessible. For the purposes of this evaluation, 10 patrols/inspections are assumed per year, with a duration

[4] As noted in Section 2.1 of the Supplemental Characterization Report, the purpose of the delineation sampling was to evaluate the extent of metals-impacted soil in the entire area (i.e., not around cabins or hot spots). Therefore, most trench locations were selected along the perimeter of the metals-impacted area to define its limits. Test pit locations were also selected in several locations within the extent of waste to define the vertical extent of contamination. As a result, additional samples should be collected to delineate the horizontal and vertical extent of contamination within the hotspot areas prior to implementation of this alternative.

of 3 hours to conduct each patrols/inspection (including travel to and from the site). Annual repairs are also included under this alternative to repair the repository, backfilled areas, or site restoration BMPs that may have degraded.

The Forest Service may need to implement administrative controls (e.g., internet-based registration system or spreadsheet) to track site use by cabin occupants and ensure the 182-day site restriction is not exceeded by any cabin occupant.

3.2.3.1. Effectiveness

This alternative would be moderately effective in the short-term. Engineering controls and BMPs would be required during execution to minimize potential short-term impacts to humans (including site construction workers and nearby residents) and the environment. All workers that could be exposed to contaminated soil would require protection through adherence to a site-specific health and safety plan. Any persons working in contaminated areas would be required to wear the appropriate PPE. Engineering controls and BMPs (e.g., dust suppression, truck decontamination, street sweeping, and erosion control measures) would be implemented to minimize potential offsite migration of contamination.

This alternative is considered moderately effective in the long-term because it would minimize exposure of humans and wildlife to impacted soil, but contamination would remain in several areas of the site. Cleanup goals would be achieved in areas where contamination is removed (i.e., hot spots), thus eliminating the risk in those areas only. Site-wide risks to cabin occupants and recreational users would be significantly reduced compared to the existing level of risk at the site. Based on the results of the focused risk analysis (Appendix A), risks to cabin occupants and recreational users would be low throughout the Cabins Area provided they limit the maximum number of days on site to 182 per year. However, risks to individual cabin occupants may still exist (i.e., a detailed risk analysis per cabin or per parcel would be required to fully evaluate individual occupant risks).[5] In addition, samples should be collected prior to implementing this alternative to fully delineate each hot spot before the start of work.

Risks to wildlife would be addressed within the hotspot removal areas only. Risks would still be posed to wildlife outside of the hotspot areas (including the potential for downgradient migration of contaminants to the surface water pathway). Of the 46 sample locations with mercury concentrations exceeding ecological criteria, contaminated soil would be removed from 23 locations (or 50%). Of the 31 sample locations with arsenic concentrations exceeding ecological criteria, contaminated soil would be removed from 13 locations (or 42%). Post-removal monitoring would be required to evaluate residual risks to wildlife following implementation of this alternative.

[5] As noted in Section 4.1 of the Supplemental Characterization Report, the characterization sampling evaluated the extent of, and resulting risk associated with, metals-impacted soil throughout the entire Cabins Area and was not specific to individual cabins, parcels, or hot spots.

The short- and long-term effectiveness of the repository would be contingent on the integrity of the cover, which acts as a physical barrier to contamination. Placement of an HDPE liner with a subsurface drainage layer, along with an appropriately designed surface water drainage system and post-construction BMPs (e.g., geotextiles and erosion control fabric), would mitigate waste migration and erosion. Periodic inspections and maintenance would be required to ensure the integrity of the repository cover system.

The overall effectiveness of this alternative is considered good, with both short-term and long-term effectiveness considered good.

3.2.3.2. Implementability

Alternative 3A would be moderately feasible to implement. The contractors, equipment, and materials required to implement the alternative are readily available, thus increasing the potential for their substitution, if needed, and the feasibility of this alternative. Planning for this alternative would require a moderate level of effort to ensure (1) the cap design for the final repository is robust and (2) all appropriate archaeological and ecological considerations are addressed during implementation. As with Alternative 2, procuring and importing 10,358 LCY of clean material for use as backfill and repository cover could be difficult, reducing the implementability of this alternative. A pre-design study of nearby fill sources on Forest Service land (with limited sampling) could be conducted to identify a local borrow source. Establishing a local borrow source would simplify this alternative, thus increasing implementability and reducing costs. The level of effort required to remove trees as part of this alternative is relatively high and does not account for preserving any trees. If tree protections are added, the implementability of this alternative would be reduced. The onsite repository would require routine inspections and maintenance, which decreases the administrative feasibility of the alternative.

Acceptance of this alternative by regulators, stakeholders, and community members is somewhat likely, because it addresses most site risks while allowing continued use of the site with minimal restrictions (e.g., ICs and engineering controls). Cabin occupants would likely accept this alternative because they would be permitted to return to the site and reoccupy their cabins with some access limitations (i.e., access restricted to 182 days per year). However, some cabin occupants and recreational users may not accept this alternative because contamination would remain at the site in areas that were not excavated and beneath the repository cover. Acceptance of this alternative may also be reduced because of the large number of trees to be removed.

3.2.3.3. Cost

The estimated total capital cost for implementing Alternative 3A is approximately $3,635,747. The long-term total cost for implementing this alternative, including annual O&M and periodic costs, is approximately $4,404,587, with a present-value cost of approximately $4,154,496. Appendix B1 provides

the detailed cost estimate for this alternative. The following major assumptions were used to estimate costs for Alternative 3A:

- Planning and design costs for this alternative assume an average level of effort and do not include costs to evaluate per-parcel or per-cabin risks (see discussion in Section 5.4 of Supplemental Characterization Report).
- Samples would be collected prior to the start of site work to fully delineate the extent of each hot spot.
- For construction, full-time site personnel would consist of five craft laborers, one site superintendent (providing construction management), and one technical staff member (providing technical and health and safety oversight). A project manager would also be present at the site part time.
- The duration of site activities is estimated to be approximately 98 days; all site activities are expected to be conducted during the same mobilization (i.e., one construction season).
- Approximately 637 trees would be removed to allow for hotspot excavation (362 trees) and repository construction (275 trees). Note: The cost of this alternative would increase if any trees need to be protected (by approximately $1,600 per protected tree). Costs do not account for any potential savings resulting from a timber sale.
- An estimated total of 4,862 BCY (6,078 LCY) of hotspot material would be excavated and loaded into haul trucks for transportation to the onsite repository.
- XRF and laboratory confirmation soil samples would be collected. Approximately 20 confirmation samples would be collected for laboratory analysis of arsenic and mercury (one from each sidewall and one from each excavation bottom).
- Waste in the repository would be graded to meet design specifications, and an HDPE liner with subsurface drainage layer would be placed on top of the repository prior to soil cover placement.
- An estimated 10,358 LCY of clean material would be imported to the site, stockpiled, and used to backfill the excavated areas (6,078 LCY) and cover the onsite repository to a thickness of 2 feet (4,280 LCY). Note: The cost of this alternative may be reduced if a local source of clean fill can be identified.
- Approximately 5,725 SY of erosion control fabric would be placed on top of the onsite repository.
- Backfill would be compacted, and the backfilled area and repository would be graded to tie-in to the surrounding grade.
- Hydroseeding would occur throughout the entire disturbed area (approximately 2.1 acres), including 1 acre for the hot spots and 1.1 acres for the repository.
- An estimated 320 linear feet of industrial chain link fencing would be installed, in addition to a locking gate at the junction of Old Mammoth Road and Mill City Tract Road and signage around the perimeter of the ARIC.

- Local Forest Service personnel would conduct approximately 10 3-hour patrols/inspections per year to ensure compliance with ICs and inspect the integrity of the cap and signage.
- Minor repairs to the repository, backfilled areas, BMPs, and/or signage would be made annually. Major repairs would be necessary every 5 years.

3.2.4. Alternative 3B, Hotspot Excavation and Offsite Disposal with LUCs

Alternative 3B involves selective removal of hot spots in Areas A, B, E, and G (see Figure B-3). The extent and volume of removal under this alternative is identical to Alternative 3A, except that contaminated soil would be transported and disposed of at an offsite licensed facility as Bevill-exempt waste in accordance with Title 40 Code of Federal Regulations (CFR) Section (§) 261.4(b)(7), rather than being encapsulated on site. Similar to Alternative 3A, ICs (i.e., digging restrictions and engineering controls (i.e., fencing, gate, and signage) would be implemented to protect current and future site users from areas of the site where contamination remains.

This alternative would involve selective removal of 362 trees (including 358 small and 4 large trees) within the area where excavation activities would occur. Additional evaluation and stakeholder input would be required to identify whether some trees should be preserved. For the purposes of this evaluation, it was arbitrarily assumed that all trees within the excavation footprints would be removed.

An excavator would be used to remove approximately 4,862 BCY of contaminated material from the delineated hotspot areas and directly load it into on-road haul trucks for transportation to the offsite disposal facility. To confirm the limits of each hot spot, a handheld XRF analyzer would be used as a screening tool to establish the initial limits and samples would be collected for laboratory analysis based on the XRF readings. Approximately 20 confirmation samples would be collected for laboratory analysis of arsenic and mercury (one from each sidewall and one from each excavation bottom).

Waste would be directly loaded into on-road haul trucks to the extent possible, with stockpiling as needed (i.e., assumed 20 percent more effort than direct loading of all waste). Approximately 7,779 tons of contaminated material would be loaded and hauled to the offsite disposal facility (assuming 1.6 tons per BCY).

Approximately 6,078 LCY of backfill material would be imported to the site and stockpiled to backfill the hotspot excavations. Imported backfill material would be loaded, hauled, and placed and compacted in lifts to backfill the excavated hot spots. Site restoration activities would include final grading in the Cabins Area to match the existing topography and hydroseeding of the entire disturbed area (approximately 6,033 SY) for erosion control. Dust suppression (i.e., spraying with water using a water truck) would be performed throughout all soil-disturbing activities. The duration of site activities is estimated to be approximately 66 days.

As with Alternative 3A, this alternative would require an engineering study and design to establish and maintain requirements for the hotspot removals, repository construction, surface water drainage, and erosion control. Samples would be collected prior to the start of site work to fully delineate the extent of each hot spot.[6] Additionally, because archaeological resources are present at the site, all earthmoving work should be evaluated during the planning phase to identify whether archaeological oversight would be required. Finally, ecological resources should be evaluated to ensure that any sensitive habitat (e.g., the area directly adjacent to and within the unnamed creek) is protected during grading and cap installation.

As with Alternative 3A, ICs (i.e., access restrictions and restrictions on interacting with shallow soil in areas where elevated metals still remain at the site) would be required to limit the exposure of cabin occupants and recreational users to remaining onsite contamination. A LUC design document would be developed that would include, at a minimum, a legal description of the ARIC, a discussion of the LUC performance objectives and associated land use activity restrictions and monitoring/maintenance actions, and a description of the legal mechanisms to implement land use restrictions.

As with Alternative 3A, cabin occupants and recreational users would be prohibited from using or visiting the site for more than 182 days (approximately 26 weeks, or 6 months) per year in order to maintain a low risk to human health. Approximately 320 linear feet of industrial chain-link fence would be installed along Old Mammoth Road at the north end of the site, and a single locking gate would be installed at the junction with Mill City Tract Road to allow for authorized access to the site during permitted occupancy periods and for maintenance and inspection purposes during periods of site restriction. Signs would also be installed along the perimeter of the ARIC to alert passersby that access is prohibited.

Long-term maintenance of this alternative would require patrols of the area once per week to ensure site access is effectively restricted. The weekly patrols would only occur during periods when site use is prohibited and during periods of the year when the site is accessible. Because the site is accessible approximately 8 months of the year and 6 of those months would be times when occupants were allowed access, weekly inspections are only assumed to be required for 2 months (or 8 weeks) of the year. Biannual inspections of the backfilled areas would also be required to ensure the remedy's effectiveness. The biannual inspections would be conducted during the 8 remaining months of the year when the site is accessible. For the purposes of this evaluation, 10 patrols/inspections are assumed per year, with a duration of 3 hours to conduct each patrol/inspection (including travel to and from the site). Annual repairs are also included under this alternative to fix any aspects of the backfilled areas, site restoration BMPs, fencing, gate, or signage that may have degraded.

[6] As noted in Section 2.1 of the Supplemental Characterization Report, the purpose of the delineation sampling was to evaluate the extent of metals-impacted soil in the entire area (i.e., not around cabins or hot spots). Therefore, most trench locations were selected along the perimeter of the metals-impacted area to define its limits. Test pit locations were also selected in several locations within the extent of waste to define the vertical extent of contamination. As a result, additional samples should be collected to delineate the horizontal and vertical extent of contamination within the hotspot areas prior to implementation of this alternative.

The Forest Service may need to implement administrative controls (e.g., internet-based registration system or spreadsheet) to track site use by cabin occupants and ensure the 182-day site restriction is not exceeded by any cabin occupant.

3.2.4.1. Effectiveness

As with Alternative 3A, this alternative would be moderately effective in the short-term. Engineering controls and BMPs would be required during execution to minimize potential short-term impacts to humans (including site construction workers and nearby residents) and the environment. All workers that could be exposed to contaminated soil would require protection through adherence to a site-specific health and safety plan. Any persons working in contaminated areas would be required to wear the appropriate PPE. Engineering controls and BMPs (e.g., dust suppression, truck decontamination, street sweeping, and erosion control measures) would be implemented to minimize potential offsite migration of contamination.

This alternative is moderately effective in the long-term because it would minimize exposure of humans and wildlife to impacted soil, but contamination would remain in several areas of the site. Cleanup goals would be achieved in areas where contamination is removed (i.e., hot spots), thus eliminating the risk in those areas only. Site-wide risks to cabin occupants and recreational users would be significantly reduced compared to the existing level of risk at the site. Based on the results of the focused risk analysis (Appendix A), risks to cabin occupants and recreational users would be low throughout the Cabins Area provided that they limit the maximum number of days on site to 182 per year. However, risks to individual cabin occupants may still exist (a detailed risk analysis per cabin or per parcel would be required to fully evaluate individual occupant risks).[7] In addition, samples should be collected prior to implementing this alternative to ensure the extent of each hot spot is known before the start of work.

As with Alternative 3A, risks to wildlife would be addressed within the hotspot removal areas. However, risks would still be posed to wildlife outside of the hotspot areas (including the potential for downgradient migration of contaminants to the surface water pathway). Contaminated soil would be removed from 23 of 46 (or 50%) sample locations with mercury concentrations exceeding ecological criteria, and contaminated soil would be removed from 13 of 31 (or 42%) sample locations with arsenic concentrations exceeding ecological criteria. Post-removal monitoring would be required to evaluate residual risks to wildlife following implementation of this alternative.

As with Alternative 3A, this alternative would be effective in the short- and long-term because contaminated material would be removed from the Cabins Area and disposed of off site. Additionally, an onsite repository would not be necessary, reducing long-term monitoring requirements and increasing

[7] As noted in Section 4.1 of the Supplemental Characterization Report, the characterization sampling evaluated the extent of, and resulting risk associated with, metals-impacted soil throughout the entire Cabins Area and was not specific to individual cabins, parcels, or hot spots.

effectiveness. Biannual inspections would be conducted to evaluate the integrity of the backfilled area, fencing, gate, and signage and conduct any necessary minor repairs.

The overall effectiveness of this alternative is considered very good, with the short-term effectiveness considered good and the long-term effectiveness considered very good.

3.2.4.2. Implementability

Alternative 3B would be moderately feasible to implement. The contractors, equipment, and materials required to enact the alternative are readily available, thus increasing the potential for their substitution, if needed, and the feasibility of the alternative. Planning for this alternative would require an average level of effort to ensure all appropriate archaeological and ecological considerations are addressed. Successful implementation of the alternative would also depend on identification of a landfill that could accept the quantity of Bevill-exempt waste, which may pose logistical challenges. Offsite disposal may also be complicated by limited availability of on-road trucks to transport the waste to a disposal facility and impacts to the local community from increased truck traffic. As with Alternatives 2 and 3A, procuring and importing 6,078 LCY of clean backfill material could be difficult, reducing the implementability of this alternative. A pre-design study of nearby fill sources on Forest Service land (with limited sampling) could be conducted to identify a local borrow source. Establishing a local borrow source would simplify this alternative, thus increasing implementability and reducing costs. The level of effort required to remove trees as part of this alternative is relatively high and does not account for preserving any trees. If tree protections are added, the implementability of this alternative would be reduced.

As with Alternative 3A, acceptance of this alternative by regulators, stakeholders, and community members is somewhat likely because it addresses most site risks while allowing continued use of the site with minimal restrictions (i.e., ICs and engineering controls). Cabin occupants would likely accept this alternative because they would be permitted to return to the site and reoccupy their cabins with some access limitations (i.e., access restricted to 182 days per year). However, some cabin occupants and recreational users may not accept this alternative because contamination would remain at the site in areas that were not excavated. Acceptance of this alternative may also be reduced because of the large number of trees to be removed.

3.2.4.3. Cost

The estimated total capital cost for implementing Alternative 3B is approximately $3,309,848. The long-term total cost for implementing this alternative, including annual O&M and periodic costs, is approximately $3,346,576, with a present-value cost of $3,527,788. Appendix B1 provides the detailed cost estimate for this alternative. The following major assumptions were used to estimate costs for Alternative 3B:

- Planning and design costs for this alternative assume an average level of effort and do not include costs to evaluate per-parcel or per-cabin risks (see discussion in Section 5.4 of Supplemental Characterization Report).
- Sampling would be collected prior to the start of site work to fully delineate the extent of each hot spot.
- For construction, full-time site personnel would consist of five craft laborers, one site superintendent (providing construction management), and one technical staff member (providing technical and health and safety oversight). A project manager would also be present at the site part time.
- The duration of site activities is estimated to be approximately 66 days; all site activities are expected to be conducted during the same mobilization (i.e., one construction season).
- Approximately 362 trees would be removed to allow for hotspot excavation. Note: The cost of this alternative would increase if any trees are to be protected (by approximately $1,600 per tree). Costs do not account for any potential savings resulting from a timber sale.
- An estimated total of 4,862 BCY (6,078 LCY) would be excavated and loaded into haul trucks for offsite disposal. Note: It is assumed that all waste will be classified as Bevill-exempt in accordance with Title 40 CFR § 261.4(b)(7). It is also assumed that an offsite facility capable of accepting Bevill-exempt waste is present within 200 miles of the site (in Beatty, Nevada); costs may increase or decrease significantly depending on the location of the receiving facility.
- XRF and laboratory confirmation soil samples would be collected. Approximately 20 confirmation samples would be collected for laboratory analysis of arsenic and mercury (one from each sidewall and one from each excavation bottom).
- An estimated 6,078 LCY of clean material would be imported to the site, stockpiled, and used to backfill the excavated areas. Note: The cost of this alternative may be reduced if a local source of clean fill can be identified.
- Backfill would be compacted and graded to tie-in to the surrounding grade.
- Hydroseeding would occur throughout the entire disturbed area (approximately 1 acre) to restore the site.
- An estimated 320 linear feet of industrial chain link fencing would be installed, in addition to a locking gate at the junction of Old Mammoth Road and Mill City Tract Road and signage along the perimeter of the ARIC.
- Local Forest Service personnel would conduct approximately 10 3-hour patrols/inspections per year to ensure compliance with ICs.
- Biannual inspections and minor repairs would be conducted to ensure integrity of the backfilled areas, fencing, gate, and signage. Major repairs to the fence and/or gate would be necessary every 5 years.

3.2.5. Alternative 4A, Complete Excavation and Onsite Repository with LUCs

Alternative 4A involves the complete removal of metals-impacted soil from the Cabins Area (see Figure B-4), encapsulation within an onsite repository, backfill of the removal area, and implementation of ICs (i.e., digging restrictions) and engineering controls (i.e., signage) to protect current and future site users and ensure the integrity of the cap.

This alternative would involve removal of approximately 1,497 trees (i.e., 961 trees from the excavation area and 536 trees to clear space for the repository). Additional evaluation and stakeholder input would be required to identify whether some trees should be preserved. For the purposes of this evaluation, it was arbitrarily assumed that all trees within the excavation and repository footprints would be removed. Removal would include felling each tree and removing its stump and root structure. Based on available tree survey data (THA, 2019), approximately 1,443 small and approximately 40 large trees would be removed under this alternative. The number and size of trees in the excavation area was determined using survey data at the site, and the number and size of trees in the repository footprint was approximated by extrapolating from the average tree density at the site (i.e., 227 trees per acre with 2 percent being large).

Following site preparation, an excavator would be used to remove all metals-impacted soil (approximately 14,176 BCY) from the Cabins Area. The removed soil would be properly stockpiled on plastic sheeting, then loaded into haul trucks for transportation to the onsite repository. As with Alternative 3A, the repository location is assumed to be on Forest Service land in the northeast quadrant of the site, south and upslope of the nearby water tank. To confirm the excavation limits, a handheld XRF analyzer would be used as a screening tool to establish the initial limits and samples would be collected for laboratory analysis based on the XRF readings. Approximately 27 confirmation samples would be collected for laboratory analysis of arsenic and mercury (collected on 100-foot by 100-foot centers).

A bulldozer would be used to grade contaminated soil to meet the repository design specifications. In total, approximately 17,720 LCY would be hauled to and placed in the onsite repository (assuming 1.25 LCY per BCY). Once graded, the repository would then be lined with an HDPE liner and geotextile subsurface drainage filter fabric prior to encapsulation to prevent water infiltrating through the contaminated soil.

Approximately 27,253 LCY of clean material would be imported and stockpiled on site. Import fill would then be used to (1) backfill the removal area (approximately 9,533 LCY) and (2) construct a 2-foot-thick cover on top of the graded and lined repository (approximately 17,720 LCY). The backfilled area would be final graded and compacted, and erosion control measures would be installed. Finally, the entire disturbed area (approximately 11,439 SY in the disturbed Cabins Area and approximately 20,097 SY at the repository) would be hydroseeded to restore the site. Dust suppression (i.e., spraying with water using a water truck) would be performed during all soil-disturbing activities. The duration of site activities is estimated to be approximately 205 days.

As with Alternative 3A, this alternative would require an engineering study and design to establish and maintain requirements for soil removal, repository construction, surface water drainage, and erosion control. As with Alternative 2, engineering controls such as grading, drainage ditches, and culverts would be used where needed to ensure proper drainage at the repository and/or backfilled areas. Additionally, because archaeological resources are present at the site, all earthmoving work should be evaluated during the planning phase to determine whether archaeological oversight would be required. Finally, ecological resources should be evaluated to ensure that any sensitive habitat (e.g., the area directly adjacent to and within the unnamed creek) is protected during grading and cap installation.

As with Alternative 3A, ICs (i.e., digging restrictions) would be required to limit the exposure of cabin occupants and recreational users to onsite contamination beneath the capped repository and to maintain the integrity of the repository. A LUC design document would be developed that would include, at a minimum, a legal description of the ARIC, a discussion of the LUC performance objectives and associated land use activity restrictions and monitoring/maintenance actions, and a description of the legal mechanisms to implement land use restrictions.

Biannual inspections of the capped repository would be required to ensure the effectiveness of the remedy. The biannual inspections would be conducted during the 8 months of the year when the site is accessible. For the purposes of this evaluation, a total of 2 inspections are assumed per year, with a duration of 3 hours to conduct each inspection (including travel to and from the site). Annual repairs are also included under this alternative to repair the repository, backfilled areas, site restoration BMPs, and/or signage that may have degraded.

3.2.5.1. Effectiveness

Alternative 4A would be moderately effective in the short-term. Engineering controls and BMPs would be required during execution to minimize potential short-term impacts to humans (including site construction workers and nearby residents) and the environment. All workers that could be exposed to contaminated soil would require protection through adherence to a site-specific health and safety plan. Any persons working in contaminated areas would be required to wear the appropriate PPE. Engineering controls and BMPs (e.g., dust suppression, truck decontamination, street sweeping, and erosion control measures) would be implemented to minimize potential offsite migration of contamination.

This alternative would be very effective in the long-term because it would remove all site COCs and encapsulate the material beneath clean soil, reducing exposure of cabin occupants and recreational users. Risks to wildlife would be eliminated within the removal area. However, some risks would still be posed to wildlife outside of the removal area (including the potential for downgradient migration of contaminants to the surface water pathway). Post-removal monitoring would be required to evaluate residual risks to wildlife following implementation of this alternative.

Because excavated soil would remain in an onsite repository, the long-term effectiveness of this alternative is somewhat reduced. As with Alternative 3A, the effectiveness of this alternative is contingent on the integrity of the repository cover. Placement of an HDPE liner with a subsurface drainage layer along with an appropriately designed surface water drainage system and post-construction BMPs (e.g., geotextiles and erosion control fabric) would mitigate waste migration and erosion. Periodic inspections and maintenance would be required to ensure the integrity of the repository cover system.

The overall effectiveness of this alternative is considered very good, with the short-term effectiveness considered good and the long-term effectiveness considered very good.

3.2.5.2. Implementability

Alternative 4A would be moderately feasible to implement. The contractors, equipment, and materials required to implement the alternative are readily available, thus increasing the potential for their substitution, if needed, and the feasibility of this alternative. Planning for this alternative would require a moderate level of effort to ensure (1) the cap design for the final repository is robust and (2) all appropriate archaeological and ecological considerations are addressed during implementation. As with Alternatives 2, 3A, and 3B, procuring and importing 27,253 LCY of clean material for use as backfill and repository cover could be difficult, reducing the implementability of this alternative. A pre-design study of nearby fill sources on Forest Service land (with limited sampling) could be conducted to identify a local borrow source. Establishing a local borrow source would simplify this alternative, thus increasing implementability and reducing costs. The level of effort required to remove trees as part of this alternative is relatively high and does not account for preserving any trees. If tree protections are added, the implementability of this alternative would be reduced. The onsite repository would require routine inspections and maintenance, which decreases the administrative feasibility of the alternative.

Acceptance of this alternative by regulators, stakeholders, and community members is likely because it addresses all risks within the Cabins Area, while allowing continued use of the site with minimal restrictions (ICs and engineering controls for the capped repository only). Cabin occupants would be likely to accept this alternative because they would be permitted to return to the site and reoccupy their cabins with no access limitations. However, some cabin occupants or recreational users may not accept this alternative because contamination, although covered, would remain at the site beneath the repository cover. Acceptance of this alternative may also be reduced because of the large number of trees to be removed.

3.2.5.3. Cost

The estimated total capital cost for implementing Alternative 4A is approximately $8,422,678. The long-term total cost for implementing this alternative, including annual O&M and periodic costs, is approximately $9,263,878, with a present-value cost of approximately $8,989,045. Appendix B1 provides

the detailed cost estimate for this alternative. The following major assumptions were used to estimate costs for Alternative 4A:

- Planning and design costs for this alternative assume an average level of effort.
- For construction, full-time site personnel would consist of five craft laborers, one site superintendent (providing construction management), and one technical staff member (providing technical and health and safety oversight). A project manager would also be present at the site part time.
- The duration of site activities is estimated to be approximately 205 days; all site activities are expected to require two mobilizations (i.e., two construction seasons).
- Approximately 1,483 trees would be removed to allow for excavation of impacted soil and construction of the repository (961 trees in the excavation area and 522 trees for the repository). Note: The cost of this alternative would increase if any trees are to be protected (by approximately $1,600 per tree). Costs do not account for any potential savings resulting from a timber sale.
- An estimated total of 14,176 BCY (17,720 LCY) would be excavated and loaded into haul trucks for transportation to the onsite repository.
- XRF and laboratory confirmation samples would be collected. Approximately 27 confirmation samples would be collected for laboratory analysis of arsenic and mercury (collected on 100-foot by 100-foot centers).
- Waste in the repository would be graded to meet design specifications, and an HDPE liner and subsurface drainage layer would be placed on top of the repository prior to soil cover placement.
- An estimated 27,253 LCY of clean material would be imported to the site, stockpiled, and used to backfill the excavated areas (17,720 LCY) and cover the onsite repository to a thickness of 2 feet (9,533 LCY). Note: The cost of this alternative may be significantly reduced if a local source of clean fill can be identified.
- Approximately 11,439 SY of erosion control fabric would be placed on top of the onsite repository.
- Backfill material would be compacted, and the backfilled area and repository would be graded to tie-in to the surrounding grade.
- Hydroseeding would occur throughout the entire disturbed area (approximately 6.5 acres), including 4 acres for the excavation area and 2.5 acres for the repository.
- Local Forest Service personnel would conduct biannual 3-hour inspections.
- to inspect the integrity of the onsite repository.
- Minor repairs to the repository, backfilled areas, BMPs, and/or signage would be made annually. Major repairs would be necessary every 5 years.

3.2.6. Alternative 4B, Complete Excavation and Offsite Disposal

Alternative 4B involves complete removal of metals-impacted soil from the Cabins Area (see Figure B-4) and transportation and disposal at an offsite licensed facility as Bevill-exempt waste in accordance with Title 40 CFR § 261.49(b)(7) followed by backfill of the removal area.

This alternative would involve removal of 961 trees within the excavation area, including 935 small trees and 26 large trees. Additional evaluation and stakeholder input would be required to identify whether some trees should be preserved. For the purposes of this evaluation, it was arbitrarily assumed that all trees within the excavation and repository footprints would be removed. Removal would include felling each tree and removing its stump.

Following site preparation, an excavator would be used to remove all metals-impacted soil (approximately 14,176 BCY) from the Cabins Area and directly load the waste into on-road haul trucks for transportation to an offsite disposal facility. A total volume of approximately 17,720 LCY would be hauled to the offsite disposal facility (assuming 1.25 LCY per BCY). To confirm the excavation limits, a handheld XRF analyzer would be used as a screening tool to establish the initial limits and samples would be collected for laboratory analysis based on the XRF readings. Approximately 27 confirmation samples would be collected for laboratory analysis of arsenic and mercury (collected on 100-foot by 100-foot centers).

Clean material would be imported, stockpiled at the site, and then used to backfill the total volume of contaminated soil removed from the Cabins Area (approximately 17,720 LCY). The backfill would then be graded and compacted, and erosion control measures would be installed. Finally, the disturbed area (approximately 20,000 SY) would be hydroseeded to restore the site. Dust suppression (i.e., spraying with water using a water truck) would be performed throughout all soil-disturbing activities. The duration of site activities is estimated to be approximately 168 days.

As with Alternative 4A, this alternative would require an engineering study and design to establish and maintain requirements for soil removal, surface water drainage, and erosion controls. Engineering controls such as grading, drainage ditches, and culverts would be used, where needed, to ensure proper drainage across the site. Additionally, because archaeological resources are present at the site, all earthmoving work should be evaluated during the planning phase to identify whether archaeological oversight would be required. Finally, ecological resources should be evaluated to ensure that any sensitive habitat (e.g., the area directly adjacent to and within the unnamed creek) is protected during backfill and grading.

No LUCs (i.e., ICs or engineering controls) or long-term maintenance would be required under this alternative because all waste would be removed from the site.

3.2.6.1. Effectiveness

As with Alternative 4A, this alternative would be moderately effective in the short-term. Engineering controls and BMPs would be required during execution to minimize potential short-term impacts to humans (including site construction workers and nearby residents) and the environment. All workers that could be exposed to contaminated soil would require protection through adherence to a site-specific health and safety plan. Any persons working in contaminated areas would be required to wear the appropriate PPE. Engineering controls and BMPs (e.g., dust suppression, truck decontamination, street sweeping, and erosion control measures) would be implemented to minimize potential offsite migration of contamination.

This alternative would be very effective in the long-term because it would removal all site COCs, thus eliminating potential exposure of cabin occupants and recreational users within the Cabins Area. Under this alternative, contamination would be permanently removed from the site and transported to an offsite disposal facility, making the alternative effective in both the short- and long-term. Risks to wildlife would be eliminated within the removal area. However, some risks would be posed to wildlife outside of the removal area (including the potential for downgradient migration of contaminants to the surface water pathway). Post-removal monitoring would be required to evaluate residual risks to wildlife following implementation of this alternative.

As with Alternative 3B, this alternative does not include construction of an onsite repository, so no major repairs or long-term maintenance is required. Biannual inspections would be conducted for the first year only to evaluate the integrity of the backfilled area and conduct any necessary minor repairs.

The overall effectiveness of this alternative is considered excellent, with the short-term effectiveness considered good and the long-term effectiveness considered excellent.

3.2.6.2. Implementability

Alternative 4B would be moderately feasible to implement. The contractors, equipment, and materials required to enact the alternative are readily available, thus increasing the potential for their substitution, if needed, and the feasibility of the alternative. Planning for this alternative would require an average level of effort to ensure all appropriate archaeological and ecological considerations are addressed during implementation of the TCRA. Successful implementation of the alternative would also depend on identification of a landfill that could accept the quantity of Bevill-exempt waste, which may pose logistical challenges. Offsite disposal may also be complicated by limited availability of on-road trucks to transport the waste to a disposal facility and impacts to the local community from increased truck traffic. As with Alternative 4A, procuring and importing 17,720 LCY of clean backfill material could be difficult, reducing the implementability of this alternative. A pre-design study of nearby fill sources on Forest Service land (with limited sampling) could be conducted to identify a local borrow source. Establishing a local borrow source would simplify this alternative, thus increasing implementability and significantly reducing costs. The level of effort required to remove trees as part of this alternative is high and does not account for preserving any trees. If tree protections are added, the implementability of this alternative would be reduced.

Acceptance of this alternative by regulators, stakeholders, and community members is likely because it addresses all risks within the Cabins Area, while allowing unrestricted reuse of the site. Cabin occupants would be likely to accept this alternative because they would be permitted to return to the site and reoccupy their cabins with no access limitations. However, acceptance of this alternative may be reduced because of the large number of trees to be removed.

3.2.6.3. Cost

The estimated total capital cost for implementing Alternative 4B is approximately $8,778,987. The long-term total cost for implementing this alternative, including annual O&M and periodic costs, is approximately $8,786,587, with an approximate present-value cost of $8,786,394. Appendix B1 provides the detailed cost estimate for this alternative. The following major assumptions were used to estimate costs for Alternative 4B:

- Planning and design costs for this alternative assume an average level of effort.
- For construction, full-time site personnel would consist of five craft laborers, one site superintendent (providing construction management), and one technical staff member (providing technical and health and safety oversight). A project manager would also be present at the site part time.
- The duration of site activities is estimated to be approximately 205 days; all site activities are expected to require two mobilizations (i.e., two construction seasons).
- Approximately 961 trees would be removed to allow for excavation of impacted soil. Costs do not account for any potential savings resulting from a timber sale.
- An estimated total of 14,176 BCY (17,720 LCY) would be excavated and loaded into haul trucks for offsite disposal. Note: It is assumed that all waste will be classified as Bevill-exempt in accordance with Title 40 CFR § 261.4(b)(7). It is also assumed that an offsite facility capable of accepting Bevill-exempt waste is present within 200 miles of the site (in Beatty, Nevada); costs may increase or decrease significantly depending on the location of the receiving facility.
- XRF and laboratory confirmation samples would be collected. Approximately 27 confirmation samples would be collected for laboratory analysis of arsenic and mercury (collected on 100-foot by 100-foot centers).
- An estimated 17,720 LCY of clean material would be imported to the site, stockpiled, and used to backfill the excavated areas. Note: the cost of this alternative may be significantly reduced if a local source of clean fill can be identified.
- Backfill would be compacted and graded to tie-in to the surrounding grade.
- Hydroseeding would occur throughout the entire disturbed area (approximately 4.1 acres).
- Biannual inspections and minor repairs would be conducted for the first year only to ensure integrity of the backfilled excavation area.

Section 4. Comparative Analysis of Alternatives

This section describes the comparative analysis of each alternative with one another to determine which alternative best meets the TCRA objectives (i.e., to mitigate exposure of humans and wildlife to site COCs—primarily arsenic and mercury—in tailings and soil within the Cabins Area). Specifically, the alternatives identified in Section 3 were compared with one another using the evaluation criteria described in Section 2. Table B-3 summarizes the results of the comparative analysis.

4.1. EFFECTIVENESS

Alternative 1 is considered the least effective alternative because soil contamination would remain on site and the risk of potential exposure to site COCs would not be eliminated or minimized. Although the risk of exposure of cabin occupants would be significantly reduced by prohibiting site access through LUCs, the risk of offsite migration from the affected area would remain. As a result, risks to recreational users and occupants downgradient of the closure area would remain and risks to wildlife within and downgradient of the closure area would remain.

Alternative 2 is considered significantly more effective than Alternative 1 because it proposes encapsulating all contamination beneath a 2-foot-thick clean cap, which would eliminate the direct exposure pathway of humans and wildlife to site COCs and allow reuse of the site by cabin occupants with minimal restrictions (ICs to restrict digging and engineering controls). Alternative 2 is somewhat more effective than Alternatives 3A and 3B, because it addresses all metals-impacted soil (rather than just hot spots) and is less effective than Alternative 4B because contamination would remain on site beneath the cap. Alternative 2 is considered similarly effective to Alternative 4A because the direct exposure pathway is eliminated but contaminants remain on site beneath a cap (and require ICs, engineering controls, and long-term maintenance to ensure the effectiveness of the remedy).

Alternative 3A is significantly more effective than Alternative 1 because it reduces site-wide human health risks to acceptable levels, although it only partially addresses risks to wildlife. This alternative is considered less effective than Alternatives 2, 4A, and 4B, which address all site contamination, because it does not account for potential risks per cabin or per parcel (which were not evaluated for this study). Alternative 3A and Alternative 3B are similarly effective. Under both alternatives, contamination other than the hot spots would remain at the site; however, under Alternative 3A, contamination would remain at the site beneath the repository cover and long-term maintenance of the capped repository would be required. Alternative 3A is less effective than Alternative 4A, but Alternative 4A would require a larger onsite repository to

accommodate the greater volume of encapsulated waste and thus would require more significant long-term monitoring and maintenance.

Alternative 3B is similarly effective to Alternative 3A; however, contamination removed from hot spots would not remain on site thus making it slightly more protective. As with Alternative 3A, it does not account for potential risks per cabin or per parcel and only partially addresses risks to wildlife. As a result, Alternative 3B is considered slightly less effective than Alternatives 2, 4A, and 4B, which address all site contamination.

Alternative 4A is considered significantly more effective than Alternatives 1, 3A, and 3B because it addresses all risks to human health in the Cabins Area and significantly reduces ecological risks. Alternative 4A is considered similarly effective to Alternative 2. Alternatives 4A and 2 address all site COCs by encapsulating them. However, the encapsulated area under Alternative 4A would be located outside of the Cabins Area, within a smaller footprint than the cap under Alternative 2, and would require slightly less effort for long-term maintenance. Alternative 4A is slightly less effective than Alternative 4B, because contaminants would remain at the site (requiring long-term maintenance and ICs), while they would be disposed of off site under Alternative 4B.

Alternative 4B is considered the most effective alternative because it would completely remove all site contamination and dispose of it at an offsite facility.

All of the alternatives, except for Alternative 1, would reduce risks to wildlife, but none of them would completely eliminate ecological risk. Alternatives 2, 4A, and 4B are more effective at reducing ecological risks than Alternatives 3A and 3B because they address all areas of metals-impacted soil (rather than just hot spots). In all cases, risks to wildlife would be eliminated within the removal areas. All alternatives would require some level of post-removal monitoring to evaluate whether residual risks to wildlife remain.

4.2. IMPLEMENTABILITY

All of the alternatives are technically and administratively feasible, the services and materials necessary to implement the alternatives are readily available, and all alternatives could be conducted within one construction season. Alternative 1 would require only minimal site work and would be the most technically feasible to implement. Alternatives 2, 3B, and 4B are all considered moderately implementable. Alternative 2 requires a high level of effort during the planning phase, but less intensive construction effort relative to Alternatives 3B and 4B. Alternatives 3B and 4B require a significant level of effort to remove trees, excavate hot spots, and dispose of materials off site, with Alternative 4B requiring more time and effort than Alternative 3B because a larger volume of material would be addressed. Alternative 2 requires long-term maintenance, ICs, and engineering controls and is considered slightly less implementable than Alternative 3B, which requires mostly administrative monitoring of ICs (access restrictions) and engineering controls (signage), and Alternative 4B, which requires only minimal maintenance for the first 5 years.

Alternatives 3A and 4A are considered the least implementable because they both require a significant level of effort to remove trees, excavate hot spots, encapsulate materials in an onsite repository, and implement long-term maintenance of the repository along with ICs and engineering controls.

Alternatives 2, 3A, 3B, and 4A are all likely to be accepted by regulators, stakeholders, and community members, particularly cabin occupants who would be allowed to return to the site and reoccupy their cabins with some limitations (i.e., restrictions on digging and/or access restrictions). The only limitations for Alternatives 2 and 4A would be to restrict digging in capped areas, making them more acceptable than Alternatives 3A and 3B, which restrict site access to 6 months of the year.

Alternative 4B is the most likely to be accepted by regulators, stakeholders, and community members because it would allow cabin occupants and recreational users unrestricted future use of the Cabins Area.

4.3. COST

The following table summarizes the estimated capital costs and estimated total costs, including ongoing maintenance, for each alternative:

Alternative	Estimated Capital Cost	Estimated Total Cost (Including O&M)
Alternative 1	$76,241	$609,491
Alternative 2	$5,196,200	$5,750,000
Alternative 3A	$3,635,747	$4,404,587
Alternative 3B	$3,309,848	$3,346,576
Alternative 4A	$8,422,678	$9,263,878
Alternative 4B	$8,778,987	$8,786,587

Capital and long-term costs for Alternative 1 reflect the lowest costs of the seven alternatives. Alternative 2 has higher capital and long-term O&M costs than Alternatives 3A and 3B. Alternatives 2, 3A, and 4A have high long-term O&M costs to maintain the integrity of the cap and/or encapsulated onsite repository. Alternatives 4A and 4B have high capital and O&M costs and are considered the least cost-effective alternatives. Alternative 3B is preferable to Alternative 1 because it minimizes the risk of human exposure by removing the most contaminated material from the site.

Alternatives 2, 4A, and 4B are the most effective and implementable of the alternatives, with Alternatives 4A and 4B being significantly more costly than Alternative 2. Alternatives 3A and 3B are considered slightly less effective (because they do not remove all site contamination) and implementable, with similar cost to Alternative 2 and significantly lower costs than Alternatives 4A and 4B.

Section 5. References

U.S. Department of Agriculture Forest Service (Forest Service), 1942. "Mill City Tract, Secs. 4 & 9, T. 4S. R. 27E., Lots 26-33." April.

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Triad/Holmes Associates (THA), 2019. "Mammoth Mill Topographic Survey, Town of Mammoth Lakes, Mono County, State of California." August 2.

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Figures

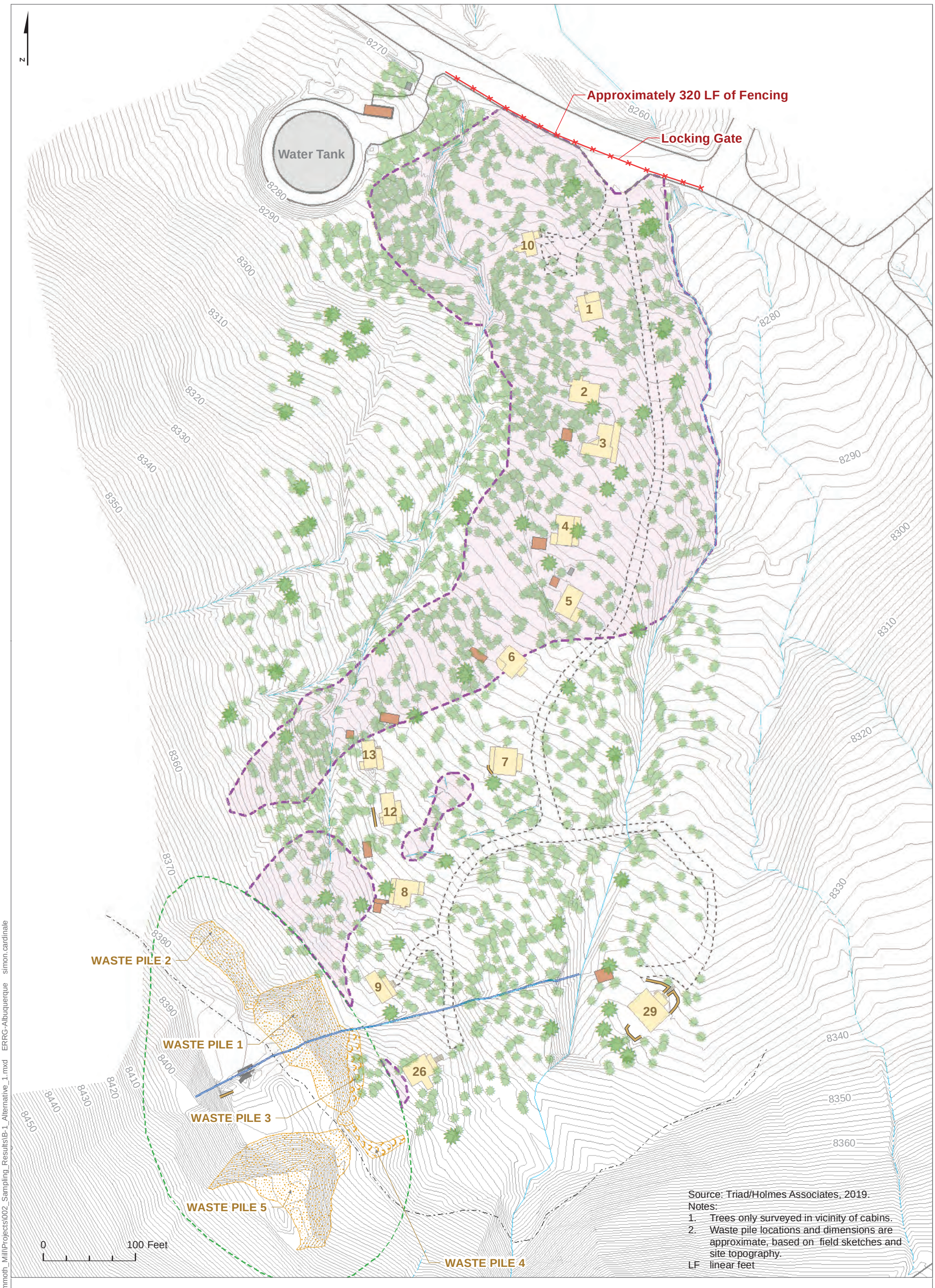

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Figure B-1. Alternative 1

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

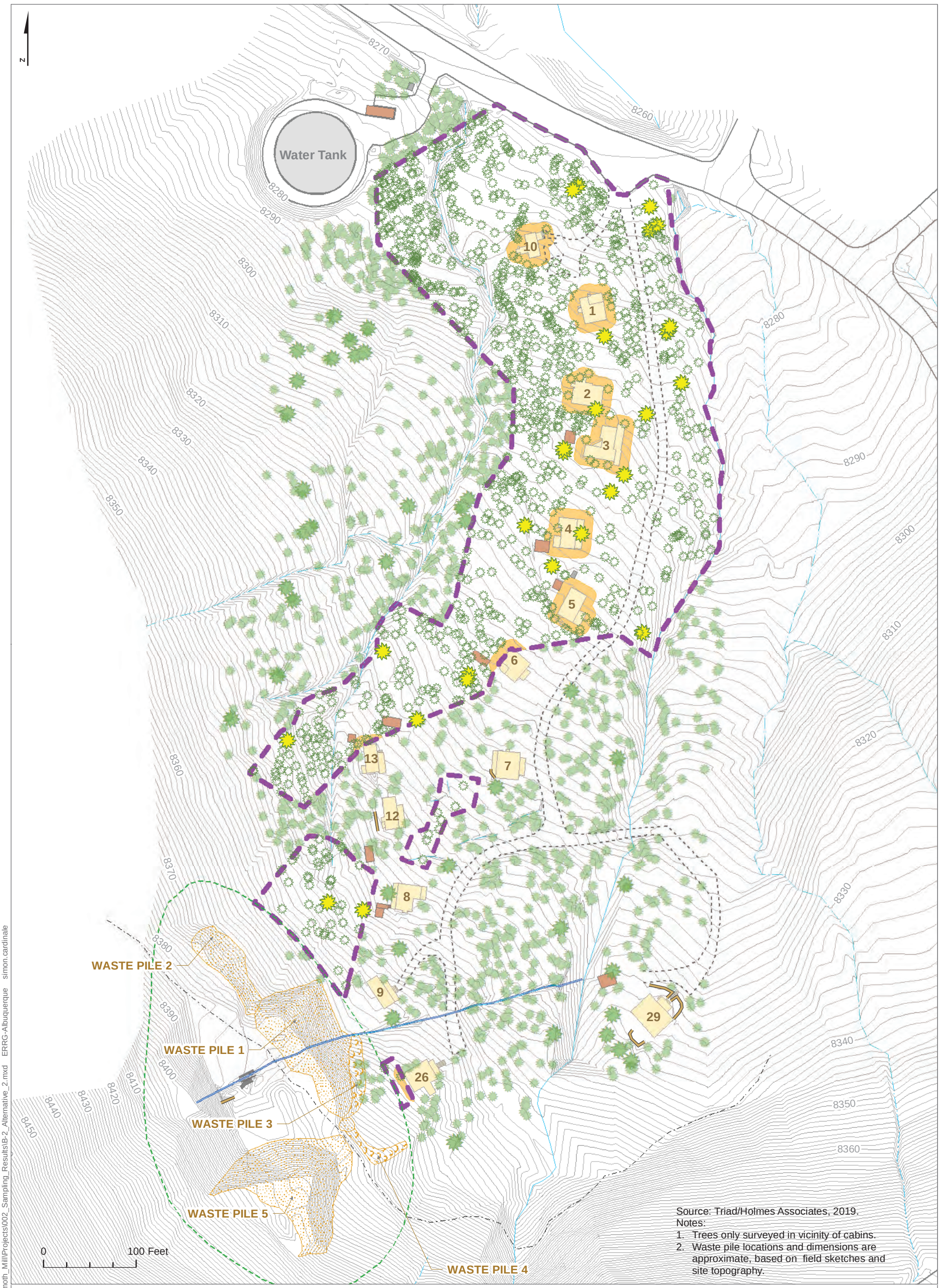

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Figure B-2. Alternative 2

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

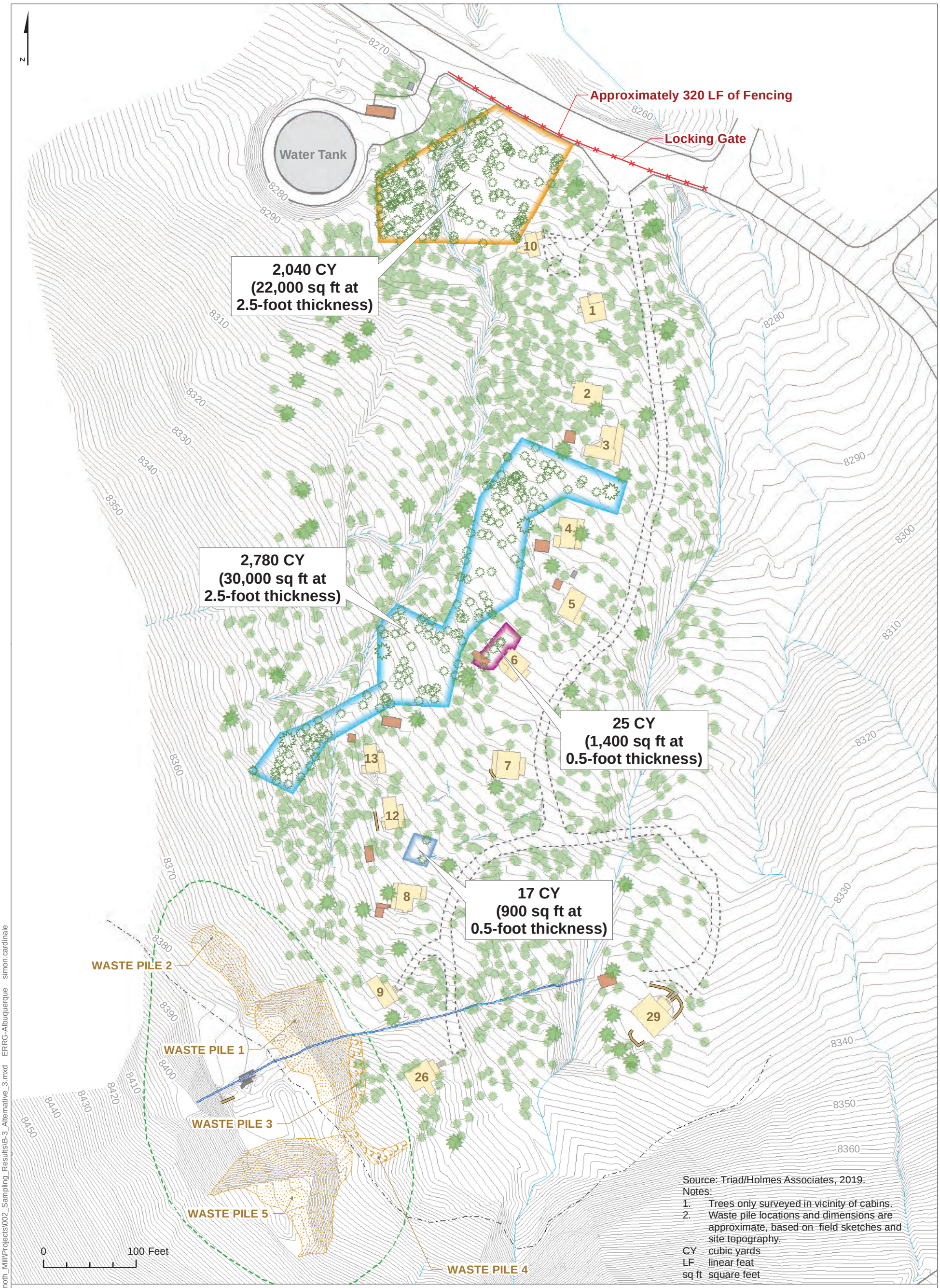

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Figure B-3. Alternative 3

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

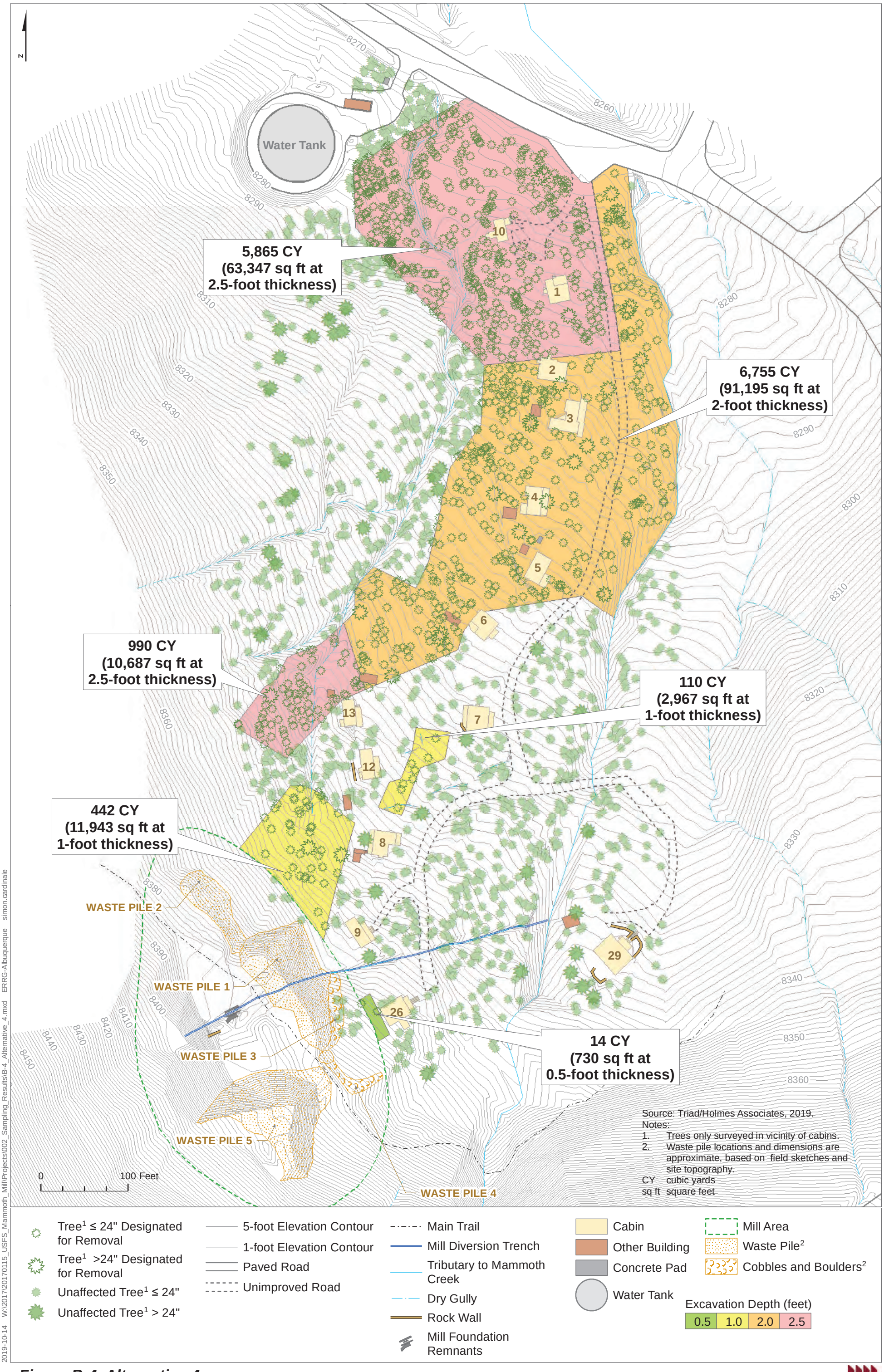

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Figure B-4. Alternative 4

Supplemental Characterization Report for the Cabins Area at Mammoth Mill
Inyo National Forest, Mono County, California

ERRG

Tables

Table B-1. Project Cleanup Levels

COC	Cleanup Level (mg/kg)
Arsenic	13.3
Mercury	31

Notes:

COC = chemical of concern

mg/kg = milligrams per kilogram

Source:

U.S. Department of Agriculture Forest Service, 2017. "Removal Action Memorandum, Time-Critical Removal Action, Mammoth Stamp Mill Site, Inyo National Forest." April 14.

Table B-2. Detailed Evaluation of Alternatives

Alternative	Effectiveness	Implementability	Cost
Alternative 1: Complete LUCs – ICs and Fencing	▪ Onsite contamination would not be removed nor would cleanup goals be met ▪ LUCs would be implemented (i.e., digging and access restrictions, including fencing, a gate, signage, and patrols) to minimize exposure of cabin occupants and recreational users ▪ Effectiveness is based on the ability of fencing and patrols to deter trespassing	▪ Commonly available site restriction materials; low Forest Service LOE ▪ Moderate administrative LOE for weekly site inspections and periodic maintenance ▪ Unlikely to be acceptable to cabin occupants and community members	▪ Estimated capital cost: $76,241 ▪ Total estimated cost, including O&M: $609,491 ▪ Potentially reduce cost by decreasing Forest Service LOE through reduced number or frequency of inspections
Alternative 2: Minor Grading and Onsite Encapsulation – with LUCs	▪ Onsite contamination would be buried beneath a 2-foot-thick clean cap, and cleanup goals would be met ▪ Integrity of the onsite repository cover would need to be maintained through long-term inspections and maintenance ▪ LUCs would be implemented (i.e., digging restrictions and signage) to minimize exposure of cabin occupants and recreational users	▪ Commonly available services and materials ▪ Potentially difficult to procure large volume of clean fill material ▪ High technical LOE for planning and design phase ▪ Moderate administrative LOE for implementing LUCs ▪ Very good probability of stakeholder acceptance; however, some cabin occupants and recreational users may not accept it because many site trees would be removed	▪ Estimated capital cost: $5,196,200 ▪ Total estimated cost, including O&M: $5,750,000 ▪ Potentially reduce cost by sourcing clean material on site rather than importing from offsite location ▪ Potentially reduce cost by limiting extent of tree removal

Table B-2. Detailed Analysis of Alternatives *(continued)*

Alternative	Effectiveness	Implementability	Cost
Alternative 3A: Hotspot Excavation and Onsite Repository with LUCs	▪ Onsite contamination would be removed from hotspot areas, but would remain in other areas of the site ▪ Cleanup goals would be met in the hotspot areas, but not within other areas of site ▪ LUCs would be implemented (i.e., digging and access restrictions, including fencing, a gate, signage, and patrols) to minimize exposure of cabin occupants and recreational users provided they limit the maximum number of days on site to 182 per year ▪ Integrity of the onsite repository cover must be maintained	▪ Commonly available services and materials ▪ Moderate LOE for planning and design of onsite repository ▪ Moderate administrative LOE for implementing LUCs ▪ Good probability of stakeholder acceptance; however, some cabin occupants and recreational users may not accept it because some contamination would remain in areas that were not excavated and beneath the repository cover and many site trees would be removed	▪ Estimated capital cost: $3,635,747 ▪ Total estimated cost, including O&M: $4,404,587 ▪ Potentially reduce cost by sourcing clean backfill on site rather than importing from offsite location
Alternative 3B: Hotspot Excavation and Offsite Disposal with LUCs	▪ Onsite contamination would be removed from the hotspot areas, but would remain in other areas of the site ▪ Cleanup goals would be met in the hotspot areas, but not within other areas of the site ▪ LUCs would be implemented (i.e., digging and access restrictions, including fencing, a gate, signage, and patrols) to minimize exposure of cabin occupants and recreational users provided they limit the maximum number of days on site to 182 per year	▪ Commonly available services and materials ▪ Moderate administrative LOE for implementing LUCs ▪ Depending on chemical concentrations in waste material, waste may need to be transported to a hazardous waste facility far from site, which may be a logistical challenge ▪ Good probability of stakeholder acceptance; however, some cabin occupants and recreational users may not accept it because some contamination would remain in areas that were not excavated and many site trees would be removed	▪ Estimated capital cost: $3,635,747 ▪ Total estimated cost, including O&M: $4,404,587 ▪ Location of the selected hazardous waste facility (i.e., if far from the site) could increase cost ▪ Costs could be reduced by sourcing clean backfill on site rather than importing from an offsite location

Table B-2. Detailed Analysis of Alternatives *(continued)*

Alternative	Effectiveness	Implementability	Cost
Alternative 4A: Complete Excavation and Onsite Repository with LUCs	▪ Would eliminate exposure of cabin occupants and recreational users within the Cabins Area, and cleanup goals would be met ▪ The integrity of the onsite repository cover must be maintained ▪ LUCs would be implemented (i.e., digging restrictions and signage) to minimize exposure of cabin occupants and recreational users	▪ Commonly available services and materials, but high technical LOE for intensive construction activities ▪ Moderate LOE for planning and design of onsite repository ▪ Potentially difficult to procure large volume of clean fill material ▪ Very good probability of stakeholder acceptance; however, some cabin occupants and recreational users may not accept it because some contamination would remain beneath the repository cover and most site trees would be removed	▪ Estimated capital cost: $8,422,678 ▪ Total estimated cost, including O&M: $9,236,878 ▪ Costs could be reduced by sourcing clean backfill on site rather than importing from offsite location and by reducing the number of trees removed
Alternative 4B: Complete Excavation and Offsite Disposal	▪ All contaminated material would be removed from the site and cleanup goals would be met ▪ Would eliminate exposure of cabin occupants and recreational users within the Cabins Area and throughout the site	▪ Commonly available services and materials, but high technical LOE (i.e., complex construction activities) ▪ Potentially difficult to procure large volume of clean fill material ▪ Depending on chemical concentrations in waste material, waste may need to be transported to a hazardous waste facility far from site, which may be a logistical challenge ▪ Very good probability of stakeholder acceptance (contaminants are completely removed, but most of site trees are also removed)	▪ Estimated capital cost: $8,778,987 ▪ Total estimated cost, including O&M: $8,786,587 ▪ Location of the selected hazardous waste facility (i.e., if far from the site) could increase cost ▪ Costs could be reduced by sourcing clean backfill on site rather than importing from an offsite location

Notes:

1 = Figure A-1 (presented in Appendix A) illustrates the hotspot areas selected for removal under Alternatives 3A and 3B.

Forest Service = U.S. Department of Agriculture Forest Service

LOE = level of effort

LUCs = land use controls

O&M = operation and maintenance

Table B-3. Comparative Analysis of Alternatives

Alternative	Effectiveness			Implementability				Estimated Total Cost, including O&M	Overall Rating by Alternative
	Overall Protection of Human Health and the Environment	Short-Term Effectiveness	Long-Term Effectiveness and Permanence	Technical Feasibility	Administrative Feasibility	Availability of Services and Materials	Acceptance		
Alternative 1, Complete LUCs – ICs and Fencing	Poor	Poor	Poor	Excellent	Very Good	Excellent	Not acceptable	$609,491	Poor
Alternative 2, Minor Grading and Onsite Encapsulation with LUCs	Poor	Poor	Very Good	Poor	Very Good	Very Good	Very Good	$5,750,000	Very Good
Alternative 3A, Hotspot Excavation and Onsite Repository with LUCs	Very Good	Poor	Poor	Poor	Poor	Very Good	Poor	$4,404,587	Poor
Alternative 3B, Hotspot Excavation and Offsite Disposal with LUCs	Very Good	Poor	Very Good	Poor	Very Good	Very Good	Poor	$3,346,576	Poor
Alternative 4A, Complete Excavation and Onsite Repository with LUCs	Very Good	Poor	Very Good	Poor	Poor	Poor	Very Good	$9,263,878	Very Good
Alternative 4B, Complete Excavation and Offsite Disposal	Excellent	Poor	Excellent	Poor	Very Good	Poor	Very Good	$8,786,587	Very Good

Notes:

ICs = institutional controls

LUCs = land use controls

O&M = operation and maintenance

Legend:

Not acceptable

Poor

Good

Very Good

Excellent

Appendix B1. Cost Estimate Tables

Table B1-1. Alternatives Cost Estimate Summary

Site: Cabins Area at Mammoth Mill
Location: Inyo National Forest, Mono County, California
Phase: Supplemental Characterization Report (-30% / +50%)

Remedial Alternative	Total Capital Cost	Total O&M Cost (30 Years)	Total Periodic Cost	Period of Analysis[2]	Total Cost[3]	Present Value Cost[4]	Range for -30% / +50%
1	$ 76,241	$ 506,250	$ 27,000	30 years	$ 609,491	$ 441,794	$ 309,256 to $ 662,692
2	$ 5,196,200	$ 364,800	$ 189,000	30 years	$ 5,750,000	$ 5,570,251	$ 3,899,175 to $ 8,355,376
3A	$ 3,635,747	$ 519,840	$ 249,000	30 years	$ 4,404,587	$ 4,154,496	$ 2,908,147 to $ 6,231,743
3B	$ 3,309,848	$ 9,728	$ 27,000	30 years	$ 3,346,576	$ 3,527,788	$ 2,469,452 to $ 5,291,682
4A	$ 8,422,678	$ 547,200	$ 294,000	30 years	$ 9,263,878	$ 8,989,045	$ 6,292,332 to $ 13,483,568
4B	$ 8,778,987	$ 7,600	$ -	30 years	$ 8,786,587	$ 8,786,394	$ 6,150,476 to $ 13,179,592

Notes:

(1) Appended tables summarize backup calculations for all cost estimates provided.

(2) Period of analysis assumes the base year is 2019.

(3) Total cost includes a 25-percent contingency factor to account for changes in scope, changes to bid quantities, and inflation.

(4) Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 revised November 2017) at https://www.whitehouse.gov/wp-content/uploads/2017/1 l/Appendix-C.pdf.

Table B1-2. Alternative 1 – Cost Summary

Site: Cabins Area at Mammoth Mill

Description: Alternative 1 – Complete LUCs – ICs and Fencing
Cost Summary for the Cabins Area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Implementation Plans and Setup	1	LS	$5,000	$5,000	Includes time for technical staff to complete pre-mobilization plans (including Work Plan and HASP with graphics, review, and production).
Mobilization and Demobilization	1	LS	$30,000	$30,000	Mobilization and demobilization of crew, materials, and heavy equipment. Craft trade crew of two (2) for 2 days. Includes costs for GSA lodging, GSA crew per diems, sanitary facilities, health and safety equipment and PPE, and other project necessities throughout the duration of site activities (6 days).
Site Work					
Fencing Installation	320	LF	$41.03	$13,100	RS Means Heavy Construction Cost Data 2019, 32 31 13.20 0500; 320 LF of 6-foot industrial chain link, galvanized steel fencing.
Locking Gate Installation	1	LS	$765	$765	RS Means Heavy Construction Cost Data 2019, 32 31 13.84 0110; one (1) 8-foot industrial gate, including hardware and concrete.
After Action Report	1	LS	$3,000	$3,000	Includes time for technical staff to write an after action report containing all relevant site data, documentation, and a summary of all site activities.
SUBTOTAL				**$51,865**	
Contingency	25%			$12,966	15% scope + 10% bid
SUBTOTAL				**$64,831**	
Project Management	10%			$5,186	Includes project management and technical oversight during all phases of construction, regulatory interface, and permitting.
Construction Management	12%			$6,224	Includes construction management, quality control, and quality control testing.
SUBTOTAL					
ICs	1	LS	$50,600	$50,600	Forest Plan amendment, legal description for ARIC, and legal fees. Includes reproduction.
	TOTAL CAPITAL CONSTRUCTION COSTS:			**$76,241**	
Inspections and Maintenance					
Weekly Inspections	35	WK	$ 300	$ 10,500	Weekly inspections to confirm effectiveness of LUCs for 8 months of year. Includes costs for one General Natural Resources Management and Biological Sciences employee (average salary at USFS averages to $40.25 hourly rate) to patrol grounds for 8 months (i.e., 35 weeks) of 1 year. Assumes 3 hours/week to inspect site, including travel from the Mammoth Ranger District Center.
Biannual Inspections	2	LS	$ 1,000	$ 2,000	Biannual inspections to evaluate the integrity of the fence.
Minor Repairs	1	LS	$ 1,000	$ 1,000	Annual minor repairs to fix any aspects of fencing that may have degraded.
SUBTOTAL				**$13,500**	
Contingency	25%			$ 3,375	10% scope + 15% bid
SUBTOTAL				**$16,875**	
		TOTAL ANNUAL O&M COSTS:		**$16,875**	per year
		TOTAL ANNUAL O&M COSTS:		**$506,250**	Years 1–30

Table B1-2. Alternative 1 – Cost Summary *(continued)*

Site: Cabins Area at Mammoth Mill

Description: Alternative 1 – Complete LUCs – ICs and Fencing
Cost Summary for the Cabins Area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
PERIODIC COSTS	**Year**					
Significant Repairs	5	1	LS	$2,000	$2,000	Costs for significant repairs to fencing and gate at end of Year 5.
SUBTOTAL (YEAR 5)					**$2,000**	
Major Repairs	10	1	LS	$7,000	$7,000	Costs for major repairs to fencing and gate at end of Year 10.
SUBTOTAL (YEAR 10)					**$7,000**	
Significant Repairs	15	1	LS	$2,000	$2,000	Costs for significant repairs to fencing and gate at end of Year 15.
SUBTOTAL (YEAR 15)					**$2,000**	
Major Repairs	20	1	LS	$7,000	$7,000	Costs for major repairs to fencing and gate at end of Year 20.
SUBTOTAL (YEAR 20)					**$7,000**	
Significant Repairs	25	1	LS	$2,000	$2,000	Costs for significant repairs to fencing and gate at end of Year 25.
SUBTOTAL (YEAR 25)					**$2,000**	
Major Repairs	30	1	LS	$7,000	$7,000	Costs for major repairs to fencing and gate at end of Year 30.
SUBTOTAL (YEAR 30)					**$7,000**	

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (2.6%)	PRESENT VALUE
Capital Cost	0	$ 76,241	$ 76,241	1.000	$ 76,241
Annual O&M Cost	1–30	$ 506,250	$16,875	0.688	$348,535
Periodic Cost	5	$2,000	$ 2,000	0.880	$ 1,759
Periodic Cost	10	$7,000	$ 7,000	0.774	$ 5,415
Periodic Cost	15	$2,000	$ 2,000	0.680	$ 1,361
Periodic Cost	20	$7,000	$ 7,000	0.598	$ 4,189
Periodic Cost	25	$2,000	$ 2,000	0.526	$ 1,053
Periodic Cost	30	$7,000	$ 7,000	0.463	$ 3,241
		$609,491			$441,794

TOTAL PRESENT VALUE OF SELECTED REMEDY **$441,794**

Table B1-2. Alternative 1 – Cost Summary *(continued)*

Site: Cabins Area at Mammoth Mill

Description: Alternative 1 – Complete LUCs – ICs and Fencing
Cost Summary for the Cabins Area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

Notes:

1. Source: RS Means Heavy Construction Cost Data Year 2019 Quarter 1.
2. Source: Hourly rate for USFS technician based on average salary found online: <https://www.federalpay.org/employees/occupations/forestry-technician>.
3. Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (revised November 2017).

ARIC = area requiring institutional controls

GSA = U.S. General Services Administration

HASP = Health and Safety Plan

ICs = institutional controls

LF = linear feet

LS = lump sum

LUCs = land use controls

O&M = operation and maintenance

PPE = personal protective equipment

QTY = quantity

USFS = U.S. Forest Service

WK = weekly

Table B1-3. Alternative 1 – Cash Flow Analysis

Year	Periodic Cost	Annual Cost	Discount Factor	Actual Periodic Cost	Actual Annual Cost
1		$16,875	0.974658869		$16,447
2		$16,875	0.949959912		$16,031
3		$16,875	0.925886854		$15,624
4		$16,875	0.902423834		$15,228
5	$2,000	$16,875	0.879555394	$1,759	$14,842
6		$16,875	0.857266465		$14,466
7		$16,875	0.835542364		$14,100
8		$16,875	0.814368776		$13,742
9		$16,875	0.79373175		$13,394
10	$7,000	$16,875	0.77361769	$5,415	$13,055
11		$16,875	0.754013343		$12,724
12		$16,875	0.734905793		$12,402
13		$16,875	0.716282449		$12,087
14		$16,875	0.698131042		$11,781
15	$2,000	$16,875	0.680439612	$1,361	$11,482
16		$16,875	0.663196503		$11,191
17		$16,875	0.646390354		$10,908
18		$16,875	0.630010091		$10,631
19		$16,875	0.614044923		$10,362
20	$7,000	$16,875	0.598484331	$4,189	$10,099
21		$16,875	0.583318061		$9,843
22		$16,875	0.568536122		$9,594
23		$16,875	0.554128774		$9,351
24		$16,875	0.540086524		$9,114
25	$2,000	$16,875	0.526400121	$1,053	$8,883
26		$16,875	0.513060547		$8,658
27		$16,875	0.500059013		$8,438
28		$16,875	0.487386952		$8,225
29		$16,875	0.475036016		$8,016
30	$7,000	$16,875	0.462998066	$3,241	$7,813

Table B1-4. Alternative 2 – Cost Summary

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 2 – Minor Grading and Onsite Encapsulation with LUCs
Cost Summary for the Expanded Cabins Area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Implementation Plans and Setup	1	LS	$24,000	$24,000	Includes time for technical staff to complete pre-mobilization plans (including Work Plan and HASP with graphics, review, and production). Also includes cost for a private utility locator to clear the site prior to earthwork.
Design	1	LS	$99,000	$99,000	Includes time for technical staff to complete the design for grading around cabins and placement of cover material.
Architectural Design	9	CABIN	$6,000	$54,000	Includes time for technical staff to complete an architectural design for the interface of cover material with each affected cabin. Includes an assessment of each cabin's footing, outbuildings, and other structural elements that may be affected by placement of a 2-foot-thick cap.
Mobilization and Demobilization	1	LS	$350,000	$350,000	Mobilization and demobilization of crew, materials, and heavy equipment. Craft trade crew of four (4) for 2 days. Includes costs for GSA lodging, GSA crew per diems, sanitary facilities, health and safety equipment and PPE, and other project necessities throughout the duration of site activities (98 days).
Site Work					
Cabin Footing Preparation	1	LS	$115,000	$115,000	Includes site work to prepare each cabin for placement of 2-foot-thick cap (preparations per final design may include construction of foundation headers, shoring, sloping, etc.).
Tree Clearing	1	LS	$35,000	$35,000	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 1650. Includes clearing of 935 small trees (12-inch to 24-inch-diameter) using a 300 HP bulldozer.
Stump Removal	1	LS	$148,000	$148,000	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 2100. Includes stump removal of 935 small trees (12-inch to 24-inch diameter) using a 1-1/2 CY excavator.
Dry Well Installation (Large Trees)	26	TREE	$1,600	$41,600	Includes installation of dry wells to protect roots of large trees (i.e., trunks greater than 24 inches in diameter) from hazards associated with increasing surrounding grade by 2 feet above ground surface.
Grading of Contaminated Material Around Cabins	350	BCY	$7.19	$2,500	RS Means Heavy Construction Cost Data 2019, 31 23 16.46 5020. This assumes a 300 HP dozer, 50-foot haul of common earth. Price multiplied by 4 for tracking to disparate locations of cabins and detail work required around cabins.
Clean Cover Material	21,302	TONS	$57.76	$1,230,000	Assumes purchase of 21,302 tons of clean cover material (13,313.9 BCY x 1.6 conversion factor) from Carson City, NV.
Import Clean Cover Material to Site	16,642	LCY	$62.16	$1,034,000	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 9104. Assumes 18-CY 8-wheel truck, 15-minute wait/load/unload time, 45-MPH, 256-mile roundtrip to import clean cover material from Carson City, NV. Duration not included in overall schedule of onsite activities (can occur concurrently with site work).
Demarcation Fabric	1	LS	$43,300	$43,300	Includes cost of 40 rolls of demarcation fabric, plus installation, to cover entire extent of 2-foot-thick cap prior to encapsulation.
Load Haul Trucks with Clean Cover Material for Encapsulation	16,642	BCY	$1.89	$31,500	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. Assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Loading performed simultaneously with hauling.
Haul Cover Material to Cabins Area for Encapsulation	16,642	LCY	$3.91	$65,100	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Encapsulate Contaminated Area	16,642	LCY	$1.05	$17,500	RS Means Heavy Construction Cost Data 2019, 31 23 23.14 4020. Backfill, structural, 200 HP dozer, 50-foot haul, common earth from existing stockpile. Placement of cover material to occur simultaneously with cover hauling.
Compaction of Encapsulated Area	13,314	ECY	$0.29	$3,900	RS Means Heavy Construction Cost Data 2019, 31 23 23.23 5060. Perform vibrating compaction on backfill in 12-inch lifts, two (2) passes with riding vibrating compaction roller.
Final Grading of Cabins Area	19,971	SY	$0.20	$4,000	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300). Grader to perform final grading on gentle slopes.

Table B1-4. Alternative 2 – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 2 – Minor Grading and Onsite Encapsulation with LUCs
Cost Summary for the Expanded Cabins Area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:					
DESCRIPTION	**QTY**	**UNIT**	**UNIT COST**	**TOTAL**	**SOURCE/NOTES**
Hydroseeding of Disturbed and Graded Areas	19,971	SY	$0.55	$11,000	RS Means Heavy Construction Cost Data 2019, 32 92 19.13 0100. Mechanical seeding, assuming 44 lbs/MSY, of disturbed area (19,971 SY).
Silt Fence for Stream Protection	530	LF	$10.00	$5,300	As-installed cost of silt fence along the length of the creek to control erosion.
Dust Suppression	5	MO	$30,000	$150,000	One 2,000-gallon water truck spraying water for dust suppression during all phases of work. Includes operator costs.
After Action Report	1	LS	$18,000	$18,000	Includes time for technical staff to write an after action report, including graphics, review, and production.
SUBTOTAL				**$3,483,000**	
Contingency	25%			$871,000	15% scope + 10% bid
SUBTOTAL				**$4,354,000**	
Project Management	10%			$348,300	Includes project management and technical oversight during all phases of construction, regulatory interface, and permitting.
Construction Management	12%			$418,000	Includes construction management, quality control, and quality control testing.
SUBTOTAL					
Institutional Controls	1	LS	$75,900	$75,900	Forest Plan amendment, legal description for ARIC and implementing digging restrictions, and legal fees. Includes reproduction.
	TOTAL CAPITAL CONSTRUCTION COSTS:			**$5,196,200**	
Inspections and Maintenance					
Biannual Inspections	2	LS	$ 1,000	$ 2,000	Biannual inspections to evaluate the integrity of all cover elements and BMPs.
Minor Repairs	1	LS	$ 6,000	$ 6,000	Annual minor repairs to fix any aspects of the cover or site restoration BMPs that may have degraded.
SUBTOTAL				**$8,000**	
Contingency	25%			$ 2,000	10% scope + 15% bid
SUBTOTAL				**$10,000**	
Project Management	10%			$800	
Contractor Overhead	7%			$560	
Profit	10%			$800	
		TOTAL ANNUAL O&M COSTS:		**$12,160**	per year
		TOTAL ANNUAL O&M COSTS:		**$364,800**	Years 1–30
PERIODIC COSTS	**Year**				
Five-Year Review Report	5	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 5.
Significant Repairs	5	1	LS	$10,000	$10,000	Costs for significant repairs to cover material and/or site restoration BMPs.
SUBTOTAL (YEAR 5)					**$29,000**	
Five-Year Review Report	10	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 10.
Major Repairs	10	1	LS	$15,000	$15,000	Costs for major repairs to cover material and/or site restoration BMPs.
SUBTOTAL (YEAR 10)					**$34,000**	

Table B1-4. Alternative 2 – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 2 – Minor Grading and Onsite Encapsulation with LUCs
Cost Summary for the Expanded Cabins Area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Five-Year Review Report	15	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 15.
Significant Repairs	15	1	LS	$10,000	$10,000	Costs for significant repairs to cover material and/or site restoration BMPs.
SUBTOTAL (YEAR 15)					**$29,000**	
Five-Year Review Report	20	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 20.
Major Repairs	20	1	LS	$15,000	$15,000	Costs for major repairs to cover material and/or site restoration BMPs.
SUBTOTAL (YEAR 20)					**$34,000**	
Five-Year Review Report	15	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 25.
Significant Repairs	15	1	LS	$10,000	$10,000	Costs for significant repairs to cover material and/or site restoration BMPs.
SUBTOTAL (YEAR 25)					**$29,000**	
Five-Year Review Report	20	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 30.
Major Repairs	20	1	LS	$15,000	$15,000	Costs for major repairs to cover material and/or site restoration BMPs.
SUBTOTAL (YEAR 30)					**$34,000**	

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (2.6%)	PRESENT VALUE
Capital Cost	0	$ 5,196,200	$ 5,196,200	1.000	$ 5,196,200
Annual O&M Cost	1-30	$ 364,800	$12,160	0.688	$251,152
Periodic Cost	5	$29,000.00	$ 29,000	0.880	$ 25,507
Periodic Cost	10	$34,000.00	$ 34,000	0.774	$ 26,303
Periodic Cost	15	$29,000.00	$ 29,000	0.680	$ 19,733
Periodic Cost	20	$34,000.00	$ 34,000	0.598	$ 20,348
Periodic Cost	25	$29,000.00	$ 29,000	0.526	$ 15,266
Periodic Cost	30	$34,000.00	$ 34,000	0.463	$ 15,742
		$5,750,000			$5,570,251
TOTAL PRESENT VALUE OF SELECTED REMEDY				**$5,570,251**	

Table B1-4. Alternative 2 – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Location: Inyo National Forest, Mono County, California

Description: Alternative 2 – Minor Grading and Onsite Encapsulation with LUCs
Cost Summary for the Expanded Cabins Area at the Mammoth Mill Site

Notes:

1. Source: 500 trees per acre estimate from Coder, 2017 based on estimate of 10-foot by 10-foot average spacing between trees: Coder, Kim D. 2017. Number of trees per acre by spacing distance. Warnell School of Forestry & Natural Resources, University of Georgia, Outreach Publication WSFNR-17-WMJ. P.p. 7.
2. Source: RS Means Heavy Construction Cost Data Year 2019 Quarter 1.
3. Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (revised November 2017).

ARIC = area requiring institutional controls
BCY= bank cubic yard
BMPs = best management practices
CY = cubic yard
ECY = embanked cubic yards
GSA = U.S. General Services Administration
HASP = Health and Safety Plan
HP = horsepower
LCY = loose cubic yards
LS = lump sum
LUCs = land use controls
MO = month
MPH = miles per hour
MSY = thousand square yards
mtd. = mounted
O&M = operation and maintenance
PPE = personal protective equipment
QTY = quantity
SY = square yard

Table B1-5. Alternative 2 – Cash Flow Analysis

Year	Periodic Cost	Annual Cost	Discount Factor	Actual Periodic Cost	Actual Annual Cost
1		$12,160	0.974658869		$11,852
2		$12,160	0.949959912		$11,552
3		$12,160	0.925886854		$11,259
4		$12,160	0.902423834		$10,973
5	$29,000	$12,160	0.879555394	$25,507.11	$10,695
6		$12,160	0.857266465		$10,424
7		$12,160	0.835542364		$10,160
8		$12,160	0.814368776		$9,903
9		$12,160	0.79373175		$9,652
10	$34,000	$12,160	0.77361769	$26,303.00	$9,407
11		$12,160	0.754013343		$9,169
12		$12,160	0.734905793		$8,936
13		$12,160	0.716282449		$8,710
14		$12,160	0.698131042		$8,489
15	$29,000	$12,160	0.680439612	$19,732.75	$8,274
16		$12,160	0.663196503		$8,064
17		$12,160	0.646390354		$7,860
18		$12,160	0.630010091		$7,661
19		$12,160	0.614044923		$7,467
20	$34,000	$12,160	0.598484331	$20,348.47	$7,278
21		$12,160	0.583318061		$7,093
22		$12,160	0.568536122		$6,913
23		$12,160	0.554128774		$6,738
24		$12,160	0.540086524		$6,567
25	$29,000	$12,160	0.526400121	$15,265.60	$6,401
26		$12,160	0.513060547		$6,239
27		$12,160	0.500059013		$6,081
28		$12,160	0.487386952		$5,927
29		$12,160	0.475036016		$5,776
30	$34,000	$12,160	0.462998066	$15,741.93	$5,630

Table B1-6. Alternative 3A – Cost Summary

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3A – Hotspot Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Implementation Plans and Setup	1	LS	$24,000	$24,000	Includes time for technical staff to complete pre-mobilization plans (including Work Plan and HASP with graphics, review, and production). Also includes cost for a private utility locator to clear the site prior to excavation.
Design	1	LS	$68,000	$68,000	Includes time for technical staff to complete the design for the excavation, repository, cover material, and all other site element specifications.
Hotspot Delineation Sampling	1	LS	$17,800	$17,800	Includes time and materials costs for technical staff to collect field samples to fully delineate the extent of each hot spot. Assumes technical staff crew of two (2) for 3 days. Assumes one (1) sample per 50-foot by 50-foot area for laboratory analysis of As and Hg (total 44 samples).
Mobilization and Demobilization	1	LS	$347,000	$347,000	Mobilization and demobilization of crew, materials, and heavy equipment. Craft trade crew of five (5) for 4 days. Includes costs for GSA lodging, GSA crew per diems, sanitary facilities, health and safety equipment and PPE, and other project necessities throughout the duration of site activities (98 days).
Site Work					
Tree Clearing	1	LS	$23,600	$23,600	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 1650 (12-inch to 24-inch diameter); 31 13 13.20 1750 (24-inch to 36-inch diameter). Includes clearing of an estimated 621 small (12-inch to 24-inch diameter) and 9 large (24-inch to 36-inch diameter) trees (of which 263 small and 5 large trees are located within the repository area) using a 300-HP bulldozer.
Stump Removal	1	LS	$100,500	$100,500	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 2100 (14-inch to 24-inch diameter); 31 13 13.20 2150 (24-inch to 36-inch diameter). Includes stump removal of an estimated 621 small (12-inch to 24-inch diameter) and 9 large (24-inch to 36-inch diameter) trees (of which 263 small and 5 large trees are located within the repository area) using a 1-1/2-CY excavator.
Grade Pad for Repository Footprint	1	LS	$2,500	$2,500	RS Means Heavy Construction Cost Data 2019, 31 22 13.20 0260. Rough grade 45,100- to 50,000-SF area (repository area approximately 46,225 SF) to create level pad for repository footprint.
Excavation and Loading of Contaminated Material	4,862	BCY	$2.27	$11,000	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Price inflated an additional 20% for difficult excavation. Loading trucks performed simultaneously with hauling.
Haul Waste to Repository	6,078	LCY	$3.91	$23,800	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Confirmation Sampling	1	LS	$6,500	$6,500	Assumes sampling with handheld XRF analyzer for duration of excavation activities and collection of approximately 20 composite confirmation samples for laboratory analysis of As and Hg.
Grade Repository Waste	1	LS	$5,000	$5,000	RS Means Heavy Construction Cost Data 2019, 31 22 13.20 0260. Rough grade 45,100- to 50,000-SF area (repository area approximately 46,225 SF). Price inflated by a factor of 2 to account for need to meet repository design specifications.
Clean Cover Material	13,258	TONS	$57.76	$765,800	Assumes purchase of 15,202 tons of clean cover/backfill material from Carson City, NV; assumes 9,501.5 BCY (includes 3,424 BCY for repository and 6,078 BCY for backfilling Cabins Area) *1.6 BCY-to-ton conversion factor.
Import Clean Cover and Backfill Material to Site	10,358	LCY	$62.16	$644,000	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 9104. Assumes 18-CY 8-wheel truck, 15-minute wait/load/unload time, 45-MPH, 256-mile roundtrip to import 10,358 LCY of clean cover material from Carson City, NV (includes 4,280 LCY for repository and 6,078 LCY for backfilling Cabins Area). Duration not included in overall schedule of onsite activities (can occur concurrently with site work).
Excavate Repository Key Trench	386	BCY	$9.89	$4,000	RSMeans Heavy Construction Cost Data 2019, 31 23 16.13 0050. Assumes 3/8 CY excavator, 1'-4' deep trench to excavate approximately 386 BCY to create 24"x24" trench to secure liner on repository waste.
Line Repository	1	LS	$105,000	$105,000	Includes installation of HDPE liner (RS Means Heavy Construction Cost Data 2019, 31 05 19.53 1200) and installation of geotextile subsurface drainage filter (RS Means Heavy Construction Cost Data 2019, 33 41 23 19 0110).

Table B1-6. Alternative 3A – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3A – Hotspot Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Backfill Repository Key Trench	482	LCY	$9.89	$5,000	RSMeans Heavy Construction Cost Data 2019, 31 23 16.13 0050. Assumes 3/8 CY excavator, 1'-4' deep trench to backfill repository key trench once liner has been installed (approximately 482 LCY [386 BCY plus 1.25x fluff factor]).
Load Haul Trucks with Clean Cover Material for Repository	4,280	LCY	$1.89	$8,100	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Loading trucks performed simultaneously with hauling.
Haul Clean Cover Material to Repository	4,280	LCY	$3.91	$16,700	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Repository Encapsulation and Grading	5,725	SY	$0.20	$1,100	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300. Grader to perform final grading on gentle slopes.
Load Haul Trucks with Backfill Material for Excavated Hotspots	6,078	LCY	$1.89	$11,500	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention.
Haul Backfill Material to Cabins Area for Hotspot Backfill	6,078	LCY	$3.91	$23,800	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Backfill Excavated Areas	6,078	LCY	$1.05	$6,400	RS Means Heavy Construction Cost Data 2019, 31 23 23.14 4020. Backfill, structural, 200-HP dozer, 50-foot haul, common earth from existing stockpile.
Compaction of Backfill	4,862	ECY	$0.29	$1,400	RS Means Heavy Construction Cost Data 2019, 31 23 23.23 5060. Perform vibrating compaction on backfill in 12-inch lifts, two (2) passes with riding vibrating compaction roller.
Final Grading of Cabins Area	6,033	SY	$0.20	$1,200	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300. Grader to perform final grading on gentle slopes.
Erosion Control Fabric	5,725	SY	$1.68	$9,600	RS Means Heavy Construction Cost Data 2019, 31 25 14.16 0020 for Erosion Control Fabric on entire covered repository (51,529 SF; 5,725.44 SY).
Hydroseeding of Disturbed and Graded Areas	11,758	SY	$0.55	$6,500	RS Means Heavy Construction Cost Data 2019, 32 92 19.13 0100. Mechanical seeding, assuming 44 lbs/MSY, of entire disturbed area, including backfilled cabins area (6,033 SY) and repository (5,725 SY).
Fencing Installation	320	LF	$41.03	$13,100	RS Means Heavy Construction Cost Data 2019, 32 31 13.20 0200; 320 LF of 6-foot industrial chain link, galvanized steel fencing.
Locking Gate Installation	1	LS	$765	$765	RS Means Heavy Construction Cost Data 2019, 32 31 13.84 0110; one (1) 8-foot industrial gate, including hardware and concrete.
Dust Suppression	5	MO	$30,000.00	$150,000	One 2,000-gallon water truck spraying water for dust suppression during all phases of work. Includes operator costs.
After Action Report	1	LS	$18,000	$18,000	Includes time for technical staff to write an after action report, including graphics, review, and production.
SUBTOTAL				**$2,421,665**	
Contingency	25%			$605,416	15% scope + 10% bid
SUBTOTAL				**$3,027,081**	
Project Management	10%			$242,166	Includes project management and technical oversight during all phases of construction, regulatory interface, and permitting.
Construction Management	12%			$290,600	Includes construction management, quality control, and quality control testing.
SUBTOTAL					
Institutional Controls	1	LS	$75,900	$75,900	Forest Plan amendment, legal description for ARIC, and legal fees. Includes reproduction.
	TOTAL CAPITAL CONSTRUCTION COSTS:			**$3,635,747**	

Table B1-6. Alternative 3A – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3A – Hotspot Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Inspections and Maintenance					
Weekly Inspections	8	WK	$ 300	$ 2,400	Weekly inspections to confirm effectiveness of LUCs for 2 months of year during the period when site is accessible and site users are restricted. Includes costs for one General Natural Resources Management and Biological Sciences employee (average salary at USFS averages to $40.25 hourly rate) to patrol grounds for 2 months (i.e., 8 weeks) of 1 year. Assumes 3 hours/week to inspect site, including travel from the Mammoth Ranger District Center.
Biannual Inspections	2	LS	$ 1,000	$ 2,000	Biannual inspections to evaluate the integrity of the repository components and site restoration BMPs.
Minor Repairs	1	LS	$ 7,000	$ 7,000	Annual minor repairs to fix any aspects of the repository and/or site restoration BMPs that may have degraded.
SUBTOTAL				**$11,400**	
Contingency	25%			$ 2,850	10% scope + 15% bid
SUBTOTAL				**$14,250**	
Project Management	10%			$1,140	
Contractor Overhead	7%			$798	
Profit	10%			$1,140	
		TOTAL ANNUAL O&M COSTS:		**$17,328**	per year
		TOTAL ANNUAL O&M COSTS:		**$519,840**	Years 1–30

PERIODIC COSTS	Year	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Five-Year Review Report	5	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 5.
Significant Repairs	5	1	LS	$15,000	$15,000	Costs for significant repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 5)					**$34,000**	
Five-Year Review Report	10	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 10.
Major Repairs	10	1	LS	$30,000	$30,000	Costs for major repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 10)					**$49,000**	
Five-Year Review Report	15	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 15.
Significant Repairs	15	1	LS	$15,000	$15,000	Costs for significant repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 15)					**$34,000**	
Five-Year Review Report	20	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 20.
Major Repairs	20	1	LS	$30,000	$30,000	Costs for major repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 20)					**$49,000**	
Five-Year Review Report	15	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 25.
Significant Repairs	15	1	LS	$15,000	$15,000	Costs for significant repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 25)					**$34,000**	
Five-Year Review Report	20	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 30.
Major Repairs	20	1	LS	$30,000	$30,000	Costs for major repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 30)					**$49,000**	

Table B1-6. Alternative 3A – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3A – Hotspot Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (2.6%)	PRESENT VALUE
Capital Cost	0	$ 3,635,747	$ 3,635,747	1.000	$3,635,747
Annual O&M Cost	1-30	$ 519,840	$17,328	0.688	$357,891
Periodic Cost	5	$34,000	$ 34,000	0.880	$ 29,905
Periodic Cost	10	$49,000	$ 49,000	0.774	$ 37,907
Periodic Cost	15	$34,000	$ 34,000	0.680	$ 23,135
Periodic Cost	20	$49,000	$ 49,000	0.598	$ 29,326
Periodic Cost	25	$34,000	$ 34,000	0.526	$ 17,898
Periodic Cost	30	$49,000	$ 49,000	0.463	$ 22,687
		$4,404,587			$4,154,496

TOTAL PRESENT VALUE OF SELECTED REMEDY **$4,154,496**

Notes:

1. Source: RS Means Heavy Construction Cost Data Year 2019 Quarter 1.
2. Some marginal costs from RS Means were increased by $0.50 due to the potential for difficulties posed by unforeseen circumstances.
3. Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (revised November 2017).

ARIC = area requiring institutional controls
As = arsenic
BCY= bank cubic yard
BMPs = best management practices
CY = cubic yard
ECY = embanked cubic yards
GSA = U.S. General Services Administration
HASP = Health and Safety Plan
HDPE = high-density polyethylene
Hg = mercury
HP = horsepower
LCY = loose cubic yards
LF = linear feet
LS = lump sum
LUCs = land use controls
MO = month
MSY = thousand square yards
mtd. = mounted
O&M = operation and maintenance
PPE = personal protective equipment
QTY = quantity
SF = square feet
SY = square yard
USFS = U.S. Forest Service
WK = week
XRF = x-ray fluorescence

Table B1-7. Alternative 3A – Cash Flow Analysis

Year	Periodic Cost	Annual Cost	Discount Factor	Actual Periodic Cost	Actual Annual Cost
1		$17,328	0.974658869		$16,888.89
2		$17,328	0.949959912		$16,460.91
3		$17,328	0.925886854		$16,043.77
4		$17,328	0.902423834		$15,637.20
5	$34,000	$17,328	0.879555394	$29,904.88	$15,240.94
6		$17,328	0.857266465		$14,854.71
7		$17,328	0.835542364		$14,478.28
8		$17,328	0.814368776		$14,111.38
9		$17,328	0.79373175		$13,753.78
10	$49,000	$17,328	0.77361769	$37,907.27	$13,405.25
11		$17,328	0.754013343		$13,065.54
12		$17,328	0.734905793		$12,734.45
13		$17,328	0.716282449		$12,411.74
14		$17,328	0.698131042		$12,097.21
15	$34,000	$17,328	0.680439612	$23,134.95	$11,790.66
16		$17,328	0.663196503		$11,491.87
17		$17,328	0.646390354		$11,200.65
18		$17,328	0.630010091		$10,916.81
19		$17,328	0.614044923		$10,640.17
20	$49,000	$17,328	0.598484331	$29,325.73	$10,370.54
21		$17,328	0.583318061		$10,107.74
22		$17,328	0.568536122		$9,851.59
23		$17,328	0.554128774		$9,601.94
24		$17,328	0.540086524		$9,358.62
25	$34,000	$17,328	0.526400121	$17,897.60	$9,121.46
26		$17,328	0.513060547		$8,890.31
27		$17,328	0.500059013		$8,665.02
28		$17,328	0.487386952		$8,445.44
29		$17,328	0.475036016		$8,231.42
30	$49,000	$17,328	0.462998066	$22,686.91	$8,022.83

Table B1-8. Alternative 3B – Cost Summary

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3B – Hotspot Excavation and Offsite Disposal with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Implementation Plans and Setup	1	LS	$24,000	$24,000	Includes time for technical staff to complete pre-mobilization plans (including Work Plan and HASP with graphics, review, and production). Also includes cost for a private utility locator to clear the site prior to
Design	1	LS	$27,000	$27,000	Includes time for technical staff to complete the design of the excavation, cover material, and all other site element specifications.
Hotspot Delineation Sampling	1	LS	$17,800	$17,800	Includes time and materials costs for technical staff to collect field samples to fully delineate the extent of each hot spot. Assumes technical staff crew of two (2) for 3 days. Assumes one (1) sample per 50-foot by 50-foot area for laboratory analysis of As and Hg (total 44 samples).
Mobilization and Demobilization	1	LS	$238,000	$238,000	Mobilization and demobilization of crew, materials, and heavy equipment. Craft trade crew of five (5) for 4 days. Includes costs for GSA lodging, GSA crew per diems, sanitary facilities, health and safety equipment and PPE, and other project necessities throughout the duration of site activities (66 days).
Site Work					
Tree Clearing	1	LS	$13,600	$13,600	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 1650 (12-inch to 24-inch diameter); 31 13 13.20 1750 (24-inch to 36-inch diameter). Includes clearing of an estimated 358 small (12-inch to 24-inch diameter) and 4 large (24-inch to 36-inch diameter) trees with 300-HP bulldozer.
Stump Removal	1	LS	$57,700	$57,700	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 2100 (14-inch to 24-inch diameter); 31 13 13.20 2150 (24-inch to 36-inch diameter). Includes stump removal of an estimated 358 small (12-inch to 24-inch diameter) and 4 large (24-inch to 36-inch diameter) trees with a 1-1/2-CY excavator.
Excavation and Loading of Contaminated Material	4,862	BCY	$2.27	$11,000	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Price inflated an additional 20% for difficult excavation. Loading trucks performed simultaneously with hauling.
Offsite Disposal	7,779	TONS	$100.00	$777,900	Cost to dispose of waste at an offsite disposal facility located approximately 200 miles away from site (Beatty, NV). Tonnage estimate assumes 1.6 tons per BCY of waste.
Confirmation Sampling	1	LS	$6,500	$6,500	Assumes sampling with a handheld XRF analyzer for duration of excavation activities and collection of approximately 20 composite confirmation samples for laboratory analysis of As and Hg.
Clean Cover Material	7,779	TONS	$57.76	$449,000	Assumes purchase of 7,779 tons (4,862 BCY*1.6 conversion factor) of backfill material from Carson City, NV.
Import Backfill Material to Site	6,078	LCY	$62.16	$378,000	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 9104. Assumes 18-CY 8-wheel truck, 15-minute wait/load/unload time, 45-MPH, 256-mile roundtrip to import 6,078 LCY of clean cover material from Carson City, NV to backfill Cabins Area. Duration not included in overall schedule of onsite activities (can occur concurrently with site work).
Load Haul Trucks with Backfill Material for Excavated Hot Spots	6,078	LCY	$1.89	$11,500	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention.
Haul Backfill Material to Cabins Area to Backfill Hot Spots	6,078	LCY	$3.91	$23,800	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Backfill Excavated Areas	6,078	LCY	$1.05	$6,400	RS Means Heavy Construction Cost Data 2019, 31 23 23.14 4020. Backfill, structural, 200-HP dozer, 50-foot haul, common earth from existing stockpile.
Compaction of Backfill	4,862	ECY	$0.29	$1,400	RS Means Heavy Construction Cost Data 2019, 31 23 23.23 5060. Perform vibrating compaction on backfill in 12-inch lifts, two (2) passes with riding vibrating compaction roller.
Final Grading of Cabins Area	6,033	SY	$0.20	$1,200	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300). Grader to perform final grading on gentle slopes.
Hydroseeding of Disturbed and Graded Areas	6,033	SY	$0.55	$3,300	RS Means Heavy Construction Cost Data 2019, 32 92 19.13 0100. Mechanical seeding, assuming 44 lbs/MSY, of entire disturbed area.

Table B1-8. Alternative 3B – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3B – Hotspot Excavation and Offsite Disposal with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Fencing Installation	320	LF	$41.03	$13,100	RS Means Heavy Construction Cost Data 2019, 32 31 13.20 0200; 320 LF of 6-foot industrial chain link, galvanized steel fencing.
Locking Gate Installation	1	LS	$765	$765	RS Means Heavy Construction Cost Data 2019, 32 31 13.84 0110; one (1) 8-foot industrial gate, including hardware and concrete.
Dust Suppression	4	MO	$30,000.00	$120,000	One 2,000-gallon water truck spraying water for dust suppression during all phases of work. Includes operator costs.
After Action Report	1	LS	$18,000	$18,000.00	Includes time for technical staff to write an after action report, including graphics, review, and production.
SUBTOTAL				**$2,199,965**	
Contingency	25%			$549,991	15% scope + 10% bid
SUBTOTAL				**$2,749,956**	
Project Management	10%			$219,996.47	Includes project management and technical oversight during all phases of construction, regulatory interface,
Construction Management	12%			$263,995.76	Includes construction management, quality control, and quality control testing.
SUBTOTAL					
Institutional Controls	1	LS	$75,900	$75,900	Forest Plan amendment, legal description for ARIC, and legal fees. Includes reproduction.
	TOTAL CAPITAL CONSTRUCTION COSTS:			**$3,309,848**	
Inspections and Maintenance					
Weekly Inspections	8	WK	$ 300	$ 2,400	Weekly inspections to confirm effectiveness of LUCs for 2 months of year during the period when site is accessible and site users are restricted. Includes costs for one General Natural Resources Management and Biological Sciences employee (average salary at USFS averages to $40.25 hourly rate) to patrol grounds for 2 months (i.e., 8 weeks) of 1 year. Assumes 3 hours/week to inspect site, including travel from the Mammoth Ranger District Center.
Biannual Inspections	2	LS	$ 1,000	$ 2,000	Biannual inspections to evaluate the integrity of site restoration BMPs.
Minor Repairs	1	LS	$ 2,000	$ 2,000	Annual minor repairs to fix any aspects of site restoration BMPs that may have degraded.
SUBTOTAL				**$6,400**	
Contingency	25%			$ 1,600	10% scope + 15% bid
SUBTOTAL				**$8,000**	
Project Management	10%			$640	
Contractor Overhead	7%			$448	
Profit	10%			$640	
		TOTAL ANNUAL O&M COSTS:		**$9,728**	per year
		TOTAL ANNUAL O&M COSTS:		**$291,840**	Years 1–30

Table B1-8. Alternative 3B – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 3B – Hotspot Excavation and Offsite Disposal with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION		QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
PERIODIC COSTS	**Year**					
Significant Repairs	5	1	LS	$2,000	$2,000	Costs for significant repairs to fencing, gate, and/or signage at end of Year 5.
SUBTOTAL (YEAR 5)					**$2,000**	
Major Repairs	10	1	LS	$7,000	$7,000	Costs for major repairs to fencing, gate, and/or signage at end of Year 10.
SUBTOTAL (YEAR 10)					**$7,000**	
Significant Repairs	15	1	LS	$2,000	$2,000	Costs for significant repairs to fencing, gate, and/or signage at end of Year 15.
SUBTOTAL (YEAR 15)					**$2,000**	
Major Repairs	20	1	LS	$7,000	$7,000	Costs for major repairs to fencing, gate, and/or signage at end of Year 20.
SUBTOTAL (YEAR 20)					**$7,000**	
Significant Repairs	25	1	LS	$2,000	$2,000	Costs for significant repairs to fencing, gate, and/or signage at end of Year 25.
SUBTOTAL (YEAR 25)					**$2,000**	
Major Repairs	30	1	LS	$7,000	$7,000	Costs for major repairs to fencing, gate, and/or signage at end of Year 30.
SUBTOTAL (YEAR 30)					**$7,000**	

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	COST	PER YEAR	FACTOR (2.6%)	VALUE
Capital Cost	0	$ 3,309,848	$ 3,309,848	1.000	$ 3,309,848
Annual O&M Cost	1-30	$ 291,840	$9,728	0.688	$ 200,921
Periodic Cost	5	$2,000	$ 2,000	0.880	$ 1,759
Periodic Cost	10	$7,000	$ 7,000	0.774	$ 5,415
Periodic Cost	15	$2,000	$ 2,000	0.680	$ 1,361
Periodic Cost	20	$7,000	$ 7,000	0.598	$ 4,189
Periodic Cost	25	$2,000	$ 2,000	0.526	$ 1,053
Periodic Cost	30	$7,000	$ 7,000	0.463	$ 3,241
		$3,628,688			$3,527,788

TOTAL PRESENT VALUE OF SELECTED REMEDY **$3,527,788**

Table B1-8. Alternative 3B – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Location: Inyo National Forest, Mono County, California

Description: Alternative 3B – Hotspot Excavation and Offsite Disposal with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Notes:

1. Source: RS Means Heavy Construction Cost Data Year 2019 Quarter 1.
2. Some marginal costs from RS Means were increased by $0.50 due to the potential for difficulties posed by unforeseen circumstances.
3. Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (revised November 2017).

ARIC = area requiring institutional controls
As = arsenic
BCY= bank cubic yard
BMPs = best management practices
CY = cubic yard
ECY = embanked cubic yards
GSA = U.S. General Services Administration
HASP = Health and Safety Plan
Hg = mercury
HP = horsepower
LCY = loose cubic yards
LF = linear feet
LS = lump sum
LUCs = land use controls
MO = month
MPH = miles per hour
MSY = thousand square yards
mtd. = mounted
O&M = operation and maintenance
PPE = personal protective equipment
QTY = quantity
SY = square yard
USFS = U.S. Forest Service
XRF = x-ray fluorescence

Table B1-9. Alternative 3B – Cash Flow Analysis

Year	Periodic Cost	Annual Cost	Discount Factor	Actual Periodic Cost	Actual Annual Cost
1		$9,728	0.974658869		$9,481
2		$9,728	0.949959912		$9,241
3		$9,728	0.925886854		$9,007
4		$9,728	0.902423834		$8,779
5	$2,000	$9,728	0.879555394	$1,759	$8,556
6		$9,728	0.857266465		$8,339
7		$9,728	0.835542364		$8,128
8		$9,728	0.814368776		$7,922
9		$9,728	0.79373175		$7,721
10	$7,000	$9,728	0.77361769	$5,415	$7,526
11		$9,728	0.754013343		$7,335
12		$9,728	0.734905793		$7,149
13		$9,728	0.716282449		$6,968
14		$9,728	0.698131042		$6,791
15	$2,000	$9,728	0.680439612	$1,361	$6,619
16		$9,728	0.663196503		$6,452
17		$9,728	0.646390354		$6,288
18		$9,728	0.630010091		$6,129
19		$9,728	0.614044923		$5,973
20	$7,000	$9,728	0.598484331	$4,189	$5,822
21		$9,728	0.583318061		$5,675
22		$9,728	0.568536122		$5,531
23		$9,728	0.554128774		$5,391
24		$9,728	0.540086524		$5,254
25	$2,000	$9,728	0.526400121	$1,053	$5,121
26		$9,728	0.513060547		$4,991
27		$9,728	0.500059013		$4,865
28		$9,728	0.487386952		$4,741
29		$9,728	0.475036016		$4,621
30	$7,000	$9,728	0.462998066	$3,241	$4,504

Table B1-10. Alternative 4A – Cost Summary

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 4A – Complete Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Implementation Plans and Setup	1	LS	$24,000	$24,000	Includes time for technical staff to complete pre-mobilization plans (including Work Plan and HASP with graphics, review, and production). Also includes cost for a private utility locator to clear the site prior to
Design	1	LS	$77,000	$77,000	Includes time for technical staff to complete the design of the excavation, repository, cover material, and all other site element specifications.
Mobilization and Demobilization	2	LS	$329,000	$658,000	Mobilization and demobilization of crew, materials, and heavy equipment for two seasons of field work. Craft trade crew of five (5) for 8 days. Includes costs for GSA lodging, GSA crew per diems, sanitary facilities, health and safety equipment and PPE, and other project necessities throughout the duration of site activities (205 days).
Site Work					
Tree Clearing	1	LS	$56,400	$56,400	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 1650 (12-inch to 24-inch diameter); 31 13 13.20 1750 (24-inch to 36-inch diameter). Includes clearing of an estimated 1,460 small (12-inch to 24-inch diameter) and 37 large (24-inch to 36-inch diameter) trees (of which 525 small and 11 large trees are located within the repository area) using a 300-HP bulldozer.
Stump Removal	1	LS	$240,300	$240,300	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 2100 (14-inch to 24-inch diameter); 31 13 13.20 2150 (24-inch to 36-inch diameter). Includes stump removal of an estimated 1,460 small (12-inch to 24-inch diameter) and 37 large (24-inch to 36-inch diameter) trees (of which 525 small and 11 large trees are located within the repository area) using a 1-1/2-CY excavator.
Grade Pad for Repository Footprint	1	LS	$5,000	$5,000	RS Means Heavy Construction Cost Data 2019, 31 22 13.20 0260. Rough grade 75,100-SF to 100,000-SF area (repository area approximately 102,953 SF).
Excavation and Loading of Contaminated Material	14,176	BCY	$2.27	$32,200	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Price inflated an additional 20% for difficult excavation. Loading trucks performed simultaneously with hauling.
Haul Waste to Repository	17,720	LCY	$1.05	$18,600	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Confirmation Sampling	1	LS	$12,200	$12,200	Assumes sampling with handheld XRF analyzer for duration of excavation activities and collection of 27 composite confirmation samples (approximately 1 sample per 100-foot by 100-foot area) for laboratory analysis of As and Hg.
Grade Repository Waste	1	LS	$10,000	$10,000	RS Means Heavy Construction Cost Data 2019, 31 22 13.20 0260. Rough grade 75,100-SF to 100,000-SF area (repository area approximately 102,953 SF). Price inflated by a factor of 2 to account for need to meet repository design specifications.
Clean Cover Material	34,883	CY	$57.76	$2,015,000	Assumes purchase of 34,883 tons of clean cover/backfill material from Carson City, NV; assumes 21,802 BCY (includes 7,626 BCY for repository and 14,176 BCY for backfilling Cabins Area) *1.6 conversion factor.
Import Clean Cover and Backfill Material to Site	27,253	LCY	$62.16	$1,694,000	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 9104. Assumes 18-CY 8-wheel truck, 15-minute wait/load/unload time, 45-MPH, 256-mile roundtrip to import 27,253 LCY of clean cover material from Carson City, NV (includes 9,533 LCY for repository and 17,720 LCY for backfilling Cabins Area). Duration not included in overall schedule of onsite activities (can occur concurrently with site work).
Excavate Repository Key Trench	542	BCY	$9.89	$6,000	RSMeans Heavy Construction Cost Data 2019, 31 23 16.13 0050. Assumes 3/8 CY excavator, 1'-4' deep trench to excavate approximately 542 BCY to create 24"x24" trench to secure liner on repository waste.
Line Repository	1	LS	$244,700	$244,700	Includes installation of both HDPE liner (RS Means Heavy Construction Cost Data 2019, 31 05 19.53 1200) and geotextile subsurface drainage filter (RS Means Heavy Construction Cost Data 2019, 33 41 23 19 0110).

Table B1-10. Alternative 4A – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 4A – Complete Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Backfill Repository Key Trench	678	LCY	$9.89	$7,000	RSMeans Heavy Construction Cost Data 2019, 31 23 16.13 0050. Assumes 3/8 CY excavator, 1'-4' deep trench to backfill repository key trench once liner has been installed (approximately 678 LCY [542 BCY plus 1.25x fluff factor]).
Load Haul Trucks with Clean Cover Material for Repository	9,533	LCY	$1.89	$18,000	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Loading trucks performed simultaneously with hauling.
Haul Clean Cover Material to Repository	9,533	LCY	$3.91	$37,300	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Repository Encapsulation and Grading	11,439	SY	$0.20	$2,300	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300. Grader to perform final grading on gentle slopes.
Load Haul Trucks with Backfill Material for Excavated Areas	17,720	LCY	$1.89	$33,500	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Loading trucks performed simultaneously with hauling.
Haul Backfill Material to Cabins Area for Excavation Backfill	17,720	LCY	$3.91	$69,300	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Demarcation Fabric	1	LS	$1,080	$1,080	Includes one (1) roll of demarcation fabric, plus installation, to line 2:1-slope perimeter of cabins prior to encapsulation.
Backfill Excavated Areas	17,720	LCY	$1.05	$18,600	RS Means Heavy Construction Cost Data 2019, 31 23 23.14 4020. Backfill, structural, 200-HP dozer, 50-foot haul, common earth from existing stockpile.
Compaction of Backfill	14,176	ECY	$0.29	$4,100	RS Means Heavy Construction Cost Data 2019, 31 23 23.23 5060. Perform vibrating compaction on backfill in 12-inch lifts, two (2) passes with riding vibrating compaction roller.
Final Grading of Cabins Area	20,097	SY	$0.20	$4,000	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300. Grader to perform final grading on gentle slopes.
Erosion Control Fabric	11,439	SY	$1.68	$19,200	RS Means Heavy Construction Cost Data 2019, 31 25 14.16 0020 for Erosion Control Fabric on entire covered repository (11,439 SY).
Hydroseeding of Disturbed and Graded Areas	31,536	SY	$0.55	$17,000	RS Means Heavy Construction Cost Data 2019, 32 92 19.13 0100. Mechanical seeding, assuming 44 lbs/MSY, of entire disturbed area, including backfilled cabins area (20,097 SY) and repository (11,439 SY).
Silt Fence for Stream Protection	530	LF	$10.00	$5,300	As-installed cost of silt fence along the length of the creek to control erosion.
Dust Suppression	11	MO	$30,000.00	$330,000	One 2,000-gallon water truck spraying water for dust suppression during all phases of work. Includes operator costs.
After Action Report	1	LS	$18,000	$18,000	Includes time for technical staff to write an after action report, including graphics, review, and production.
SUBTOTAL				**$5,678,080**	
Contingency	25%			$1,419,520	15% scope + 10% bid
SUBTOTAL				**$7,097,600**	
Project Management	10%			$567,808	Includes project management and technical oversight during all phases of construction, regulatory interface,
Construction Management	12%			$681,370	Includes construction management, quality control, and quality control testing.
SUBTOTAL					
Institutional Controls	1	LS	$75,900	$75,900	Forest Plan amendment, legal description for ARIC, and legal fees. Includes reproduction.
	TOTAL CAPITAL CONSTRUCTION COSTS:			**$8,422,678**	

Table B1-10. Alternative 4A – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 4A – Complete Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Inspections and Maintenance					
Biannual Inspections	2	LS	$ 1,000	$ 2,000	Biannual inspections to evaluate the integrity of the repository components and site restoration BMPs.
Minor Repairs	1	LS	$ 10,000	$ 10,000	Annual minor repairs to fix any aspects of the repository and/or site restoration BMPs that may have degraded.
SUBTOTAL				**$12,000**	
Contingency	25%			$ 3,000	10% scope + 15% bid
SUBTOTAL				**$15,000**	
Project Management	10%			$1,200	
Contractor Overhead	7%			$840	
Profit	10%			$1,200	
			TOTAL ANNUAL O&M COSTS:	**$18,240**	per year
			TOTAL ANNUAL O&M COSTS:	**$547,200**	Years 1–30

PERIODIC COSTS	Year					
Five-Year Review Report	5	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 5.
Significant Repairs	5	1	LS	$20,000	$20,000	Costs for significant repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 5)					**$39,000**	
Five-Year Review Report	10	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 10.
Major Repairs	10	1	LS	$40,000	$40,000	Costs for major repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 10)					**$59,000**	
Five-Year Review Report	15	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 15.
Significant Repairs	15	1	LS	$20,000	$20,000	Costs for significant repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 15)					**$39,000**	
Five-Year Review Report	20	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 20.
Major Repairs	20	1	LS	$40,000	$40,000	Costs for major repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 20)					**$59,000**	
Five-Year Review Report	15	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 25.
Significant Repairs	15	1	LS	$20,000	$20,000	Costs for significant repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 25)					**$39,000**	
Five-Year Review Report	20	1	LS	$19,000	$19,000	Preparation of one report at the end of Year 30.
Major Repairs	20	1	LS	$40,000	$40,000	Costs for major repairs to the repository and/or site restoration BMPs.
SUBTOTAL (YEAR 30)					**$59,000**	

Table B1-10. Alternative 4A – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 4A – Complete Excavation and Onsite Repository with LUCs
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (2.6%)	PRESENT VALUE
Capital Cost	0	$8,422,678	$ 8,422,678	1.000	$8,422,678
Annual O&M Cost	1–30	$547,200	$18,240	0.688	$376,728
Periodic Cost	5	$39,000	$ 39,000	0.880	$34,303
Periodic Cost	10	$59,000	$ 59,000	0.774	$45,643
Periodic Cost	15	$39,000	$ 39,000	0.680	$26,537
Periodic Cost	20	$59,000	$ 59,000	0.598	$35,311
Periodic Cost	25	$39,000	$ 39,000	0.526	$20,530
Periodic Cost	30	$59,000	$ 59,000	0.463	$27,317
		$9,263,878			$8,989,045

TOTAL PRESENT VALUE OF SELECTED REMEDY **$8,989,045**

Notes:

1. Source: RS Means Heavy Construction Cost Data Year 2019 Quarter 1.
2. Many marginal costs from RS Means were increased by $0.50 due to the potential for difficulties posed by unforeseen circumstances.
3. Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (revised November 2017).

ARIC = area requiring institutional controls
As = arsenic
BCY= bank cubic yard
BMPs = best management practices
CY = cubic yard
ECY = embanked cubic yards
GSA = U.S. General Services Administration
HASP = Health and Safety Plan
HDPE = high-density polyethylene
Hg = mercury
HP = horsepower
LCY = loose cubic yards
LF = linear feet
LS = lump sum
LUCs = land use controls
MO = month
MPH = miles per hour
MSY = thousand square yards
mtd. = mounted
O&M = operation and maintenance
PPE = personal protective equipment
QTY = quantity
SF = square feet
SY = square yard
XRF = x-ray fluorescence

Table B1-11. Alternative 4A – Cash Flow Analysis

Year	Periodic Cost	Annual Cost	Discount Factor	Actual Periodic Cost	Actual Annual Cost
1		$18,240	0.974658869		$17,778
2		$18,240	0.949959912		$17,327
3		$18,240	0.925886854		$16,888
4		$18,240	0.902423834		$16,460
5	$39,000	$18,240	0.879555394	$34,303	$16,043
6		$18,240	0.857266465		$15,637
7		$18,240	0.835542364		$15,240
8		$18,240	0.814368776		$14,854
9		$18,240	0.79373175		$14,478
10	$59,000	$18,240	0.77361769	$45,643	$14,111
11		$18,240	0.754013343		$13,753
12		$18,240	0.734905793		$13,405
13		$18,240	0.716282449		$13,065
14		$18,240	0.698131042		$12,734
15	$39,000	$18,240	0.680439612	$26,537	$12,411
16		$18,240	0.663196503		$12,097
17		$18,240	0.646390354		$11,790
18		$18,240	0.630010091		$11,491
19		$18,240	0.614044923		$11,200
20	$59,000	$18,240	0.598484331	$35,311	$10,916
21		$18,240	0.583318061		$10,640
22		$18,240	0.568536122		$10,370
23		$18,240	0.554128774		$10,107
24		$18,240	0.540086524		$9,851
25	$39,000	$18,240	0.526400121	$20,530	$9,602
26		$18,240	0.513060547		$9,358
27		$18,240	0.500059013		$9,121
28		$18,240	0.487386952		$8,890
29		$18,240	0.475036016		$8,665
30	$59,000	$18,240	0.462998066	$27,317	$8,445

Table B1-12. Alternative 4B – Cost Summary

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 4B – Complete Excavation and Offsite Disposal
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Implementation Plans and Setup	1	LS	$24,000	$24,000	Includes time for technical staff to complete pre-mobilization plans (including Work Plan and HASP with graphics, review, and production). Also includes cost for a private utility locator to clear the site prior to
Design	1	LS	$36,000	$36,000	Includes time for technical staff to complete the design of the excavation, cover material, and all other site element specifications.
Mobilization and Demobilization	2	LS	$282,000	$564,000	Mobilization and demobilization of crew, materials, and heavy equipment for two seasons of field work. Craft trade crew of 5 for 8 days. Includes costs for GSA lodging, GSA crew per diems, sanitary facilities, health and safety equipment and PPE, and other project necessities throughout the duration of site activities (168 days).
Site Work					
Tree Clearing	1	LS	$36,300	$36,300	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 1650 (12-inch to 24-inch diameter); 31 13 13.20 1750 (24-inch to 36-inch diameter). Includes clearing of an estimated 935 small (12-inch to 24-inch diameter) and 26 large (24-inch to 36-inch diameter) trees with 300-HP bulldozer.
Stump Removal	1	LS	$154,400	$154,400	RS Means Heavy Construction Cost Data 2019, 31 13 13.20 2100 (14-inch to 24-inch diameter); 31 13 13.20 2150 (24-inch to 36-inch diameter). Includes stump removal of an estimated 935 small (12-inch to 24-inch diameter) and 26 large (24-inch to 36-inch diameter) trees with a 1-1/2-CY excavator.
Excavation and Loading of Contaminated Material	14,176	BCY	$2.27	$32,200	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Price inflated an additional 20% for difficult excavation. Loading trucks performed simultaneously with hauling.
Offsite Disposal	22,682	TONS	$100	$2,268,200	Cost to dispose of waste at an offsite disposal facility located approximately 200 miles away from site (Beatty, NV). Tonnage estimate assumes 1.6 tons per BCY of waste.
Confirmation Sampling	1	LS	$12,200	$12,200	Assumes sampling with handheld XRF analyzer for duration of excavation activities and collection of 27 composite confirmation samples (approximately 1 sample per 100-foot by 100-foot area) for laboratory analysis of As and Hg.
Clean Cover Material	22,682	CY	$57.76	$1,310,000	Assumes purchase of 22,682 tons (14,176 BCY*1.6 conversion factor) of backfill material from Carson City, NV.
Import Backfill Material to Site	17,720	LCY	$62.16	$1,101,000	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 9104. Assumes 18-CY 8-wheel truck, 15-minute wait/load/unload time, 45-MPH, 256-mile roundtrip to import 17,720 LCY of clean cover material from Carson City, NV to backfill Cabins Area. Duration not included in overall schedule of onsite activities (can occur concurrently with site work).
Load Haul Trucks with Backfill Material for Excavated Areas	17,720	BCY	$1.89	$33,500	RS Means Heavy Construction Cost Data 2019, 31 23 16.42 0300. This assumes an excavator, hydraulic, crawler mtd., and 3-CY capacity. Marginal price inflated 15% to reflect truck loading, per RS Means convention. Loading trucks performed simultaneously with hauling.
Haul Backfill Material to Cabins Area for Excavation Backfill	17,720	LCY	$3.91	$69,300	RS Means Heavy Construction Cost Data 2019, 31 23 23.20 5090. Haul common earth, 22-CY dump truck, 15-minute wait/load/unload time, 10-MPH, 0.5-mile roundtrip.
Backfill Excavated Areas	17,720	LCY	$1.05	$18,600	RS Means Heavy Construction Cost Data 2019, 31 23 23.14 4020. Backfill, structural, 200-HP dozer, 50-foot haul, common earth from existing stockpile. Will occur simultaneously with hauling material.
Compaction of Backfill	14,176	ECY	$0.29	$4,100	RS Means Heavy Construction Cost Data 2019, 31 23 23.23 5060. Perform vibrating compaction on backfill in 12-inch lifts, two (2) passes with riding vibrating compaction roller.
Final Grading of Cabins Area	20,097	SY	$0.20	$4,000	RS Means Heavy Construction Cost Data 2019, 31 22 16.10 3300. Grader to perform final grading on gentle slopes.

Table B1-12. Alternative 4B – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Description: Alternative 4B – Complete Excavation and Offsite Disposal
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Location: Inyo National Forest, Mono County, California

CAPITAL COSTS:

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	SOURCE/NOTES
Hydroseeding of Disturbed and Graded Areas	20,097	SY	$0.55	$11,000	RS Means Heavy Construction Cost Data 2019, 32 92 19.13 0100. Mechanical seeding, assuming 44 lbs/MSY, of backfilled cabins area (20,097 SY).
Silt Fence for Stream Protection	530	LF	$10.00	$5,300	As-installed cost of silt fence along the length of the creek to control erosion.
Dust Suppression	9	MO	$30,000	$270,000	One 2,000-gallon water truck spraying water for dust suppression during all phases of work. Includes operator costs.
After Action Report	1	LS	$18,000	$18,000.00	Includes time for technical staff to write an after action report, including graphics, review, and production.
SUBTOTAL				**$5,972,100**	
Contingency	25%			$1,493,025	15% scope + 10% bid
SUBTOTAL				**$7,465,125**	
Project Management	10%			$597,210	Includes project management and technical oversight during all phases of construction, regulatory interface, and permitting.
Construction Management	12%			$716,652	Includes construction management, quality control, and quality control testing.
SUBTOTAL				**$1,313,862**	
	TOTAL CAPITAL CONSTRUCTION COSTS:			**$8,778,987**	
Inspections and Maintenance					
Biannual Inspections	2	LS	$ 1,000	$ 2,000	Biannual inspections to evaluate the integrity of site restoration BMPs.
Minor Repairs	1	LS	$ 3,000	$ 3,000	One minor repair event to fix any BMPs that may have degraded.
SUBTOTAL				**$5,000**	
Contingency	25%			$ 1,250	10% scope + 15% bid
SUBTOTAL				**$6,250**	
Project Management	10%			$500	
Contractor Overhead	7%			$350	
Profit	10%			$500	
		TOTAL ANNUAL O&M COSTS:		**$7,600**	Year 1 only

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	DISCOUNT FACTOR (2.6%)	PRESENT VALUE
Capital Cost	0	$ 8,778,987	$ 8,778,987	1.000	$8,778,987
Annual O&M Cost	1–30	$ 228,000	$7,600	0.688	$7,407
		$9,006,987			$8,786,394
TOTAL PRESENT VALUE OF SELECTED REMEDY				**$8,786,394**	

Table B1-12. Alternative 4B – Cost Summary *(continued)*

Site: Expanded Cabins Area at Mammoth Mill

Location: Inyo National Forest, Mono County, California

Description: Alternative 4B – Complete Excavation and Offsite Disposal
Cost Summary for the Expanded Cabins area at the Mammoth Mill Site

Notes:

1. Source: RS Means Heavy Construction Cost Data Year 2019 Quarter 1.
2. Many marginal costs from RS Means were increased by $0.50 due to the potential for difficulties posed by unforeseen circumstances.
3. Based on a 2.6-percent discount factor for projects with a 30-year (or greater) duration, as specified for federal facility sites in Appendix C of Office of Management and Budget Circular A-94 (revised November 2017).

As = arsenic
BCY= bank cubic yard
BMPs = best management practices
CY = cubic yard
ECY = embanked cubic yards
GSA = U.S. General Services Administration
HASP = Health and Safety Plan
Hg = mercury
HP = horsepower
LCY = loose cubic yards
LF = linear feet
LS = lump sum
MO = month
MSY = thousand square yards
mtd. = mounted
O&M = operation and maintenance
PPE = personal protective equipment
QTY = quantity
SY = square yard
XRF = x-ray fluorescence

Table B1-13. Alternative 4B – Cash Flow Analysis

Year	Period Cost	Annual Cost	Discount Factor	Actual Annual Cost
1		$7,600	0.974658869	$7,407
2		$0	0.949959912	$0
3		$0	0.925886854	$0
4		$0	0.902423834	$0
5		$0	0.879555394	$0
6		$0	0.857266465	$0
7		$0	0.835542364	$0
8		$0	0.814368776	$0
9		$0	0.79373175	$0
10		$0	0.77361769	$0
11		$0	0.754013343	$0
12		$0	0.734905793	$0
13		$0	0.716282449	$0
14		$0	0.698131042	$0
15		$0	0.680439612	$0
16		$0	0.663196503	$0
17		$0	0.646390354	$0
18		$0	0.630010091	$0
19		$0	0.614044923	$0
20		$0	0.598484331	$0
21		$0	0.583318061	$0
22		$0	0.568536122	$0
23		$0	0.554128774	$0
24		$0	0.540086524	$0
25		$0	0.526400121	$0
26		$0	0.513060547	$0
27		$0	0.500059013	$0
28		$0	0.487386952	$0
29		$0	0.475036016	$0
30		$0	0.462998066	$0

Appendix C. Photographic Log

Photograph C-1: Mini-excavator setting up at T1 trench location. Facing northeast.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 8, 2018

Photograph C-2: Closeup view of soil in top 12 inches of trench T1.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 8, 2018

Photograph C-3: Soil profile in trench T4; note thin, lenticular deposits of light gray tailings.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 8, 2018

Photograph C-4: XRF screening at trench T5.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-5: Mini-excavator removing large boulders (up to 16 inches in diameter) during excavation of trench T5. Facing west.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-6: Soil profile at trench T6.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-7: Test pit T7A (foreground) and trench T7B (background). Facing southeast.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-8: Historic refuse (including approximately 500 cans and 100 bottles and glass shards) discovered in drainage west of Cabins 4 and 5. Items were exposed at the surface.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-9: Soil profile at trench T9.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-10: Trench T10 during excavation. Facing southeast.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-11: Soil profile at trench T10; note increasing presence of pebbles and cobbles with depth.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-12: Soil in top 12 inches of test pit T12; note presence of thick (approximately 3-inch) layer of vegetative duff.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-13: Trench T15. Facing northwest.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-14: Soil profile at trench T15; note presence of discrete soil horizons.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-15: Recording GPS location data at trench T15.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 9, 2018

Photograph C-16: Excavating trench T17. Facing northwest.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 10, 2018

Photograph C-17: Soil profile at trench T17; note presence of white-gray tailings.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Ava Lazor (ERRG) Date: October 10, 2018

Photograph C-18: Soil profile at trench T20; note small lens of white-gray tailings.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 10, 2018

Photograph C-19: Soil collected from trench T20; note white-gray tailings.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 10, 2018

Photograph C-20: Archaeologist (from G2 Archaeology) screening soil at trench T20.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 10, 2018

Photograph C-21: Excavating trench T21. Facing southwest.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 10, 2018

Photograph C-22: Unnamed tributary (creek) to Mammoth Creek along eastern boundary of the Cabins Area. Facing south.

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 10, 2018

Photograph C-23: Soil profile at trench T26; note well-developed soil horizons.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Ava Lazor (ERRG) Date: October 10, 2018

Photograph C-24: Archaeologist (from G2 Archaeology) screening soil at trench T30.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 11, 2018

Photograph C-25: Excavating trench T31 near Cabin 29. Facing northeast.
Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA
Photographed by: Caitlin Gorman (ERRG) Date: October 11, 2018

Photograph C-26: Soil profile at trench T31; note presence of fine-grained white-gray material (possible ash or tailings).

Supplemental Characterization, Cabin Areas, Mammoth Mill, Inyo National Forest, CA

Photographed by: Caitlin Gorman (ERRG) Date: October 11, 2018

Appendix D. Archaeology Report

November 14, 2018

Jacqueline Beidl
Forest Archaeologist and Tribal Liaison
Forest Service
Inyo National Forest
351 Pacu Lane
Bishop, CA 93514

Re: Mammoth Stamp Mill TCRA 2018 Site Investigation Monitoring Results (R2018050402281)

Dear Jacquie:

G2 Archaeology (G2) was contracted by Engineering/Remediation Resources Group, Inc. (ERRG) to conduct archaeological monitoring of ground disturbing activities related to additional site investigations to determine the extent of soil contamination at the Mammoth Stamp Mill and Mill City Historic Townsite (05-04-52-2140) and the Mill City Artifact Scatter (05-04-52-939) in Mono County, California (Figure 1). The project is related to the USDA Forest Service Pacific Southwest Region (USFS) Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Time-Critical Removal Action (TCRA) to mitigate human-induced contaminated soil and sediment at the Mammoth Stamp Mill Site. The TCRA directs that approximately 9,554 cubic yards of mill waste/contaminated soil within the mill area, cabin area, diversion ditch, and along a perennial tributary of Mammoth Creek, which has been shown to contain levels of arsenic, lead, and mercury that exceed established risk-based exposure thresholds, will be excavated and removed. The site was originally sampled in July 2014, but ERRG was tasked with completing additional site investigations to determine the full horizontal and vertical extent of contaminated soil. The USFS determined that further site investigations and removal action would have an adverse effect upon the Mammoth Stamp Mill and Mill City Historic Townsite (05-04-52-2140) and the Mill City Artifact Scatter (05-04-52-939), both of which are cultural properties that have not been formally evaluated for eligibility on the National Register of Historic Places (NRHP) and are thus assumed NRHP-eligible for the purpose of assessing effects of the undertaking under Section 106 of the National Historic Preservation Act (NHPA).

Monitoring Methods

In accordance with the Scope of Work (SOW), appended to the Memorandum of Agreement (MOA) between the USFS and the California State Historic Preservation Officer Regarding Implementation of the Mammoth Stamp Mill CERCLA Time-Critical Removal Action, Mono County, California (Project MOA: 2018), between October 8-11, 2018, the G2 archaeological monitor, Ms. Elisabeth Bennett, worked closely with the ERRG project team, Caitlin Gorman, Ava Lazor, and Alberto Malgoza, to guide excavations away from visible surface cultural resources (e.g., the stamp mill fly wheel, cabin foundations, artifact concentrations). Prior to ground disturbing activities, ERRG staff flagged a total of 31 test unit locations. Ms. Bennett surveyed the area within and surrounding each test unit location to ascertain the presence or absence of cultural materials and/or features. She also surveyed the path the excavator took between test units to guide them around cultural materials. The prehistoric lithic scatter at site 05-04-52-939 is dispersed, making it impossible to avoid all debitage; however, small artifact clusters were avoided. With Ms. Bennett present, all ERRG excavations were conducted with a BOBCAT Mini Excavator with a 12-inch bucket (Model E35I) or were excavated by hand with shovels. The ERRG test units ranged in size between 18 x 18 x 18-inch shovel pits to large trenches that measured up to 20 feet long by 2 feet wide and 4 feet deep.

Mechanical excavations were completed in 6-inch lifts, with spoils piled to one side for ease of archaeological screening and backfilling. Approximately 50% of all excavated soil was screened through 1/8-inch mesh; the remaining 50% was visually inspected by shovel broadcasting. All artifacts were described and then re-deposited into the units. Considering the toxic nature of the soil, care was taken to ensure dust from screening was kept to a minimum. Pre- and post-excavation photographs were taken of test units. Diagnostic artifacts were also photographed. No artifacts were collected during the monitoring effort.

Monitoring Results

The results of the monitoring effort are summarized in Table 1 below. Of 31 test units, all but five (exceptions being Test Units 2, 3, 5, 11, and 29) were placed within the boundaries of sites 05-04-52-939, 05-04-52-1056, and 05-04-52-2140 (Figure 2). Regarding prehistoric site 05-04-52-939, surface artifacts were noted at six test units (Test Units 1, 4, 16, 20, 21, and 28) placed within previously recorded site boundaries. Two obsidian flakes were also observed on the surface of Test Unit 20, outside the 05-04-52-939 boundary. The lithic concentrations identified by Faust (1989) could not be redefined given the presence of heavy duff cover across much of site 05-04-52-939. Subsurface artifacts (prehistoric and historic) were unearthed in 20 units (Test Units 1, 4, 5, 6, 9, 10, 16, 17, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30 and 31). This demonstrates that the horizontal boundaries of sites 05-04-52-939 and 05-04-52-2140 extend beyond their 2017 delineated boundaries. Most identified artifacts were obsidian flakes, although several diagnostic historic artifacts were also found (see Table 2).

Monitoring work also identified a large but dispersed concentration of historic refuse outside the boundaries of sites 05-04-52-2140 and 05-04-52-939, and well beyond the testing area, but within the boundaries of the historic Mill City Recreational Residence Tract (site 05-04-052-1056). The refuse deposit is located within a shallow drainage that trends roughly north-south, due east of Test Units 23 and 25 (see Figure 2). The UTM coordinates for the roughly 200-feet long concentration are 324017mE/4165724mN at the north end and 324000mE/4165683mN at the south end. The concentration consists of approximately 500 cans and 100 bottles and glass shards. Most metal artifacts are rotary-opened single- and multi-serve sanitary food cans, but rectangular meat tins, metal scraps, thin twisted wire cable, motor oil cans, and 5-gallon fuel cans were also observed. Several diagnostic bottles were documented (Table 2); these artifacts, along with other indices, imply that the bulk of refuse dates to the early-mid twentieth century. The concentration was not recorded by G2 because it is located well outside the impact area of test excavations and because its documentation was not included in the SOW.

Table 1. Test Unit Results.

ID #	UTMs (NAD83, Z11)	Unit Type & Dimensions (L x W x D)	Soil Description	Cultural Materials on Surface	Subsurface Artifacts	Cultural Materials in Proximity	Comments
1	324041mE 4165825mN	Trench 9.5' x 14" x 12"	0-2" white-gray loamy sand 2-12" orange-brown, clayey silt, brown to beige w/depth	Yes 2 OBS flakes	11 OBS flakes	Numerous	Flakes visible in road shoulder.
2	324060mE 4165852mN	Test Pit 18" x 14" x 12"	0-5" gray-brown loamy sand 5-12" brown silty loam w/gravel	No	None	None	On slope, across (north) Old Mammoth Road.

ID #	UTMs (NAD83, Z11)	Unit Type & Dimensions (L x W x D)	Soil Description	Cultural Materials on Surface	Subsurface Artifacts	Cultural Materials in Proximity	Comments
3	324069mE 4165866mN	Test Pit	Not logged (shallow)	No	None	None	On slope, across (north) Old Mammoth Road.
4	323995mE 4165821mN	Trench 19' x 14" x 15"	0-2" gray-beige silty loam 2-4" lens, white-gray tailings 4-8" gray-beige silty loam 8-15" brown silty soil	Yes 5 OBS flakes (north end)	20 OBS flakes	Numerous	Unit located near water tank; flakes visible on disturbed berm around water tank (15 ft. to north).
5	324115mE 4165728mN	Trench 9.8' x 14" x 48"	0-36" brown silty sandy loam w/large cobbles 36-48" gray-beige silty loam	No	40 OBS flakes, 1 cut nail	None	Located southeast of Cabin 3; flakes noted at 4 ft. below surface.
6	324076mE 4165754mN	Trench 13' x 14" x 18"	0-18" brown-beige to gray-brown silty sandy loam	No	4 OBS flakes	6 OBS flakes	
7A	324076mE 4165671	Trench 7.7' x 14" x 12"	0-12" gray-brown silt	No	None	None	
7B	324074mE 4165676mN	Test Pit 2' x 14" x 12"	0-12" gray-brown silt	No	None	1 aqua bottle finish	Poor ground visibility – heavy duff.
8	324027mE 4165723mN	Trench 16.2' x 14" x 6"	0-6" brown-gray silty loam	No	None	None	Poor ground visibility – heavy duff.
9	324006mE 4165657mN	Test Pit 4' x 14" x 12"	0-5" gray-brown silty sand 5-12" gray-brown silty loam	No	1 OBS shatter	None	
10	323976mE 4165646mN	Trench 14' x 14" x 24"	0-24" brown silty loam w/cobbles throughout	No	1950s refuse (west end)	None	Unit located in infilled earthen mound.
11	323970mE 4165655mN	Test Pit	Not logged (shallow)	No	None	None	
12	323954mE 4165625mN	Test Pit	Not logged (shallow)	No	None	None	Poor ground visibility – dense tree chippings.
13	323964mE 4165588mN	Trench 26.2' x 14" x 12"	0-12" brown silty loam, lighter tan, sandier w/depth	No	None	None	Close to tailings.
14	323954mE 4165587mN	Test Pit	Not logged (shallow)	No	None	None	Close to tailings.
15	323976mE 4165586mN	Trench 9' x 14" x 12"	0-5" brown-gray silty loam 5-9" light gray silty sand 9-12" yellowish silty loam	No	None	None	
16	323990mE 4165591mN	Test Pit	Not logged (shallow)	Yes	1 OBS flake	None	
17	324071mE 4165791mN	Trench 12.1' x 14" x 24"	0-5" gray silty loam 5-24" yellowish silty sand	No	11 OBS flakes	1 OBS flake	
18	324084mE 4165792mN	Trench 23.9' x 14" x 24"	0-12" gray-brown silty loam 12-24" yellowish silty loam	No	None	None	

ID #	UTMs (NAD83, Z11)	Unit Type & Dimensions (L x W x D)	Soil Description	Cultural Materials on Surface	Subsurface Artifacts	Cultural Materials in Proximity	Comments
19	324053mE 4165758mN	Test Pit 18" x 14" x 12"	0-8" brown-gray silty loam 8-12" yellowish silty sand	No	2 OBS flakes	None	
20	324044mE 4165725mN	Test Pit 18" x 14" x 18"	0-12" brown-beige silty sand 12-18" orange-brown silty sand	Yes 2 OBS flakes	8 OBS flakes	1950's refuse scatter adjacent to unit	Joy Dish Soap can in northwest corner of unit
21	324064mE 4165714mN	Test Pit 18" x 14" x 12"	0-12" brown silty loam	Yes 2 OBS flakes	2 OBS flakes	None	
22A	324096mE 4165719mN	Trench 11.4' x 14" x 12"	0-9" brown silty loam w/pumice 9-12" brown silty loam, w/o pumice	No	3 OBS flakes	5 OBS flakes	Flakes are near cabins
22B	324100mE 4165719mN	Test Pit 18" x 14" x 12"	0-9" brown silty loam w/pumice 9-12" brown silty loam, w/o pumice	No	None	None	
23	324001mE 4165716mN	Test Pit	Not logged (shallow)	No	2 OBS flakes, 1 canned ham tin (west end)	None	Poor ground visibility – dense tree chippings.
24	324009mE 4165764mN	Test Pit	Not logged (shallow)	No	None	None	Poor ground visibility – dense tree chippings.
25	323982mE 4165696mN	Test Pit	Not logged (shallow)	No	1 OBS flake	None	Poor ground visibility – dense tree chippings.
26	324012mE 4165618mN	Test Pit	Not logged (shallow)	No	2 WIE historic ceramics, 1 can fragment	None	
27	324102mE 4165790mN	Test Pit	Not logged (shallow)	No	1 cut nail fragment	None	Poor ground visibility – heavy duff.
28	323965mE 4165795mN	Test Pit	Not logged (shallow)	Yes 1 OBS flake	8 OBS flakes	8 OBS flakes, H-I-C can, black glass	
29	323989mE 4165853mN	Test Pit	Not logged (shallow)	No	10 OBS flakes	Numerous	Flakes in berm around water tower.
30	324036mE 4165806mN	Test Pit	Not logged (shallow)	No	6 OBS flakes	5 OBS flakes	Disturbed surface.
31	324059mE 4165547mN	Trench 18.5' x 14" x 48"	0-12" brown silty loam 12-24" white-gray ash 24-36" brown silty loam w/clasts 36-48" brown-gray silt w/clasts, organics	No	6 OBS flakes, 1 aqua bottle finish, 2 green glass bases, 2 frags pane glass	Sparse flakes, WIE, can frags, aqua bottle panel	Flakes in driveway & landscaping of cabin; historic artifacts in rear yard.

Note: OBS, obsidian; WIE, white improved earthenware; H-I-C, hole-in-cap.

Table 2. Diagnostic historic artifacts identified in test units.

Artifact	Location	Photos	Comments
Joy Dish Soap can	Test Unit 20	2381-2383	Post-1949
Colorless glass bottle, "Mistol"	Concentration	2391	Manufactured nasal drops, company in business from 1929-1957 (https://maryfransmuse.weebly.com/mistol.html)

Artifact	Location	Photos	Comments
Milk glass jar, "Pond's"	Concentration	2392	Pond's cold cream invented 1904, in milk glass jars until 1940s/1950s (https://cosmeticsandskin.com/companies/ponds.php)
Colorless glass bottle, "Hinds Honey and Almond Cream"	Concentration	2393	1910-1920s; dropped apostrophe in name after 1910; company dissolved 1936 (http://cosmeticsandskin.com/companies/hinds.php)
Colorless glass jar base, "Best Foods"	Concentration	2394	Post-1927
"Veedol Motor Additive" can	Concentration	2401	Manufactured 1913-present (Tidewater Associated Oil) (https://www.linkedin.com/pulse/history-tidewater-oil-company-zulker-naeen)
Canned ham tin, "Rath Black Hawk"	Test Unit 23	2402	Manufactured 1891-?, advertisements in 1950s newspaper (http://findingaids.lib.iastate.edu/spcl/manuscripts/MS562.pdf)
Colorless glass base, Owens-Illinois mark	Test Unit 23 (adjacent)	2405	OI in diamond, 1929-1960; Plant 18, Columbus, OH (1930-1948)
Colorless glass bottle base, *Duraglas* Owens-Illinois mark	Test Unit 24	2408	*Duraglas* mark, 1929-1964 Plant 23, Los Angeles, CA (1932-present)
Hole-in-cap, multi-serve	Test Unit 28	2412	Early twentieth century

Interpretations

Prehistoric artifacts identified during monitoring consist entirely of obsidian late-stage bifacing debris. Relatively little debitage was observed on the ground surface at testing locations, mainly due to the presence of duff cover, and quantities of flakes identified in excavated matrix were also relatively low. Flakes are generally small (<3 cm diameter) but show different visual attributes, most being opaque black or grey but some (particularly smaller pieces) being slightly translucent. These attributes are consistent with those identified for Casa Diablo obsidian, from either the Sawmill Ridge (black opaque) or Lookout Mountain (grey opaque and semi-translucent) sources (Bettinger et al. 1984; Giambastiani 2004). Faust (1989:1) identified "100 Casa Diablo obsidian flakes" on the surface of 05-04-52-939, as did Burns (2005), although the latter record may have simply been repeating information contained in the former record. Nonetheless, the dominance of Casa Diablo obsidian is certainly expected given the proximity of sites 05-04-52-2140 and 05-04-52-939 to both of the Casa Diablo obsidian subsource locations.

Unfortunately, a Rosegate projectile point and a handstone on the surface of site 05-04-52-939 noted previously by Faust (1989) and Burns (2005) were not relocated during the monitoring effort. A possible flaked shard of olive glass, identified by Burns (2005) near the plotted location of the Rosegate point, was also not relocated. The fact that these artifacts were not relocated is likely due to the presence of heavy duff cover across much of the site.

As for historic findings, materials unearthed during testing are generally consistent with mid-twentieth century age, from roughly the 1930s to early 1960s. Domestic refuse is almost exclusively represented among found artifacts, including various food and beverage containers, pieces of ceramic dishware, two face cream containers, a soap tin, a nasal drops bottle, and a motor oil additive can. Structural materials are represented by a pair of cut nails and two shards of window pane glass. These materials are entirely consistent with refuse that typical of mid-twentieth century residential discard patterns and surely derives

from recreational cabin occupations dating post-1923. No test units were placed at the south end of site 05-04-52-939, in the vicinity of two cabin foundations and an 1870s refuse scatter noted by Faust (1989) and attributed by him to the mid-late nineteenth century historic occupations at Mill City.

In addition, the deposit of historic refuse identified in a drainage near Test Units 23 and 25, outside the west boundary of site 05-04-52-939, appears to date to the mid-twentieth century. It is likely a dump generated over an extended period by occupants of the Mill City Recreational Residence Tract (site 05-04-52-1056).

Summary and Recommendations

Of the 31 test units, 20 were positive for cultural materials either on the surface, subsurface, or both (see Table 1). Despite the discovery of many subsurface artifacts, no newly identified cultural deposits, buried components, or intact archaeological features were encountered in test units. The historic refuse scatter found beyond existing site boundaries and well outside the area of testing was not recorded.

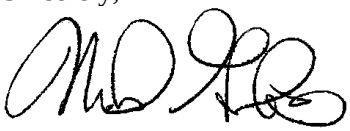
G2 understands that this was the first phase in the CERCLA TCRA project at the Mammoth Stamp Mill and Mill City Historic Townsite (05-04-52-2140) and the Mill City Artifact Scatter (05-04-52-939). Subsequent phases of soil removal will require that (1) the entire project area is re-surveyed for cultural resources; (2) the two existing sites are updated and their horizontal boundaries redefined; and (3) the historic refuse scatter near Test Units 23 and 25 should be added as an update to the NRHP-ineligible summer home tract (site 05-04-52-1056).

Project findings also show that some adjustments could be made to horizontal site boundaries. The results of excavations at Test Units 5, 19, 20, and 24 indicate that the boundaries of site 05-04-52-939 should be expanded to the north, east, and west to at least envelop the locations of these units (Figure 3). Similarly, the results of excavations at Test Unit 31 indicate that the eastern boundary of site 05-04-52-2140 should be expanded to surround that unit (see Figure 3). In contrast, the results of excavations in areas noted as "obsidian flake scatters" by Faust (1989) and as "loci" by Burns (2005) did not yield quantities of subsurface artifacts consistent with the presence of discrete, buried prehistoric components (e.g., Test Units 5, 7, 18, 21, 22, and 27). This implies that any activity "loci" seemingly evident on the site surface are only surface/near-surface deposits or are artificial constructs based on factors such as ground surface visibility.

Finally, G2 recommends future investigators consider the subsurface findings of this monitoring effort in considering horizontal and vertical site boundaries. If appropriate personal protection can be afforded to archaeological workers, it might be useful to use augering or shovel testing to help delineate the areal extent of buried artifact deposits. This has already been proposed by USFS but was removed from the current MOA/SOW due to the safety concerns of SHPO.

This concludes our monitoring report. Feel free to contact me should you have any questions.

Sincerely,



Mark Giambastiani, Ph.D.
Principal Investigator

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Faust, N.
1989 DPR Site Record for CA-MNO-2562/FS 05-04-52-939. On file at Inyo National Forest, Bishop, California.

Giambastiani, M. A.
2004 Prehistoric Obsidian Use on the Volcanic Tableland and its Implications for Settlement and Technological Change in the Western Great Basin. Unpublished Ph.D. Dissertation, University of California, Davis.

Attachments: Figures 1-3

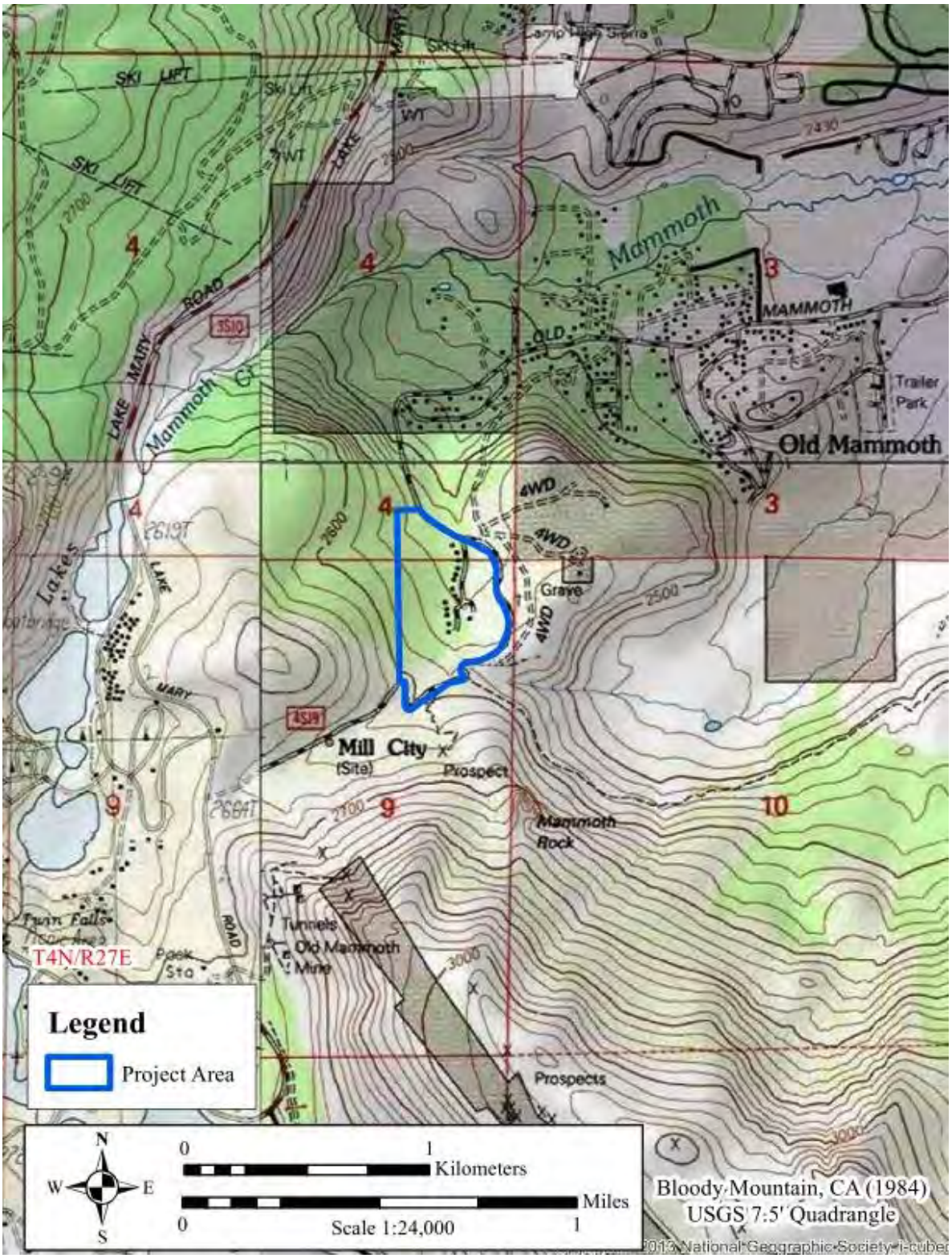


Figure 1 – Location of Mammoth Stamp Mill TCRA 2018 Site Investigation Monitoring.

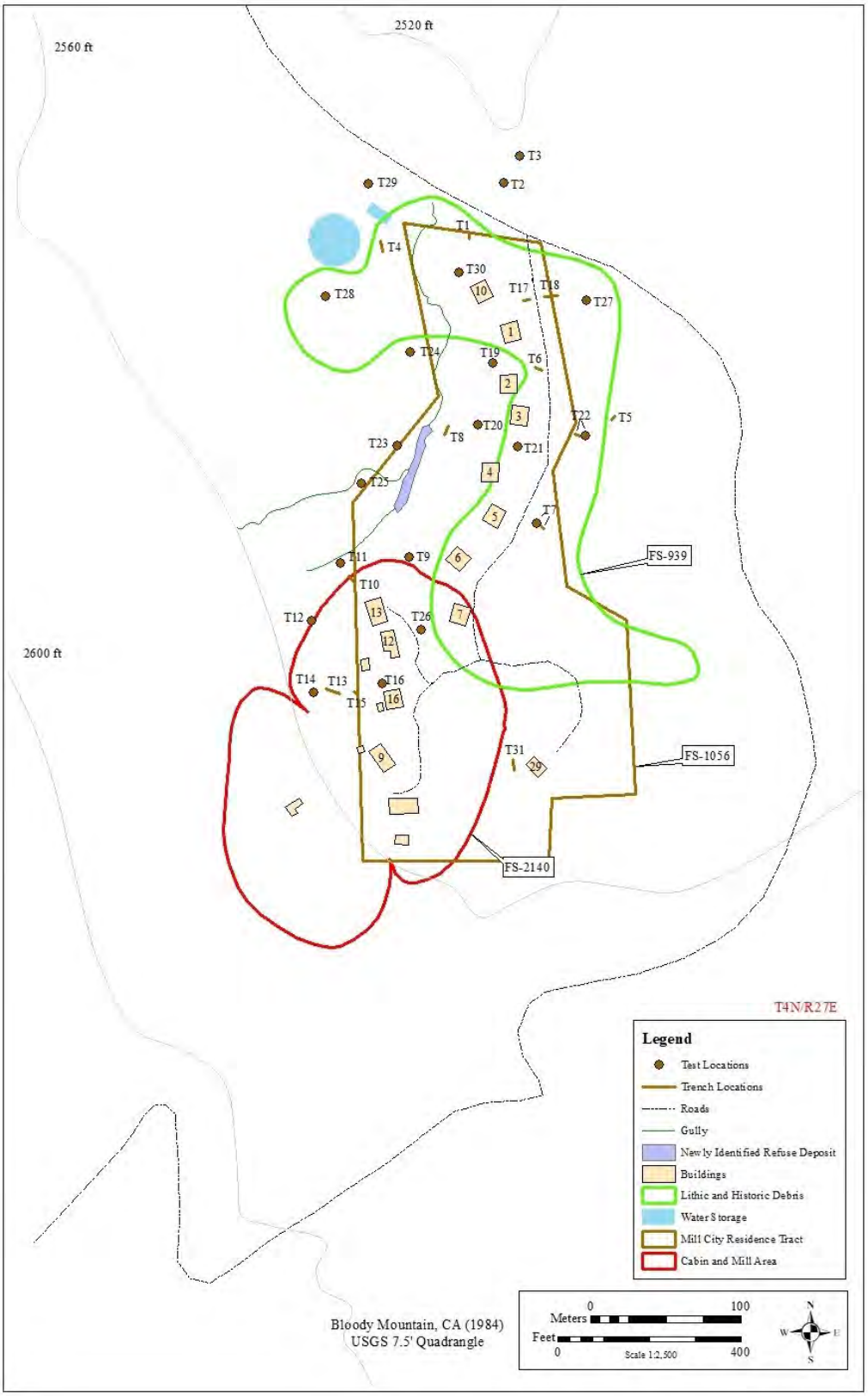


Figure 2 - Previous boundaries of sites FS-05-04-52-939. FS-05-04-52-1056, and FS-05-04-52-2140.

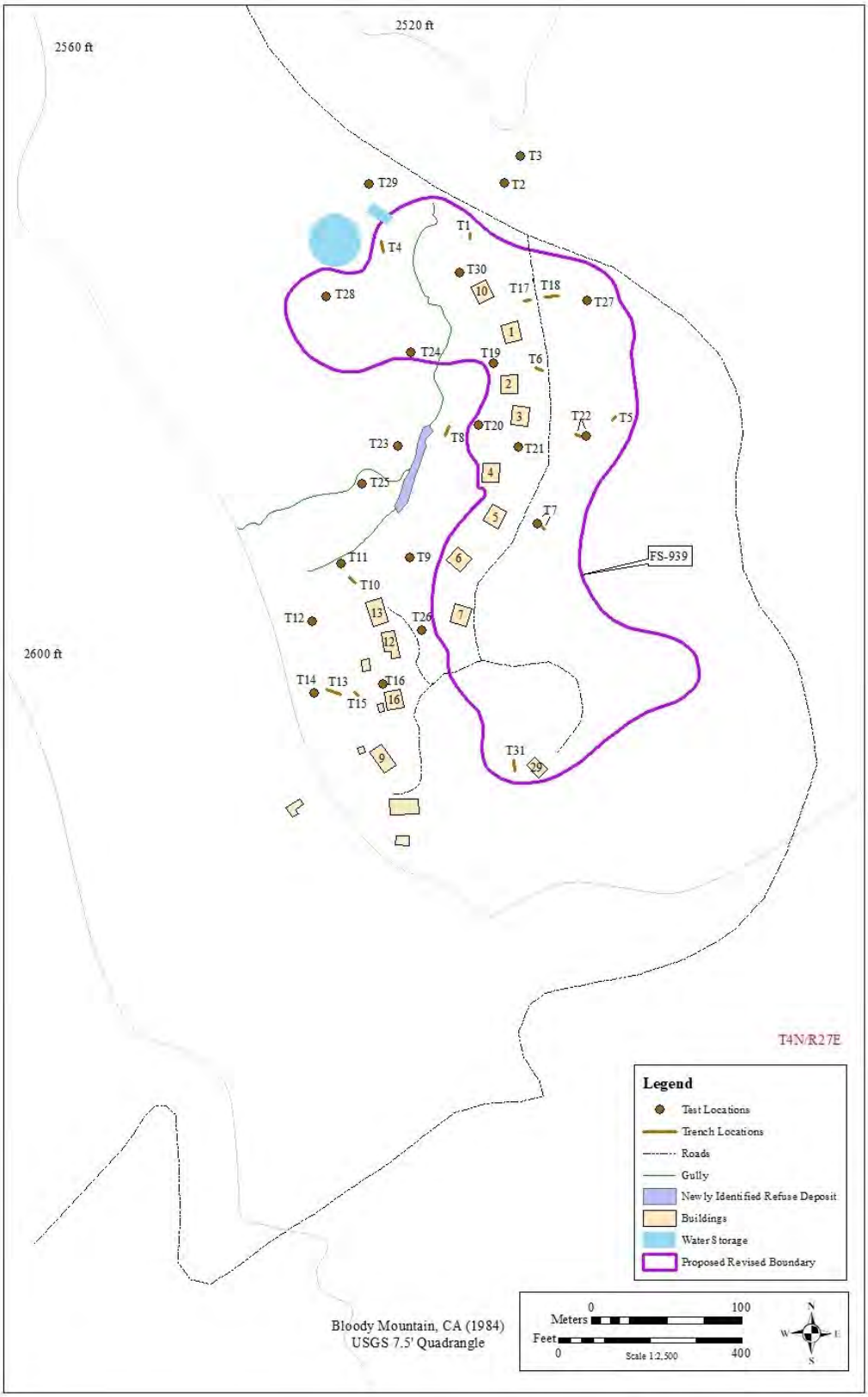


Figure 3 - Proposed new boundary for site FS-05-04-52-939.

Appendix E. Daily Field Logs

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazor
Client: US Forest Service
Day: Monday
Date: 10/8/2018
Project Name: Mammoth
Project No.: 20170115
Weather: Cold & clear (~40°F @ 7AM)
Page: 1 of
Site Visitors: Noelle Graham, USFS; Lizzie Bennett, GZ Archaeology

Description of Field Activities:

7-7:30: Daily tailgate and health & safety meeting
7:30-8:30: Site walk, flagging/marking trench sites w/ archaeologist while private utility locator clears
8:30-9:00: Site briefing w/ Noelle (USFS), who brought an XRF to perform her own survey of contamination (primarily to east of cabins)
9:00-10:00: Mammoth water arrives for brief site meeting to confirm utility locations; calibrating XRF.
10:00-10:50: Dig first trench @ site location [T1] w/ mini-ex. Located along Old Mammoth Rd to S, just W of ⊥ w/ Old Mill Tract Rd. Trench 9.3 ft N/S length.

(T1)
XRF 1 (S end trench @ 4" bgs): Hg: 1269 ± 12 Pb: 482 ± 5 As: 75 ± 4
XRF 2 (N end) @ 4" bgs: Hg: 543 ± 7 Pb: 326 ± 4 As: 51 ± 3
XRF 3 (S end) @ 8" bgs: Hg: <5.3 Pb: 27.8 ± 1.7 As: 4.1 ± 1.1
XRF 4 (N end) @ 8" bgs: Hg: 8.3 ± 1.8 Pb: 34.4 ± 1.7 As: 3.9 ± 1.1
XRF 5 (N end) @ 12" bgs: Hg: 6.3 ± 1.8 Pb: 31.3 ± 1.7 As: 4.7 ± 1.1
XRF 6 (S end) @ 12" bgs: Hg: 6.8 ± 1.5 Pb: 25.7 ± 1.6 As: 7.2 ± 1.1

11:45 Return to collect lab samples: S end of trench
MM-S-111-~~12.5~~ 1.0 (@ 11:50) & MM-S-111-~~3.0~~ 1.0 (@ 11:51)

10:50-11:10: Dig test hole @ site location [T2] w/ shovels. Located N of Old Mammoth Rd, W of Creek

(T2)
XRF 1 (@ 1" bgs): Hg: 59 ± 3 Pb: 70 ± 2 As: 10.5 ± 1.4
XRF 2 (@ 6" bgs): Hg: 28 ± 2 Pb: 42.5 ± 1.8 As: 10.3 ± 1.2
XRF 3 (@ 12" bgs): Hg: 8.8 ± 1.8 Pb: 29.7 ± 1.6 As: 3.1 ± 1.1

11:30 Return to collect lab samples:
MM-S-112-~~12.0~~ 1.0 (@ 11:35) & MM-S-112-~~3.0~~ 1.0 (@ 11:36)

Signed: [signature] Date: 10/8/2018

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazor
Day: Monday
Project Name: Mammoth
Weather: Clear & cold
Site Visitors: Lizzy Bennett, QZ

Client: USPS
Date: 10/8/2018
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

11:10-11:30: Dig pot hole @ site location [T3] w/ shovels
↳ across from old Mammoth Rd, E of creek
XRF 42 (@3" bgs) Hg: [illegible] Pb: [illegible] As: [illegible]
↳ entering into gravelly, lighter-colored soil beneath dust
XRF 43 (@12" bgs) Hg: 8.7 ± 1.8 Pb: 32.3 ± 1.6 As: 12.1 ± 1.2
☒ Collected lab samples:
MM-S-110-~~12.0~~ 1.0 @ 11:22 (fine gravel, med-gray/brown)
MM-S-110-~~30.0~~ 2 @ 11:26 (grayer than deeper sample)
13:00: Take XRF readings @ locality approx 50 ft NW of T4
44 XRF 44 (@3") Hg: 394 ± 6 Pb: 209 ± 3 As: 32 ± 2
AT [T4]: NW/SE striking trench approx. 19 ft lateral distance.
45 XRF 45 (11 ft from SE end) @3" bgs: Hg: 25 ± 2 Pb: 30.6 ± 1.6 As: <3.1
46 XRF 46 (NW end, @3" bgs): Hg: <5.7 Pb: 31.9 ± 1.8 As: 4.4 ± 1.2
47 XRF 47 (SE end @3" bgs): Hg: 1133 ± 11 Pb: 383 ± 5 As: 140 ± 4 Ag: 60 ± 6
49 XRF 49 (NW end @14" bgs): Hg: 5.3 ± 1.7 Pb: 33.8 ± 1.7 As: <3.3
48 ↳ XRF 48 (NW end @6" bgs): Hg: 79 ± 3 Pb: 68 ± 2 As: 7.2 ± 1.4
* Note: high [Hg, Pb, As] are variable & appear to be concentrated near top of soil horizon, approx 2-4" bgs.
☒ Lab samples @ NW end of T4 trench:
MM-S-114-~~14.0~~ (@ 14:20)
MM-S-114-~~6.0~~ 0.5 (@ 14:23)
50 XRF 50 (SE end @6" bgs): Hg: 290 ± 5 Pb: 83 ± 2 As: 24 ± 1.7
51 XRF 51 (SE end @32" bgs): Hg: 13.6 ± 2 Pb: 32.0 ± 1.7 As: 5.5 ± 1.2
☒ Lab samples @ SE end of T4 trench:
MM-S-115-~~32.0~~ 2.7 (@ 14:40) & MM-S-115-~~3.0~~ 0.3 (@ 14:30)
* Note: trench oriented 104° SE of N (strike)

Signed: [signature] Date: 10/8/2018

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Nalazor
Day: Monday
Project Name: Mammoth
Weather: Cold & clear
Site Visitors: Izzy Bennett, GZ

Client: USFS
Date: 10/8/2018
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

14:10 : Samples @ MM-S-113, west of T4
XRF 52 (@ 8" bgs) : Hg: <6.0 Pb: 27.5 ± 1.9 As: <3.6
XRF 53 (@ 3" bgs) : Hg: 33 ± 3 Pb: 32 ± 2 As: 6.9 ± 1.7
Ag: 31 ± 8
[X] Lab samples : MM-S-113-3.0 (@14:10)
MM-S-113-8.0 (@14:12)
14:50-16:00 : Trenching T5 South of Old Mammoth Rd, E of Old Mill Tract across from cabin 3.
XRF 54 @ 6" bgs : Hg: 22 ± 2 Pb: 29.6 ± 1.6 As: 94.9 ± 1.8
T5 XRF 55 @ 14" bgs : Hg: 48 ± 2 Pb: 36.6 ± 1.7 As ~~Fe~~: 178 ± 2
XRF 56 @ 29" bgs : Hg: 21 ± 2 Pb: 26.7 ± 1.7 As: 233 ± 3
↳ Trench full of boulders, 20-24" in diameter interspersed throughout. Surrounding area filled w/ rocks cobbles and drainage.
[X] Noticing that [As] ↑ w/ depth markedly east of Old Mill Tract Rd.
16:00 - Demob for day

Signed: [signature]

Date: 10/8/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazor
Day: Tuesday
Project Name: Mammoth
Weather: chilly & clear.
Site Visitors: Lizzie Bennett (GZ)

Client: USFS
Date: 10/9/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

0700-0730 Daily tailgate meeting, H&S updates. Noted marked trees that teams are to stay clear of as new safety hazard.

0730-0845 Returned to [T5] to trench to 3ft bgs. Calibrated XRF w/ holster standard.

XRF readings @ T5 (cont'd from 10/8/18):

57 XRF4 @ 6" bgs: Hg: 25±2 Pb: 29.7±1.7 As: 93.9±1.8 Ni: 19±5

58 XRF5 @ 12" bgs: Hg: 43±2 Pb: 28.8±1.6 As: 114.4±1.9 Ni: 40±5

59 XRF6 @ 24" bgs: Hg: 37±2 Pb: 28.2±1.6 As: 233±3 Ni: 23±5

60 XRF7 @ 36" bgs: Hg: 10±2 Pb: 22.1±1.7 As: 266±3 Ni: 26±6

61 XRF8 @ 48" bgs: Hg: <7 Pb: 28.2±2 As: 141±3 Ni: 26±7

62 XRF9 @ 48.4" bgs: Hg: <7 Pb: 116.6±1.9 As: 55±2 Ni: <21

[X] Lab samples: ~~MM-S-116-48~~ at [T5], southern end.

① MM-S-116-4.0 @ 0820
② MM-S-116-2.3 @ 0823
③ MM-S-116-0.5 @ 0829

NOTE: will hold samples at lab until confirming w/ USFS.

0855-0930: Begin excavation at [T6] trench, just west of Old Mill Tract Rd, ENE of Cabin 2.

XRF readings @ T6 (NW end of trench):

63 XRF1 @ 6" bgs: Hg: 6.0±1.8 Pb: 29.9±1.7 ~~As: 18.5±1.2~~ As: 18.5±1.2 ~~Ni: 19±5~~ Ni: 19±5

64 XRF2 @ 3" bgs: Hg: 65±3 Pb: 60±2 As: 16.7±1.5 Ni: 72±6

XRF readings @ T6 (SE end of trench):

65 XRF3 @ 6" bgs: Hg: 8.8±1.9 Pb: 30.1±1.7 As: 8.8±1.2 Ni: 19±5

Signed: [signature] Date: 10/9/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Tuesday
Project Name: Mammoth
Weather: Chilly & clear
Site Visitors: Little Bennet, GZ

Client: USFS
Date: 10/9/2018
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

(A) XRF sampling from T6 locality, SE end (cont'd):

66 XRF4 @ 3" bgs: Hg: 175±4 Pb: 133±3 As: 20.9±1.9 Ni: 45±6 Ag: 29±5

67 XRF5 @ 12" bgs: Hg: 8.3±1.8 Pb: 27.0±1.6 As: 16.1±1.1 Ni: 68±5

68 XRF6 @ 18" bgs: Hg: 6.4±1.9 Pb: 31.2±1.8 As: 6.8±1.2 Ni: <17

(A) XRF sampling from T6 locality, NW end (cont'd):

69 XRF7 @ 12" bgs: Hg: <5.3 Pb: 26.3±1.6 As: 17.4±1.2 Ni: 26±5

70 XRF8 @ 18" bgs: Hg: 8.6±1.9 Pb: 25.0±1.6 As: 15.3±1.2 Ni: 68±6

(A) Lab samples at T6 locality, at SE end of trench:
① MM-5-117-1.5 @ 0921
② MM-5-117-0.3 @ 0922

0930-1030: Begin excavation at T7 locality, east of Old Mill Tract Rd, just west of creek.

(A) XRF sampling from T7A, SE end of trench:

71 XRF1 @ 3" bgs: Hg: 22±2 Pb: 70±2 As: 27.9±1.5 Ni: 22±5

72 XRF2 @ 6" bgs: Hg: 18±2 Pb: 53.4±1.9 As: 34.9±1.5

73 XRF3 @ 12" bgs: Hg: 9.2±1.8 Pb: 35.9±1.7 As: 21.5±1.3 Ni: 44±5

(A) XRF sampling from T7A, NW end of trench:

74 XRF4 @ 3" bgs: Hg: 8.2±1.9 Pb: 72±2 As: 12.3±1.5 Ni: 24±5

75 XRF5 @ 6" bgs: Hg: 8.9±1.8 Pb: 47.4±1.8 As: 25.5±1.4 Ni: 31±5

76 XRF6 @ 12" bgs: Hg: 5.9±1.8 Pb: 26.2±1.6 As: 19.9±1.2 Ni: <16

Signed: Ava Lazar

Date: 10/9/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Tuesday
Project Name: mammoth
Weather: Chilly & clear
Site Visitors: Lizzy Bennet, G2

Client: USFS
Date: 10/9/2018
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

[*] Lab samples @ T7A locality, SE end of trench:
① MM-S-119-1.0 @ 1023
② MM-S-119-0.3 @ 1025
NOTE: Will hold samples until confirm w/ USFS.
- Approx 9.5' NW of T7A, dug pot hole [T7B].
(*) XRF sampling at T7B locality:
77 XRF1 @ 3" bgs: Hg: 9.7 ± 1.8 Pb: 34.5 ± 1.6 As: 17.0 ± 1.2 Ni: 28 ± 5
78 XRF2 @ 6" bgs: Hg: 14.2 ± 1.9 Pb: 44.9 ± 1.8 As: 27.7 ± 1.4 Ni: 28 ± 5
79 XRF3 @ 12" bgs: Hg: 11.3 ± 1.8 Pb: 30.3 ± 1.6 As: 18.2 ± 1.2 Ni: 52 ± 5
[*] Lab samples @ T7B locality:
① MM-S-118-1.0 @ 1016
② MM-S-118-0.3 @ 1018
1045-1115: Begin excavation at [T8] locality. West of Old Mill Tract Rd, W of Cabins 2 & 3. Note original planned location of T8 was moved N by ~150' due to unearthed cans excavated by scavengers since October 2017.
(*) XRF readings @ [T8], S end of trench:
80 XRF1 @ 3" bgs: Hg: 6.0 ± 2.0 Pb: 28.2 ± 1.8 As: 4.0 ± 1.2
81 XRF2 @ 6" bgs: Hg: < 5.2 Pb: 30.2 ± 1.7 As: < 3.2
(*) XRF reading @ T8, N end of trench:
82 XRF3 @ 6" bgs: Hg: 6.3 ± 1.8 Pb: 30 ± 1.7 As: 4.6 ± 1.1 Ni: 45 ± 5
[*] Lab sample @ T8 locality, S end of trench:
① MM-S-120-0.3 @ 1102
1115-1145: Begin excavation at [T9] locality.
(*) XRF readings @ T9 (pot hole):
83 XRF1 @ 3" bgs: Hg: 177 ± 4 Pb: 157 ± 3 As: 216 ± 1.9 Ag: 25 ± 5 Ni: 40 ± 5

Signed: [signature] Date: 10/9/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lator
Day: Tuesday
Project Name: Mammoth
Weather: Chilly & clear
Site Visitors: Lizzy Bennett, GZ

Client: USFS
Date: 10/9/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

(*) XRF sampling @ T9 locality, cont'd:

84 XRF2 @ 6" bgs: Hg: 5.5 ± 1.8 Pb: 22.6 ± 1.6 As: 4.5 ± 1.0

85 XRF3 @ 12" bgs: Hg: 12 ± 1.9 Pb: 25.1 ± 1.6 ~~As: 21.6 ± 1.9~~ As: 5.7 ± 1.1 Ni: 54 ± 6

(*) Lab samples @ T9 locality:

(1) MM-S-121-1.0 @ 1135

(2) MM-S-121-0.3 @ 1137

1230-1330: Begin excavation @ T10 locality, just east of drainage west of Old Mill Trail Rd, North of Cabin 13. middle of (AL)

(*) XRF readings @ T10, ~~NW end of~~ trench:

86 XRF1 @ 3" bgs: Hg: 39 ± 2 Pb: 39.3 ± 1.7 As: 8.3 ± 1.2 Ni: 50 ± 6

87 XRF2 @ 6" bgs: Hg: 17 ± 2 Pb: 30.6 ± 1.8 As: <3.5 Ni: <17

88 XRF3 @ 12" bgs: Hg: 12.4 ± 1.8 Pb: 23.7 ± 1.5 As: 4.4 ± 1.0 Ni: 64 ± 5

(*) XRF readings @ T10, SE end of trench:

89 XRF4 @ 3" bgs: Hg: 322 ± 5 Pb: 136 ± 3 As: 19.8 ± 1.8 Ni: 15 ± 5

90 XRF5 @ 6" bgs: Hg: 314 ± 5 Pb: 74.9 ± 1.9 As: 8.4 ± 1.3

91 XRF6 @ 12" bgs: Hg: 265 ± 6 Pb: 49 ± 2 As: <4.5 Ni: <18

- Extended trench further NW @ T10 to perform further XRF sampling.

(*) XRF readings @ furthest NW end of T10 trench:

92 XRF7 @ 3" bgs: ~~29.7 Pb~~ Hg: 29 ± 2 Pb: 43.3 ± 1.8 As: 6.1 ± 1.2 Ni: 40 ± 5

93 XRF8 @ 6" bgs: Hg: 79 ± 3 Pb: 61 ± 2 As: 11.4 ± 1.6 Ni: 42 ± 6

Signed: [signature] Date: 10/9/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Tuesday
Project Name: Mammoth
Weather: Clear & chilly
Site Visitors: Lizzy Bennet, GZ

Client: USFS
Date: 10/9/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

(*) XRF readings @ T10, SE end of trench:
94 XRF9 @ 18" bgs: Hg: 198 ± 4 Pb: 30.7 ± 1.7 As: 4.0 ± 1.1 Ni: 43 ± 6
95 XRF10 @ 24" bgs: Hg: 14.6 ± 1.9 Pb: 32.5 ± 1.7 As: 3.9 ± 1.1 Ni: 64 ± 6
(*) Lab samples at [T10], furthest NW end of trench:
① MM-S-122-0.5 @ 1319
(*) Lab samples at [T10] @ SE end of trench:
① MM-S-122-2.0 @ 1303
② MM-S-122-1.5 @ 1305
③ MM-S-122-0.3 @ 1306
1320-1400 Begin excavating @ [T11] locality, west of T10 by approx. 50 ft. Pot hole only.
(*) XRF readings @ [T11]:
96 XRF1 @ 3" bgs: Hg: 24 ± 2 Pb: 32.5 ± 1.7 As: 3.7 ± 1.1 Ni: 27 ± 5
97 XRF2 @ 6" bgs: Hg: 8.5 ± 1.9 Pb: 30.3 ± 1.7 As: 3.9 ± 1.1 Ni: 57 ± 6
(*) Lab samples @ [T11]:
① MM-S-124-0.3 @ 1350
Note: used grease gun on mini excavator from 1350-1400.
1409-1430 Began hand digging at [T12] locality, up the hill west of MM-S-30 by approx. 20 ft. Pot hole only.
(*) XRF reading at T12:
98 XRF1 @ 6" bgs: Hg: 21 ± 2 Pb: 28.4 ± 1.6 As: <3.2
99 XRF2 @ 3" bgs: Hg: 11.5 ± 1.9 Pb: 33.2 ± 1.8
(*) Lab sampling at [T12]:
① MM-S-125-0.6 @ 1415
- Note: at 1421, a curious passerby came by & asked about the project. We informed them we were performing

Signed: [signature] Date: 10/9/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Tuesday
Project Name: Mammoth
Weather: Clear & chilly
Site Visitors: Larry Bennet, GZ

Client: USPS
Date: 10/9/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

environmental surveying, and they moved on.
1430 - Began excavating at [T13] locality, just east and south of T12, west of cabin 8.
(*) XRF readings at WNW end of trench:
100 XRF1 @ 6": Hg: 31±3 Pb: 37±2 As: <4.0 Ni: <18
101 XRF2 @ 12": Hg: <5.8 Pb: 29.8±1.9 As: <3.6 Ni: <18
102 XRF3 @ 4": Hg: 49±2 Pb: 63.3±2.0 As: 9.2±1.4 Ni: 39±5
(*) XRF readings at center of trench, 14 ft from W end:
103 XRF4 @ 5" bgs: Hg: 24±2 Pb: 36.2±1.8 As: 3.8±1.2
104 XRF5 @ 8" bgs: Hg: 16±2 Pb: 20.9±1.6 As: <3.1 Ni: 73±6
105 XRF6 @ 12" bgs: Hg: <5.5 Pb: 29.0±1.7 As: <3.3 Ni: <16
1450 - Dig small pothole at new [T14] locality, approx. 30 ft WNW of T13 trench.
(*) XRF readings @ T14:
106 XRF1 @ 4" bgs: Hg: 10±2 Pb: 26.4±1.7 As: <3.4 Ni: 18±6
107 XRF2 @ 8" bgs: Hg: <5.6 Pb: 27.6±1.7 As: 4.1±1.2
[*] Lab samples taken from [T14]:
① MM-S-126-0.4 @ 1450
1500 - Return to T13 to extend trench to ESE.
(*) XRF readings @ T13 (cont'd), new ESE end of trench:
108 XRF7 @ 6" bgs: Hg: 49±2 Pb: 54.9±1.8 As: 9.8±1.3 Ni: 50±5
109 XRF8 @ 12" bgs: Hg: <5.5 Pb: 30.0±1.8 As: <3.5 Ni: <17
[*] Lab samples @ T13, ESE end of trench:
① MM-S-127-1.0 @ 1518
② MM-S-127-0.5 @ 1519

Signed: [signature] Date: 10/9/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lanor
Day: Tuesday
Project Name: Mammoth
Weather: Clear & chilly
Site Visitors: Terry Bennett, GZ

Client: USFS
Date: 10/9/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

1530-1600: Began excavation @ [T15] locality, just east of T13.

(*) XRF readings @ T15, east end of trench:

110 XRF1 @ 5" bgs: Hg: 7.7 ± 1.8 Pb: 36.4 ± 1.7 As: 3.4 ± 1.1 Ni: <15

111 XRF2 @ 12" bgs: Hg: 8.9 ± 1.8 Pb: 28.8 ± 1.6 As: <3.1 Ni: 49 ± 5

(*) XRF readings @ T15, west end of trench:

112 XRF3 @ 3" bgs: Hg: 7.1 ± 1.8 Pb: 32.4 ± 1.7 As: 5.6 ± 1.1 Ni: 50 ± 6

113 XRF4 @ 6" bgs: Hg: 130 ± 4 Pb: 711 ± 6 As: 41 ± 4 Ni: 42 ± 5

114 XRF5 @ 14" bgs: Hg: <5.5 Pb: 30.1 ± 1.7 As: <3.4 Ni: <17

(*) XRF readings @ T15, east end of trench (cont'd):

115 XRF6 @ 8" bgs: Hg: 52 ± 3 Pb: 128 ± 3 As: 5.8 ± 1.7 Ni: 21 ± 5

(*) Lab samples from [T15] locality, colocated with MM-S-63 from ERRG project work in October 2017:

① MM-S-63-0.5 @ 1556

② MM-S-63-1.0 @ 1600

- Began excavating T16 (east of T15), but XRF battery died.

1600 - Demob for day.

Signed: [signature] Date: 10/9/16

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Wednesday
Project Name: Mammoth
Weather: Clear & Cold
Site Visitors: Lizzy Bennett, GZ

Client: USFS
Date: 10/10/18
Project No.: 2017015
Page: ____ of ____

Description of Field Activities:

7-7:30 Hg capsule readings - low flow calibration is average 0.5037 L/min.
GilAir v/o low flow module calibration is average 2.465 L/min.

7:40 → Turning air filters on for collection - Hg & ~~[illegible]~~ are in collection

7:40-8:00 Safety tailgate meeting. Completed personal Data Sheet and calibration.
Background reading for personal Dir RAM: CONC: 0.000 mg/m³, TWA 0.000 mg/m³.

~~8:00~~ Calibrated XRF. Then mobilize to

8:00-8:30 Continue site investigation at T16 locality (same as MM-S-62)

116 XRF1 @ 3" bgs: Hg: 5.2±1.7 Pb: 49.2±1.8 Ni: 19±5 As: 9.4±1.3
117 XRF2 @ 6" bgs: Hg: 7.1±1.7 Pb: 53.6±1.9 Ni: 18±5 As: 8.7±1.3
118 XRF3 @ 9" bgs: Hg: 7.7±1.8 Pb: 57.4±1.9 Ni: 28±5 As: 7.8±1.3
119 XRF4 @ 12" bgs: Hg: 27±2 Pb: 109±2 Ni: <16 As: <5
120 XRF5 @ 18" bgs: Hg: 13.7±2.0 Pb: 58±2 Ni: <16 As: 7.6±1.4

↳ Approx. 6" soil horizon, notable moisture present. Beneath this horizon, soil is notably less consolidated.
Will return for GPS coordinates.

8:40-9:20 Begin excavation at T17, just west of Old Mill Tract Rd, Just S of Old Mammoth. North 15 ft of Cabin 1.

121 XRF1 @ W end, @ 3" bgs: Hg: 332±5 Pb: 125±2 As: 15.4±1.7 Ni: 17±5 Hg: 23±5
122 XRF2 @ W end @ 6" bgs: Hg: 314±5 Pb: 125±2 As: 16.1±1.7 Ni: 40±5 Hg: 31±5
123 XRF3 @ W end @ 9" bgs: Hg: 37±2 Pb: 38.4±1.7 Ni: 24±5 As: 9.2±1.2
124 XRF4 @ W end @ 12" bgs: Hg: 19±2 Pb: 29.7±1.7 Ni: 47±6 As: 5.6±1

Signed: [signature] Date: 10/10/18

Lab samples @ T17: MM-S-128-~~12.0~~ @9:00 HOLD
MM-S-128-~~6.0~~ 0.5 @9:03 HOLD

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Larson
Day: Wednesday
Project Name: Mammoth
Weather: Clear & cold
Site Visitors: Lizzy, Bennett, GZ

Client: USFS
Date: 10/10/18
Project No.: 2017005
Page: ____ of ____

Description of Field Activities:

—Need to come back and GPS T17.

9:20-9:45 Begin excavation at [T18], just E of T17 on E side of old Mill Tract Rd.

Bkt reading: 0.004 mg/m3 CONC, 0.002 mg/m3 TWA } Taken during trench excavation w/ mini-excavator.

125 XRF1 @E end @ 6" bgs: Hg: 257±5 Pb: 93±2 As: 18.6±1.6 Ni: 21±5

126 XRF2 @E end @ [illegible]" bgs: Hg: 63±3 Pb: 55.4±1.9 As: 19.8±1.4 Ni: 28±5

127 XRF3 @E end @ 12, 18" bgs: Hg: 25±2 Pb: 35.8±1.7 As: 18.5±1.2 Ni: 28±5

128 XRF4 @E end @ 24" bgs: Hg: <6 2.0 Pb: 29±2 As: 10.3±1.4 Ni: <19

Lab samples: MM-S-129-~~24.0~~ 2.0 @9:30 — Note: Hold 24" sample pending analysis of 12" sample for presence/concentration of arsenic

MM-S-129-~~6.0~~ 0.5 @9:35

MM-S-129-~~18.0~~ 1.5 @9:36

9:50-10:30 Begin excavation at [T19] locality, in between Cabins 1 & 2. Trenching to approx. 2 ft.

129 XRF1 @3" @ W end: Hg: 33±2 Pb: 44.6±1.8 As: 5.5±1.2 Ni: 21±5

130 XRF2 @6" @ W end: Hg: 11.7±1.8 Pb: 35.6±1.7 As: <3.2 Ni: 37±5

131 XRF3 @12" @ W end: Hg: <5.3 Pb: 29.5±1.7 As: <3.3 Ni: <16

Lab samples: MM-S-130-~~0.5~~ @10:11 NOTE: Hold sample 6.0 unless 3.0 comes back hot after analysis.

MM-S-130-~~3.0~~ 0.3 @10:12

10:40-11:10 Begin excavation @ [T20] locality, just west of Cabin 3. Note extremely well defined soil stratigraphy, including a white/gray layer 1.5-2" thick.

Tailings

132 XRF1 @3" on E side: Hg: 234±4 Pb: 77±2 As: 16.5±1.5 Ni: <14

133 XRF2 @6" on E end: Hg: 677±8 Pb: 316±4 As: 57±3 Ni: 24±5 Aj: 133±5

134 XRF3 @9" on E end: Hg: 121±3 Pb: 30.4±1.7 As: <3.2 Ni: 28±5

135 XRF4 @12" on E end: Hg: 154±5 Pb: 48±2 As: 6.4±1.5 Ni: <19

Signed: [signature] Date: 10/10/18

136 XRF5 @18" on E end: Hg: 20.2±1.9 Pb: 30.1±1.5 As: <3.0 Ni: 48±5

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazer
Day: Wednesday
Project Name: Mammoth
Weather: Clear & cold
Site Visitors: Lizzy Bennett, GZ

Client: USPS
Date: 10/10/18
Project No.: 2017015
Page: ____ of ____

Description of Field Activities:

T20 (cont'd)

Lab samples MM-S-131-~~18.0~~ 1.5 @10:56
MM-S-131-~~0.0~~ 0.3 @10:58

11:15-11:45 Begin excavation at T21 locality, between (N/S) cabins 3 & 4.

137 XRF1 @1" bgs @E end: Hg: 290±5 Pb: 219±3 As: 57±2 Ag: 58±5 Ni: 24±5
138 XRF2 @3" bgs @E end: Hg: 338±5 Pb: 221±3 As: 58±2 Ag: 35±5 Ni: 25±5
139 XRF3 @6" bgs @E end: Hg: 53±2 Pb: 48.1±1.7 As: 10.8±1.2 Ni: 22±5
140 XRF4 @9" bgs @E end: Hg: 42±2 Pb: 52.3±1.8 As: 11.0±1.3 Ni: 26±5
141 XRF5 @12" bgs @E end: Ag: 47±2 Pb: 54.4±1.7 As: <3.4 Ni: 28±5
142 XRF6 @18" bgs @E end: Hg: 6.6±1.7 Pb: 33.5±1.6 As: <3.2 Ni: 30±5

Lab samples: MM-S-132-~~18.0~~ 1.5 @11:34
MM-S-132-~~3.0~~ 3.3 @11:35

Note: ~~pump~~ air monitoring pump turned off @ 11:55. Turned back on at 12:25. (A&B)

12:30-1320 Begin excavation at T22 locality, just E of Old Mill Trail ~~[illegible]~~ across from Cabin 2.

143 XRF1 @3" E end: Hg: 19±2 Pb: 27.1±1.6 As: 9.6±1.1 Ni: 51±6
22A 144 XRF2 @6" E end: Hg: 47±2 Pb: 47.9±1.8 As: 23.9±1.4 Ni: 20±5
145 XRF3 @9" E end: Hg: 7.8±1.8 Pb: 29.9±1.6 As: 64.9±1.6 Ni: 19±5
146 XRF4 @3" very E end Hg: 16±3 Pb: 37±2 As: 50±2 Ni: <21
147 XRF5 @6" " Hg: 17.8±1.8 Pb: 43.7±1.7 As: 67.9±1.6 Ni: <14
148 XRF6 @12" " : Hg: 41±3 Pb: 52±2 As: 41.7±1.7 Ni: <17
149 XRF7 @15" " : Hg: 29±3 Pb: 41±2 As: 31.6±1.7 Ni: <18
150 XRF8 @12" remain. Hg: 43±2 Pb: 54.0±1.7 As: 29.0±1.2 Ni: <14

22B Lab samples: MM-S-133-~~15.0~~ 13.5 @13:05
MM-S-133-~~12.0~~ @13:07
MM-S-133-~~30.0~~ 30.3 @13:10.

(*) Note: hold samples until MM-S-133-12.0 comes back. If clean, ~~[illegible]~~ will run.

Floodplain deposits, very rich soil, large cobbles, pinnacle detritus N 2-3cm

Signed: [signature]
Date: 10/10/18

Note: T22B distance to creek approx 10ft.

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Wednesday
Project Name: Mammoth
Weather: Cold & clear
Site Visitors: Lizzy Bennett, G2

Client: USPS
Date: 10/10/18
Project No.: 70170118
Page: ____ of ____

Description of Field Activities:

13:30-14:00 Begin excavating @ TEST PIT [T23], due W of cabin 4, W of creek.

151 XRF1 @ 5": Hg: 14.2±1.9 Pb: 33.5±1.7 As: 3.3±1.1 Ni: 22±5
152 XRF2 @ 8": Hg: 8.1±1.8 Pb: 33.4±1.7 As: <3.4 Ni: <15
153 XRF3 @ 12": Hg: <6 Pb: 28.9±1.9 As: <3.7 Ni: <18
154 XRF4 @ 18": Hg: <4.6 Pb: 23.7±1.5 As: <2.8 Ni: <14

Note: Duff was primarily wood chips, approx. 4" bgs. Following duff, soil is primarily fine-grained and "clumpy" (i.e., indurated) and penetrates to ~8" bgs. Cans were found at this layer. Fine gravel (~10-15%, 1-10 mm in diameter). Underlain by medium-grained silty, notably yellower soil.

Lab sample: [MM-S-134-0.4] @ 1345

14:00-14:20 Begin excavating at TEST PIT [T24] SE of water tank on hill and due W of cabin 1.

2" of duff/wood chips, then 4" of gray/brown

155 XRF1 @ 3": Hg: 8.9±1.7 Pb: 35.1±1.6 As: <3.2 Ni: 31±5
156 XRF2 @ 6": Hg: <5.4 Pb: 34.1±1.9 As: <3.6 Ni: <17
157 XRF3 @ 12": Hg: <7 Pb: 28±2 As: <4.3 Ni: <22

*Lab sample: [MM-S-135-0.3] 14:09

14:25-14:40 Begin excavating at TEST PIT [T25], just W of cabin 5, closer to 6. Just NW of XRF06. Primarily homogenous, fine-grained & silty.

2-3 in of duff. Soil becomes dry @ ~12", otherwise moist.

158 XRF1 @ 3": Hg: <4.8 Pb: 25.7±1.5 As: <2.9 Ni: 36±5
159 XRF2 @ 6": Hg: <5.1 Pb: 25.2±1.6 As: <3.0 Ni: 30±5
160 XRF3 @ 12": Hg: 6.1±1.8 Pb: 31.1±1.7 As: 3.4±1.1 Ni: 35±5
161 XRF4 @ 18": Hg: 8±2 Pb: 38±2 As: <3.9 Ni: 20±6

Signed: [signature] Date: 10/10/18

* Lab samples: [MM-S-136-0.3] @ 1431 Some 1-10 mm pebbles throughout.

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Larar
Day: Wednesday
Project Name: Mammoth
Weather:
Site Visitors: Lizzy Bennett, GZ

Client: USFS
Date: 10/10/18
Project No.: 2017015
Page: ____ of ____

Description of Field Activities:

14:45-15:00 Begin excavating at TEST PIT 126, just SSW of Cabin 7.

162 XRF₁ @ 3" bgs: Hg: 66 ± 3 Pb: 61 ± 3 As: 14.2 ± 1.9 Ni: 29 ± 5

163 XRF₂ @ 6" bgs: Hg: 13.2 ± 1.9 Pb: 62 ± 2 As: 4.4 ± 1.4 Ni: <15

164 XRF₃ @ 12" bgs: Hg: <8 Pb: 32 ± 3 As: <4.8 Ni: <25

Approx 2" of duff underlain by fine-grained to silty, med- to dark-brown soil w/ high concentration of organics and moisture. Characterized by lower % sand. Beneath approx. 6-8", the color of the soil lightens gradationally to become light to med. brown w/ yellow tinge. Higher sand content (30-40%).

*Lab samples: MM-S-137-~~12.5~~ @ 14:58 (in this 6-8" horizon.
MM-S 137-~~3.5~~ @ 15:00 small pebbles of pumice 5-10 mm dia, approx 5-10%.

15:00-15:30 Explored w/ XRF the surface beneath duff (1-3" bgs) to spot check chem soil readings around Cabin 29. ~~Hg characteristic~~ High As characterizes the area, max ~132. Hg levels did not exceed 20. Pb was below cleanup levels as well. As, however, was consistently high around perimeter of property.

15:40 - Removed personal air sampling equipment, packed equipment for the day.

SAMPLES: GILMRC.112 - Sample AIR01 (Hg, low-flow)
11405 - Sample AIR02 (Metals, reg flow)

Signed: [signature] Date: 10/10/2018

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by:	Ava Lazor	Client:	USFS
Day:	Thursday	Date:	10/11/18
Project Name:	Mammoth	Project No.:	2017 0115
Weather:	Cool & clear	Page:	of
Site Visitors:	Larry Bennett, GZ		

Description of Field Activities:

7:00-7:30 Arrive on site, perform health & safety tailgate meeting. Calibrate XRF. >200 Hg @6" bgs

7:30-8:00 Begin excavation @ TEST PIT T27, due E of T18, just S of Old Mammoth Rd.

XRF1 @ 3" bgs: Hg: <5.7 Pb: 50±2 As: 21.1±1.5 Ni: <17

165 XRF2 @ 6" bgs: Hg: 10.2±1.8 Pb: 64.2±1.9 As: 18.9±1.4 Ni: <14

166 XRF3 @ 9" bgs: Hg: 14.2±1.9 Pb: 43.7±1.8 As: 54.3±1.6 Ni: 18±5

167 XRF4 @ 12" bgs: Hg: 16±2 Pb: 32.0±1.8 As: 82.4±1.8 Ni: <17

168 XRF5 @ 18" bgs: Hg: <4.4 Pb: 29.1±1.4 As: 42.3±1.3 Ni: <13.

2 jars 3 oz.

Lab sample: MM-S-138-~~3.0~~ @ 7:47

Soil characterized by medium-grn to silty texture. Moisture penetrates to approx 12". Color grades from medium brown to light/med brown w/ more yellow tinge, corresp. w/moisture. Pebbles ~1-10mm interspersed throughout (rounded), approx. 10-12 per 1' transect.

8:10-8:30 Begin excavation at TEST PIT T28, SW of water tank on exposed hillside.

170 XRF1 @ 3" bgs: Hg: 6.1±1.7 Pb: 31.4±1.6 As: <3.1 Ni: 17±5

171 XRF2 @ 6" bgs: Hg: <5.0 Pb: 28.9±1.6 As: <3.0 Ni: <15

2 jars 3 oz

172 XRF3 @ 9" bgs: Hg: <5.3 Pb: 31.7±1.7 As: 3.4±1.1 Ni: <16

173 XRF4 @ 12" bgs: Hg: <5.3 Pb: 30.9±1.7 As: <3.4 Ni: 28±6

174 XRF5 @ 18" bgs: Hg: <6 Pb: 32.2±1.9 As: <3.8 Ni: <18

3-4" duff (wood chips, sticks) covers fine-grn to silty, med-brown, pebble-rich soil to 9-10" depth; noticeably moisture-rich to 10". Soil becomes yellower/lighter >10" depth. Pebbles 1-3 mm. Note presence of one 1.5' cobble. Roots penetrate to 18" bgs.

Signed: Lab sample MM-S-139-~~3.0~~ @ 8:26 Date: 10/11/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Thursday
Project Name: Mammoth
Weather: Cold & Clear
Site Visitors: Larry Bennett, GZ

Client: MPS
Date: 10/11/18
Project No.: 2017015
Page: ____ of ____

Description of Field Activities:

8:30-9:15 Begin excavation @ TEST PIT [T29] locality, N of water tank and S of old Mammoth Rd (~157 ft S).
Approx. 6-8" of duff (wood-rich, mulchy, branches) covers ~0.5-1" thick, light gray, very fine-grn to silty, well sorted layer that pinches out entirely in trench. Underlain by med-grn to silty,
175 XRF1 @ 7" bgs: Hg: 35 ± 2 Pb: 43.0 ± 1.7 As: 5.8 ± 1.2 Ni: 41 ± 5
176 XRF2 @ 10" bgs: Hg: 6.0 ± 1.8 Pb: 28.5 ± 1.7 As: <3.3 Ni: <15
177 XRF3 @ 13" bgs: Hg: 6.5 ± 1.8 Pb: 28.7 ± 1.7 As: <3.2 Ni: <16
178 XRF4 @ 16" bgs: Hg: <5.4 Pb: 27.5 ± 1.7 As: 3.9 ± 1.1 Ni: <16
179 XRF5 @ 22" bgs: Hg: <5.4 Pb: 30.7 ± 1.8 As: <3.4 Ni: <16
moderately well-sorted, med-beige sand w/ 1-30 mm pebbles interspersed @ frequency of 10-15/1' transect. Marked increase in pebble density @ 16" bgs to 25-30/1' transect. Roots penetrate to depth.
[N] Lab samples: [MM-S-140-~~10.0~~ 0.8] @ 9:00
[MM-S-140-~~7.0~~ 0.8] @ 9:03
Note that elevated [Hg] region is so thin and ephemeral that the lab sample is likely to become homogenized w/ surrounding material and yield a negative analysis d/t concentration near detection limit on XRF reading (XRF1).

9:30- Begin excavating at TEST PIT [T30] locality, just NW of Cabin 10, S of old Mammoth Rd by ~3 feet
180 XRF1 @ 3" bgs: Hg: 308 ± 5 Pb: 66 ± 2 As: 13.4 ± 1.5 Ni: <16
181 XRF2 @ 6" bgs: Hg: 160 ± 4 Pb: 62 ± 2 As: 13.3 ± 1.5 Ni: <15
182 XRF3 @ 9" bgs: Hg: 26 ± 2 Pb: 36.4 ± 1.8 As: 5.7 ± 1.2 Ni: <16
183 XRF4 @ 12" bgs: Hg: 91 ± 3 Pb: 43.3 ± 1.8 As: 4.1 ± 1.2 Ni: 32 ± 5
184 XRF5 @ 15" bgs: Hg: 389 ± 6 Pb: 78 ± 2 As: 6.7 ± 1.4 Ni: 23 ± 5

Signed: [signature] Date: 10/11/18

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazar
Day: Thursday
Project Name: Mammoth
Weather: Cold & clear
Site Visitors: Lizzy Bennett, GZ

Client: USFS
Date: 10/11/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

T30 (cont'd)

185 XRF6 @ 18" bgs: Hg: 6.2 ± 1.7 Pb: 31.8 ± 1.6 As: <3.1 Ni: 25 ± 5

186 XRF6 @ 24" bgs: Hg: 5.7 ± 1.7 Pb: 32.1 ± 1.6 As: <3.2 Ni: 24 ± 5

Lab samples: MM-S-141-~~20.0~~ 0.3 @ 9:55

MM-S-141-~~15.0~~ 1.3 @ 10:04

MM-S-141-~~30.0~~ 0.3 @ 10:06

10:30-12:00 Begin digging at T31 locality, ~20 ft W of cabin 29, just E of shed.

~~XRF1 @ S end @ 2" bgs: Hg: 135 ± 2.0 As: 83 ± 3 Pb: 466 ± 5 Ni: <15~~

Note: likely slight strike mixing

187 XRF2 @ S end @ 4" bgs: Hg: 17 ± 2 As: 124 ± 3 Pb: 195 ± 3 Ni: <16

188 XRF3 @ S end @ 7" bgs: Hg: 23 ± 2 As: 151 ± 2 Pb: 68.1 ± 1.9 Ni: 24 ± 5

189 XRF4 @ S end @ 10" bgs: Hg: 25 ± 2 As: 189 ± 2 Pb: 25.6 ± 1.5 Ni: 24 ± 5

190 XRF5 @ S end @ 13" bgs: Hg: 38 ± 2 As: 166 ± 2 Pb: 27.5 ± 1.6 Ni: <15

↳ on white layer

191 XRF6 @ S end @ 18" bgs: Hg: 47 ± 3 As: 98 ± 2 Pb: 30.3 ± 1.9 Ni: <17

↳ still in white/gray "layer" zone

Note: at approx. 3.5', a moderately to well consolidated zone is observed, w/ some amphibole phenocrysts observed.

192 XRF7 @ N end @ 19" bgs: Hg: 29 ± 2 As: 73.1 ± 1.8 Pb: 31.8 ± 1.8 Ni: <17

193 XRF8 @ N end @ 24" bgs: Hg: 63 ± 3 As: 27.2 ± 1.4 Pb: 22.5 ± 1.7 Ni: <16

↳ note: in white, "ashy" zone.

194 XRF9 @ N end @ 28" bgs: Hg: 144 ± 4 As: 50.3 ± 1.5 Pb: 34.1 ± 1.7 Ni: <14

195 XRF10 @ N end @ 33" bgs: Hg: 16 ± 2 As: 13.5 ± 1.2 Pb: 26.7 ± 1.7 Ni: <16.

↳ note: getting more consolidated here. 2.3

Lab sampling on N end: MM-S-142-~~28.0~~ @ 11:36

MM-S-142-~~3.0~~ 0.3 @ 11:46

Signed: [signature] Date: 10/11/18

NOTE: USFS has some historic info on Cabin 29, original cabin burned down recently and current cabin is rebuilt.

ERRG

DAILY FIELD ACTIVITY LOG

Prepared by: Ava Lazor
Day: Thursday
Project Name: Mammoth
Weather: Cold & clear
Site Visitors: Lizzy Bennett, G2

Client: USFS
Date: 10/11/18
Project No.: 20170115
Page: ____ of ____

Description of Field Activities:

XRF data around cabin 29.
XRF1 25 ft S of center of cabin: Hg: <4.4 Pb: 407±2 As: 42.4±1.6 Ni: <13
2" bgs, just below duff
XRF2 16 ft E of NE corner of cabin 29.
Hg: 12.7±1.8 Pb: 107±2 As: 107±2 Ni: <14
XRF3 5 ft due North of NE corner of cabin 29.
Hg: 6.1±1.7 Pb: 135±3 As: 37.0±1.9 Ni: <14
1200-1300
1300 - Demob from site

Signed: [signature]

Date: 10/11/18

ERRG

WorkCare Incident Intervention:
(888) 449-7787

ERRG

DAILY TAILGATE SAFETY MEETING

Date: 10/8/2018 Time: 0700 Location: Mammoth Lakes, CA
Project Name: Mammoth Client: USPS
Daily Scheduled Tasks: Perform trenching, XRF reading, & sampling activities.

PERMITS

Intrusive Activities (i.e., Excavation or Drilling) Today? ☒ Y ☐ N
Has 811 Notification Been Completed? ☒ Y ☐ N
Positive responses must be documented on SOP OP-006 Forms **811 Ticket #:** X827401466 **Expires:** 10/29/18
Cal/OSHA 41-3 Dig Activity Notification Form Completed? ☐ Y ☐ N ☐ N/A, Why:

Equipment/Vehicle Safety Inspection:
Daily Equipment/Vehicle Inspection Completed? ☒ Y ☐ N ☐ N/A List:
Deficiencies Noted/Discussed & Addressed? ☐ Y ☐ N ☒ N/A

Hospital and Clinic
Hospital (address/phone #): Mammoth Hospital: 85 Sierra Park Rd. 960.924.4076
Clinic (address/phone #): Same as above.
Discussed Route (dial 9-1-1 for emergencies)? ☒ Y ☐ N Map Location? In HASP on-site.

Training
Is everyone on site current with HAZWOPER refresher training? ☒ Y ☐ N ☐ N/A
If no, list/explain: N/A

Required Personal Protective Equipment (PPE):

☒ Safety glasses	☐ Respirator/Cartridges:	☐ Personal flotation device	☐ Insect Repellant
☐ Goggles	☒ Head Protection (i.e., hard hat)	☐ Gloves:	☐ Coverall:
☐ Face shield	☒ Safety toed boots	☐ FRCs/Nomex	☐ Fall protection
☐ Hearing Protection	☒ High visibility vest	☐ Sunscreen	☐ Other:

Before Beginning Work:

☒ Emergency Alarm Test	☒ SDS (Safety Data Sheets)	☒ Containers labeled	☒ Visitors, or guests
☒ AHA Review	☒ First-Aid kit & Eyewash station	☒ CPR/ First-Aid certified (see sign-in)	☐ Stretches
AL ☒ Nearby Crews or Overlapping Work	☒ Fire extinguisher (ABC)	☒ Evacuation route/ Mtg Location	☐ Other:

Safe Vehicle/ Equipment Use:

☒ Seat belt worn	☒ Parked in a safe location	☒ First move forward, backed in	☐ Other:
☒ Speed and traffic rules	☒ Emergency brake used	☒ Tires chocked	
☒ No cell phones used	☒ Spotter if backing is necessary	☒ Good housekeeping in vehicle	

Associated and Identified Hazards:

☐ Lockout/ Tagout	☒ Dust or Wind Blown Particles	☐ Falling hazards	☐ Thunder/lightning
☐ No Locking/Fixed Blade Knives	☒ Buried utilities	☐ Pinch points	☐ Abrasions, cuts, scrapes
☒ Overhead utilities	☐ High pressure	☐ Loud noise	☐ Biological Hazards
☐ Pedestrian hazards	☐ Heat stress	☐ Traffic hazards	☐ Ergonomic (<50 lb. lift)
☐ Electrical	☐ Cold stress	☐ Machine guarding	☒ Allergies
☒ Heavy equipment	☐ High wind	☐ Power tools / GFCI	☒ Slips, trips, falls
☐ Burn hazards	☐ Permit-required confined space	☐ Permit-required hot work	☐ Unstable footing
☐ Spill Potential	☐ Other:	☐ Other:	☐ Other:

HAZARD IDENTIFICATION/ AHA REVIEW

AHA's Reviewed: ☒ Y ☐ N SOP's Reviewed: ☒ Y ☐ N

List AHA's Reviewed: Overhead/buried utilities, slips/trips/falls, allergies, dust.

List SOP's Reviewed: Heavy equipment

ERRG

HEALTH AND SAFETY PLAN ACCEPTANCE

Project: Mammoth Mill Delineation Sampling

Contract No.:	ERRG Project No.:
Project Location: Mammoth Lakes, CA	Health and Safety Officer:

The undersigned acknowledge that they have read and understood and agree to abide by the health and safety plan.

Name (Printed)	Name (Signature)	Date
CAITLIN GORMAN	[illegible]	10-8-18
LIZZIE BENNETT	Lizzie Bennett	" " "
DON GREENWOOD	[illegible]	10-8-18
AVA LAZER	[illegible]	10/8/18
ALBERTO MAGANA	[illegible]	10-8-18

Version1

I:\Forms\Field Work Forms\HASP_Acknowledg.doc

WorkCare Incident Intervention:
(888) 449-7787

ERRG

DAILY TAILGATE SAFETY MEETING

Date: 10/9/2018 Time: 0700 Location: Mammoth Lakes, CA
Project Name: Mammoth Client: USFS
Daily Scheduled Tasks: Perform trenching, XRF reading, & sampling activities.

PERMITS

Intrusive Activities (i.e., Excavation or Drilling) Today? ☒ Y ☐ N
Has 811 Notification Been Completed? ☒ Y ☐ N
Positive responses must be documented on SOP OP-006 Forms **811 Ticket #:** X827401466 **Expires:** 10/29/2018
Cal/OSHA 41-3 Dig Activity Notification Form Completed? ☐ Y ☐ N ☐ N/A, Why:

Equipment/Vehicle Safety Inspection:
Daily Equipment/Vehicle Inspection Completed? ☒ Y ☐ N ☐ N/A List:
Deficiencies Noted/Discussed & Addressed? ☐ Y ☐ N ☒ N/A

Hospital and Clinic
Hospital (address/phone #): 85 Sierra Park Rd. 960.924.4076
Clinic (address/phone #): Same as above.
Discussed Route (dial 9-1-1 for emergencies)? ☒ Y ☐ N Map Location?

Training
Is everyone on site current with HAZWOPER refresher training? ☒ Y ☐ N ☐ N/A
If no, list/explain:

Required Personal Protective Equipment (PPE):

☒ Safety glasses	☐ Respirator/Cartridges:	☐ Personal flotation device	☐ Insect Repellant
☐ Goggles	☒ Head Protection (i.e., hard hat)	☐ Gloves:	☐ Coverall:
☐ Face shield	☒ Safety toed boots	☐ FRCs/Nomex	☐ Fall protection
☐ Hearing Protection	☒ High visibility vest	☐ Sunscreen	☐ Other:

Before Beginning Work:

☒ Emergency Alarm Test	☐ SDS (Safety Data Sheets)	☒ Containers labeled	☒ Visitors, or guests
☐ AHA Review	☒ First-Aid kit & Eyewash station	☒ CPR/ First-Aid certified (see sign-in)	☐ Stretches
☐ Nearby Crews or Overlapping Work	☒ Fire extinguisher (ABC)	☒ Evacuation route/ Mtg Location	☐ Other:

Safe Vehicle/ Equipment Use:

☒ Seat belt worn	☒ Parked in a safe location	☒ First move forward, backed in	☐ Other:
☒ Speed and traffic rules	☒ Emergency brake used	☒ Tires chocked	
☒ No cell phones used	☒ Spotter if backing is necessary	☒ Good housekeeping in vehicle	

Associated and Identified Hazards:

☐ Lockout/ Tagout	☒ Dust or Wind Blown Particles	☐ Falling hazards	☐ Thunder/lightning
☐ No Locking/Fixed Blade Knives	☒ Buried utilities	☐ Pinch points	☐ Abrasions, cuts, scrapes
☒ Overhead utilities	☐ High pressure	☐ Loud noise	☐ Biological Hazards
☐ Pedestrian hazards	☐ Heat stress	☐ Traffic hazards	☐ Ergonomic (<50 lb. lift)
☐ Electrical	☐ Cold stress	☐ Machine guarding	☒ Allergies
☒ Heavy equipment	☐ High wind	☐ Power tools / GFCI	☒ Slips, trips, falls
☐ Burn hazards	☐ Permit-required confined space	☐ Permit-required hot work	☐ Unstable footing
☐ Spill Potential	☐ Other:	☐ Other:	☐ Other:

HAZARD IDENTIFICATION/ AHA REVIEW

AHA's Reviewed: ☒ Y ☐ N SOP's Reviewed: ☐ Y ☒ N
List AHA's Reviewed: overhead/buried utilities, slips/trips/falls, allergies, dust.
List SOP's Reviewed: N/A

WorkCare Incident Intervention:
(888) 449-7787

ERRG

Health and Safety Plan

Any Modification to the HASP? ☐ Y ☒ N

If Yes, List or reference location: N/A

Noise reading obtained? ☐ Y ☒ N (Noise readings should be obtained for baseline activities as well as when additional equipment/tasks are performed)

If Yes, List Location and Results: N/A

Air monitoring conducted? ☐ Y ☒ N ☐ N/A Any results greater than set action level? ☐ Y ☐ N

If Yes, List: N/A

Ambient Air Temperature Monitoring

Forecasted High/Low Temperature: 59/24°F Log temps for these times: 7AM 30°F 11AM N/A 2PM 55°F

☒ Identify location and access to water ☐ Identify location of shade

If temperature exceeds 95°F implement additional measures: communication of hazard and additional observation for signs and symptoms of heat stress, encourage water breaks.

STOP WORK ISSUED:

☐	PEOPLE	Unsafe behavior is observed. A person contacts or almost contacts an object. A person takes a short cut.
☐	COMMUNICATION	Instructions are not accurate or complete.
☐	PROCEDURE	Inadequate, incorrect, or out of date procedures. Can be AHA, SOP, etc.
☐	EQUIPMENT	Inadequate, improper, or wrong tool for the job.
☐	ENVIRONMENTAL	Weather related. Lightning, ice/snow, mud, dust, etc. Changes to site attributed to weather.

Other Comments:

All workers who sign below have read, understood and will follow the planning documents issued for the job.

Meeting Conducted By: Ava Lutar *Company:* ERRG

Printed Name	Signature	Company	Is this your first day on-site?	Have you been with the company less than 6 months?	Is your CPR/ 1st Aid training current?	Is your Gold Shovel Training current (w/in 12 mo)?
Alberto Mendoza	J A M	ERRG	☐ Y ☒ N	☐ Y ☒ N	☒ Y ☐ N	☒ Y ☐ N
lizzie Bennett	lizzie Bennett	G2	☐ Y ☒ N	☒ Y ☐ N	☒ Y ☐ N	☒ Y ☐ N
CARLIN GOLDMAN	CG	ERRG	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N	☒ Y ☐ N
Ava Lutar	[illegible]	ERRG	☐ Y ☒ N	☒ Y ☐ N	☐ Y ☒ N	☒ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N

WorkCare Incident Intervention:
(888) 449-7787

ERRG

DAILY TAILGATE SAFETY MEETING

Date: 10/10/18 Time: 7:45 AM Location: Mammoth Lakes - Old Mill Tract Rd
Project Name: _____ Client: VIFS
Daily Scheduled Tasks: _____

PERMITS

Intrusive Activities (i.e., Excavation or Drilling) Today? ☒ Y ☐ N
Has 811 Notification Been Completed? ☒ Y ☐ N
Positive responses must be documented on SOP OP-008 Forms **811 Ticket #:** **Expires:**
Cal/OSHA 41-3 Dig Activity Notification Form Completed? ☐ Y ☐ N ☐ N/A, Why:

Equipment/Vehicle Safety Inspection:
Daily Equipment/Vehicle Inspection Completed? ☐ Y ☐ N ☐ N/A List:
Deficiencies Noted/Discussed & Addressed? ☐ Y ☐ N ☐ N/A

Hospital and Clinic
Hospital (address/phone #): _____
Clinic (address/phone #): _____
Discussed Route (dial 9-1-1 for emergencies)? ☐ Y ☐ N Map Location? _____

Training
Is everyone on site current with HAZWOPER refresher training? ☐ Y ☐ N ☐ N/A
If no, list/explain: _____

Required Personal Protective Equipment (PPE):

☐ Safety glasses	☐ Respirator/Cartridges: _____	☐ Personal flotation device	☐ Insect Repellant
☐ Goggles	☐ Head Protection (i.e., hard hat)	☐ Gloves: _____	☐ Coverall: _____
☐ Face shield	☐ Safety toed boots	☐ FRCs/Nomex	☐ Fall protection
☐ Hearing Protection	☐ High visibility vest	☐ Sunscreen	☐ Other: _____

Before Beginning Work:

☐ Emergency Alarm Test	☐ SDS (Safety Data Sheets)	☐ Containers labeled	☐ Visitors, or guests
☐ AHA Review	☐ First-Aid kit & Eyewash station	☐ CPR/ First-Aid certified (see sign-in)	☐ Stretches
☐ Nearby Crews or Overlapping Work	☐ Fire extinguisher (ABC)	☐ Evacuation route/ Mtg Location	☐ Other: _____

Safe Vehicle/ Equipment Use:

☐ Seat belt worn	☐ Parked in a safe location	☐ First move forward, backed in	☐ Other: _____
☐ Speed and traffic rules	☐ Emergency brake used	☐ Tires chocked	_____
☐ No cell phones used	☐ Spotter if backing is necessary	☐ Good housekeeping in vehicle	_____

Associated and Identified Hazards:

☐ Lockout/ Tagout	☐ Dust or Wind Blown Particles	☐ Falling hazards	☐ Thunder/lightning
☐ No Locking/Fixed Blade Knives	☐ Buried utilities	☐ Pinch points	☐ Abrasions, cuts, scrapes
☐ Overhead utilities	☐ High pressure	☐ Loud noise	☐ Biological Hazards
☐ Pedestrian hazards	☐ Heat stress	☐ Traffic hazards	☐ Ergonomic (<50 lb. lift)
☐ Electrical	☐ Cold stress	☐ Machine guarding	☐ Allergies
☐ Heavy equipment	☐ High wind	☐ Power tools / GFCI	☐ Slips, trips, falls
☐ Burn hazards	☐ Permit-required confined space	☐ Permit-required hot work	☐ Unstable footing
☐ Spill Potential	☐ Other: _____	☐ Other: _____	☐ Other: _____

HAZARD IDENTIFICATION/ AHA REVIEW

AHA's Reviewed: ☐ Y ☐ N SOP's Reviewed: ☐ Y ☐ N

List AHA's Reviewed: _____

List SOP's Reviewed: _____

ERRG

Health and Safety Plan

Any Modification to the HASP? ☐ Y ☒ N

If Yes, List or reference location:

Noise reading obtained? ☐ Y ☒ N (Noise readings should be obtained for baseline activities as well as when additional equipment/tasks are performed)

If Yes, List Location and Results:

Air monitoring conducted? ☒ Y ☐ N ☐ N/A Any results greater than set action level? ☐ Y ☐ N

If Yes, List: Low-flow air monitoring (HG capsule) & dust/metals monitoring (37 mm cassettes)

Ambient Air Temperature Monitoring

Forecasted High/Low Temperature: 54/24°F Log temps for these times: 7AM 31°F 11AM _____ 2PM _____

☒ Identify location and access to water ☒ Identify location of shade

If temperature exceeds 95°F implement additional measures: communication of hazard and additional observation for signs and symptoms of heat stress, encourage water breaks.

STOP WORK ISSUED:

☐	PEOPLE	Unsafe behavior is observed. A person contacts or almost contacts an object. A person takes a short cut.
☐	COMMUNICATION	Instructions are not accurate or complete.
☐	PROCEDURE	Inadequate, incorrect, or out of date procedures. Can be AHA, SOP, etc.
☐	EQUIPMENT	Inadequate, improper, or wrong tool for the job.
☐	ENVIRONMENTAL	Weather related. Lightning, ice/snow, mud, dust, etc. Changes to site attributed to weather.

Other Comments:

All workers who sign below have read, understood and will follow the planning documents issued for the job.

Meeting Conducted By: Ava Lazer *Company:*

Printed Name	Signature	Company	Is this your first day on-site?	Have you been with the company less than 6 months?	Is your CPR/ 1st Aid training current?	Is your Gold Shovel Training current (w/in 12 mo)?
Ava Lazer	[illegible]	ERRG	☐ Y ☒ N	☒ Y ☒ N	☐ Y ☒ N	☒ Y ☐ N
Caitlin Gorman	[illegible]	ERRG	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N	☒ Y ☐ N
Lizzie Bennett	Lizzie Bennett	G2	☐ Y ☒ N	☒ Y ☒ N	☐ Y ☒ N	☒ Y ☐ N
Roberto Melgoza	[illegible]	ERRG	☐ Y ☒ N	☒ Y ☐ N	☒ Y ☐ N	☒ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N

WorkCare Incident Intervention:
(888) 449-7787

ERRG

DAILY TAILGATE SAFETY MEETING

Date: 10/11/18 Time: 7:00 Location: Old Mill City, Mammoth Lakes
Project Name: Mammoth Client: USFS
Daily Scheduled Tasks:

PERMITS

Intrusive Activities (i.e., Excavation or Drilling) Today?	☒ Y	☐ N	
Has 811 Notification Been Completed?	☒ Y	☐ N	
Positive responses must be documented on SOP OP-006 Forms	**811 Ticket #:**	**Expires:**	
Cal/OSHA 41-3 Dig Activity Notification Form Completed?	☐ Y	☐ N	☐ N/A, Why:

Equipment/Vehicle Safety Inspection:

Daily Equipment/Vehicle Inspection Completed? ☐ Y ☐ N ☐ N/A List:
Deficiencies Noted/Discussed & Addressed? ☐ Y ☐ N ☐ N/A

Hospital and Clinic

Hospital (address/phone #):
Clinic (address/phone #):

Discussed Route (dial 9-1-1 for emergencies)? ☐ Y ☐ N Map Location?

Training

Is everyone on site current with HAZWOPER refresher training? ☒ Y ☐ N ☐ N/A
If no, list/explain:

Required Personal Protective Equipment (PPE):

☐ Safety glasses	☐ Respirator/Cartridges:	☐ Personal flotation device	☐ Insect Repellant
☐ Goggles	☐ Head Protection (i.e., hard hat)	☐ Gloves:	☐ Coverall:
☐ Face shield	☐ Safety toed boots	☐ FRCs/Nomex	☐ Fall protection
☐ Hearing Protection	☐ High visibility vest	☐ Sunscreen	☐ Other:

Before Beginning Work:

☐ Emergency Alarm Test	☐ SDS (Safety Data Sheets)	☐ Containers labeled	☐ Visitors, or guests
☐ AHA Review	☐ First-Aid kit & Eyewash station	☐ CPR/ First-Aid certified (see sign-in)	☐ Stretches
☐ Nearby Crews or Overlapping Work	☐ Fire extinguisher (ABC)	☐ Evacuation route/ Mtg Location	☐ Other:

Safe Vehicle/ Equipment Use:

☐ Seat belt worn	☐ Parked in a safe location	☐ First move forward, backed in	☐ Other:
☐ Speed and traffic rules	☐ Emergency brake used	☐ Tires chocked	
☐ No cell phones used	☐ Spotter if backing is necessary	☐ Good housekeeping in vehicle	

Associated and Identified Hazards:

☐ Lockout/ Tagout	☐ Dust or Wind Blown Particles	☐ Falling hazards	☐ Thunder/lightning
☐ No Locking/Fixed Blade Knives	☐ Buried utilities	☐ Pinch points	☐ Abrasions, cuts, scrapes
☐ Overhead utilities	☐ High pressure	☐ Loud noise	☐ Biological Hazards
☐ Pedestrian hazards	☐ Heat stress	☐ Traffic hazards	☐ Ergonomic (<50 lb. lift)
☐ Electrical	☐ Cold stress	☐ Machine guarding	☐ Allergies
☐ Heavy equipment	☐ High wind	☐ Power tools / GFCI	☐ Slips, trips, falls
☐ Burn hazards	☐ Permit-required confined space	☐ Permit-required hot work	☐ Unstable footing
☐ Spill Potential	☐ Other:	☐ Other:	☐ Other:

HAZARD IDENTIFICATION/ AHA REVIEW

AHA's Reviewed: ☐ Y ☐ N SOP's Reviewed: ☐ Y ☐ N

List AHA's Reviewed:

List SOP's Reviewed:

WorkCare Incident Intervention:
(888) 449-7787

ERRG

Health and Safety Plan

Any Modification to the HASP? ☐ Y ☒ N

If Yes, List or reference location: N/A

Noise reading obtained? ☐ Y ☒ N (Noise readings should be obtained for baseline activities as well as when additional equipment/tasks are performed)

If Yes, List Location and Results: N/A

Air monitoring conducted? ☐ Y ☒ N ☐ N/A Any results greater than set action level? ☐ Y ☐ N

If Yes, List: N/A

Ambient Air Temperature Monitoring

Forecasted High/Low Temperature: 50/26°F Log temps for these times: 7AM 31°F 11AM _____ 2PM _____

☒ Identify location and access to water ☒ Identify location of shade

If temperature exceeds 95°F implement additional measures: communication of hazard and additional observation for signs and symptoms of heat stress, encourage water breaks.

STOP WORK ISSUED:

☐	PEOPLE	Unsafe behavior is observed. A person contacts or almost contacts an object. A person takes a short cut.
☐	COMMUNICATION	Instructions are not accurate or complete.
☐	PROCEDURE	Inadequate, incorrect, or out of date procedures. Can be AHA, SOP, etc.
☐	EQUIPMENT	Inadequate, improper, or wrong tool for the job.
☐	ENVIRONMENTAL	Weather related. Lightning, ice/snow, mud, dust, etc. Changes to site attributed to weather.

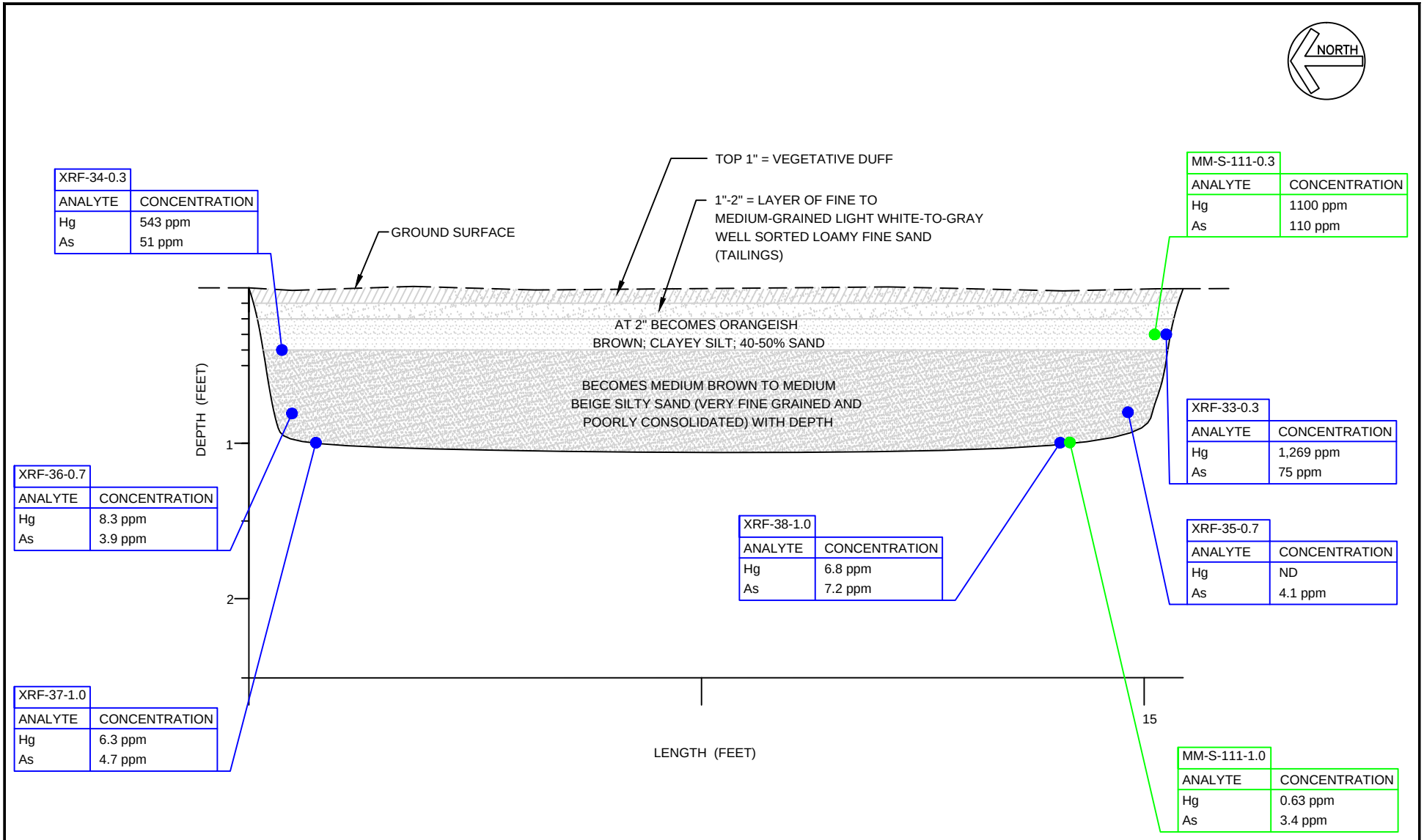
Other Comments: _____

All workers who sign below have read, understood and will follow the planning documents issued for the job.

Meeting Conducted By: AVA LAZOV *Company:* ERRG

Printed Name	Signature	Company	Is this your first day on-site?	Have you been with the company less than 6 months?	Is your CPR/ 1st Aid training current?	Is your Gold Shovel Training current (w/in 12 mo)?
AVA LAZOV	[signature]	ERRG	☐ Y ☒ N	☒ Y ☐ N	☐ Y ☒ N	☒ Y ☐ N
CAITLIN GORMAN	[signature]	ERRG	☐ Y ☒ N	☐ Y ☒ N	☐ Y ☒ N	☒ Y ☐ N
LIZZIE BENNETT	Lizzie Bennett		☐ Y ☒ N	☒ Y ☐ N	☒ Y ☒ N	☒ Y ☐ N
ALBERTO MIRANDA	[signature]	ERRG	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N
			☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N	☐ Y ☐ N

Appendix F. Trench Logs



ERRG

Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

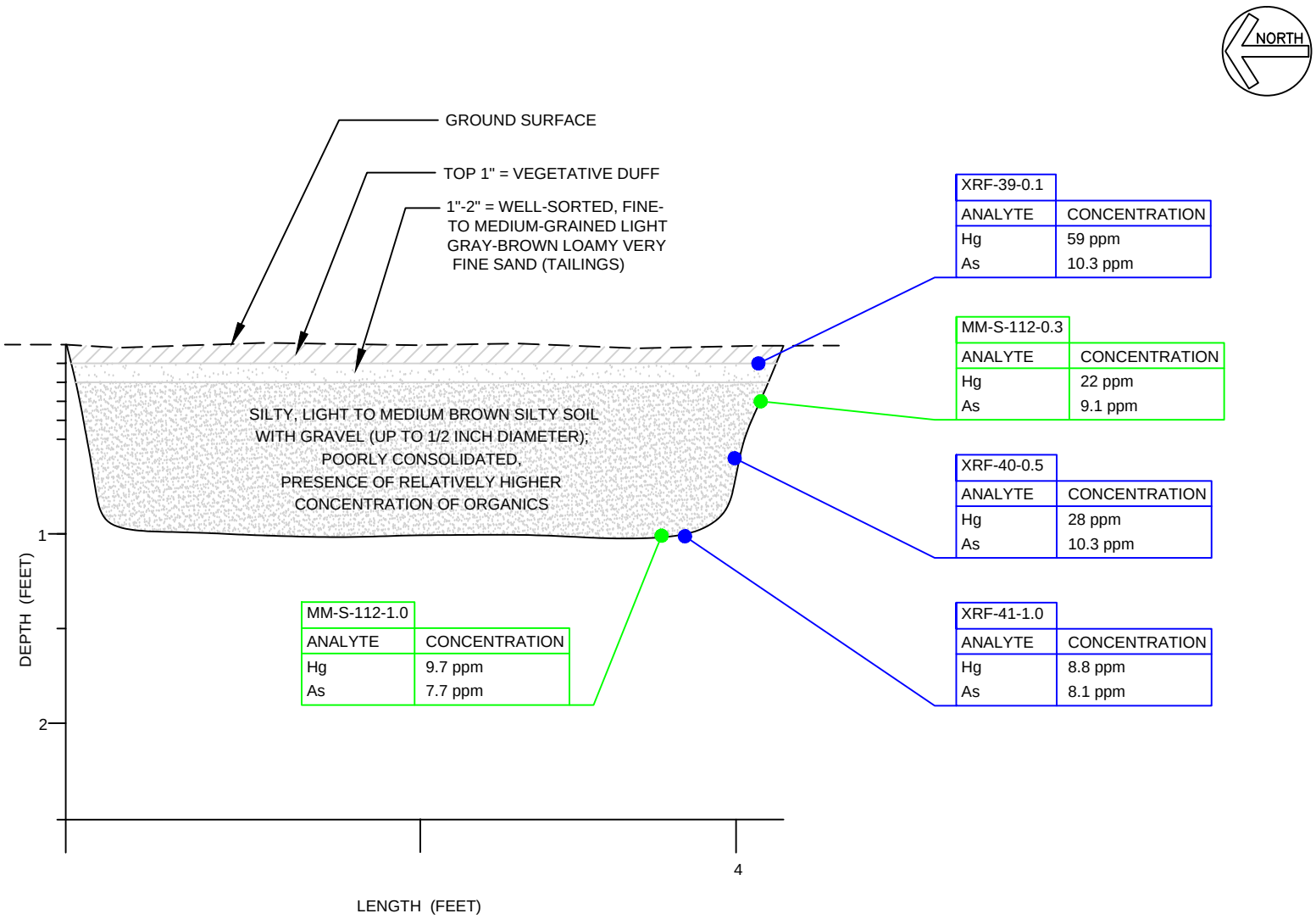
CHECKED BY:

P.E/P.G.:

TRENCH LOG T1

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	1	18	1

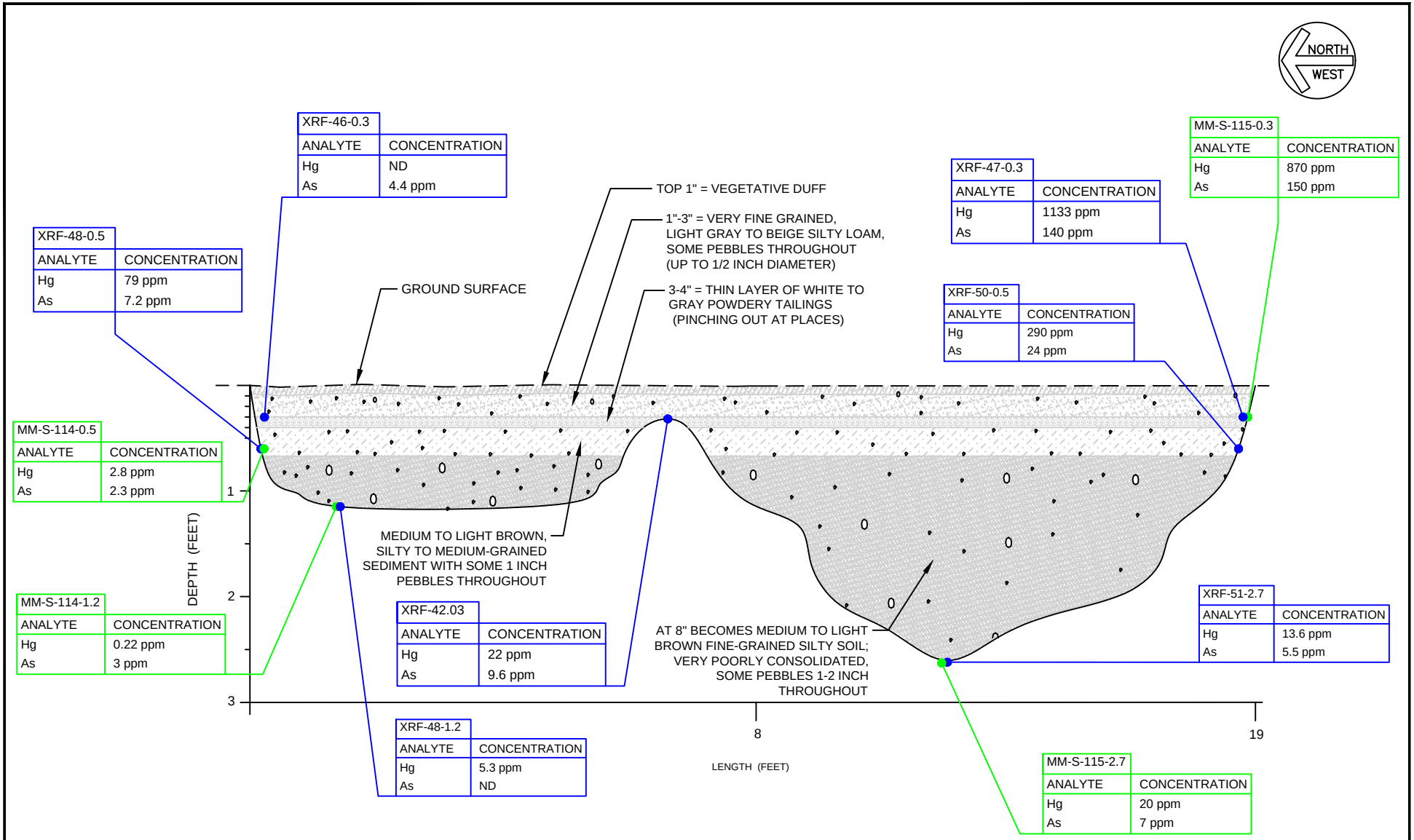
FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL1.dwg LAYOUT NAME: 1 PLOTTED: Sunday, September 29, 2019 - 11:40am



ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT:	DESIGNED BY:	TRENCH LOG T2				
U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	CHECKED BY:					
LOCATION: MAMMOTH, CALIFORNIA	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 2	OF 18	FIG NO. 2

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL2.dwg LAYOUT NAME: 2 PLOTTED: Sunday, September 29, 2019 – 11:40am



FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL4.dwg LAYOUT NAME: 4 PLOTTED: Sunday, September 29, 2019 - 11:40am

ERRG
Engineering/Remediation Resources Group, Inc.
115 Sansome St., Suite 200
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

CHECKED BY:

P.E/P.G.:

TRENCH LOG T4

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
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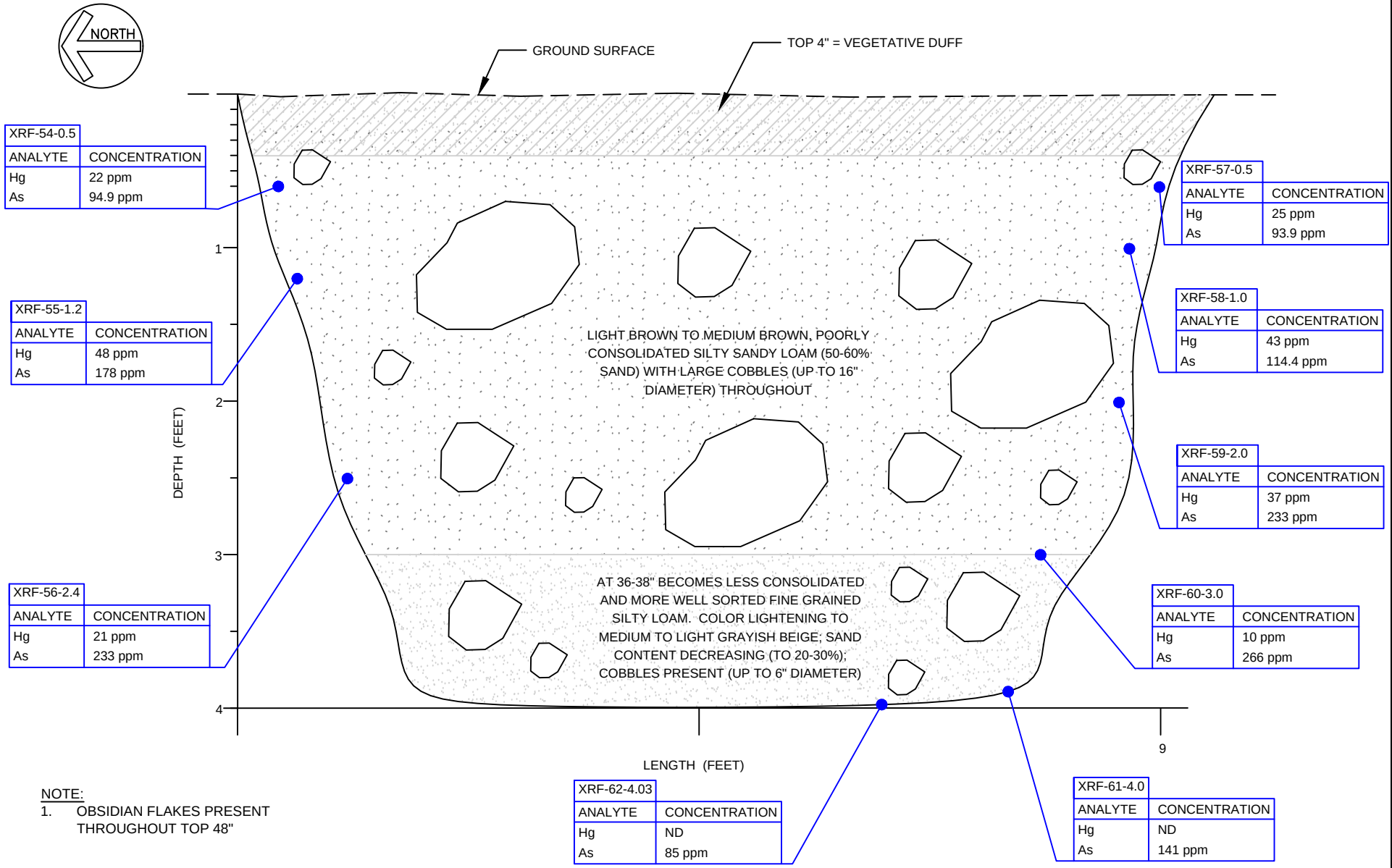


XRF-54-0.5

ANALYTE	CONCENTRATION
Hg	22 ppm
As	94.9 ppm

XRF-55-1.2

ANALYTE	CONCENTRATION
Hg	48 ppm
As	178 ppm

XRF-56-2.4

ANALYTE	CONCENTRATION
Hg	21 ppm
As	233 ppm

XRF-57-0.5

ANALYTE	CONCENTRATION
Hg	25 ppm
As	93.9 ppm

XRF-58-1.0

ANALYTE	CONCENTRATION
Hg	43 ppm
As	114.4 ppm

XRF-59-2.0

ANALYTE	CONCENTRATION
Hg	37 ppm
As	233 ppm

XRF-60-3.0

ANALYTE	CONCENTRATION
Hg	10 ppm
As	266 ppm

XRF-61-4.0

ANALYTE	CONCENTRATION
Hg	ND
As	141 ppm

XRF-62-4.03

ANALYTE	CONCENTRATION
Hg	ND
As	85 ppm

NOTE:
1. OBSIDIAN FLAKES PRESENT THROUGHOUT TOP 48"

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

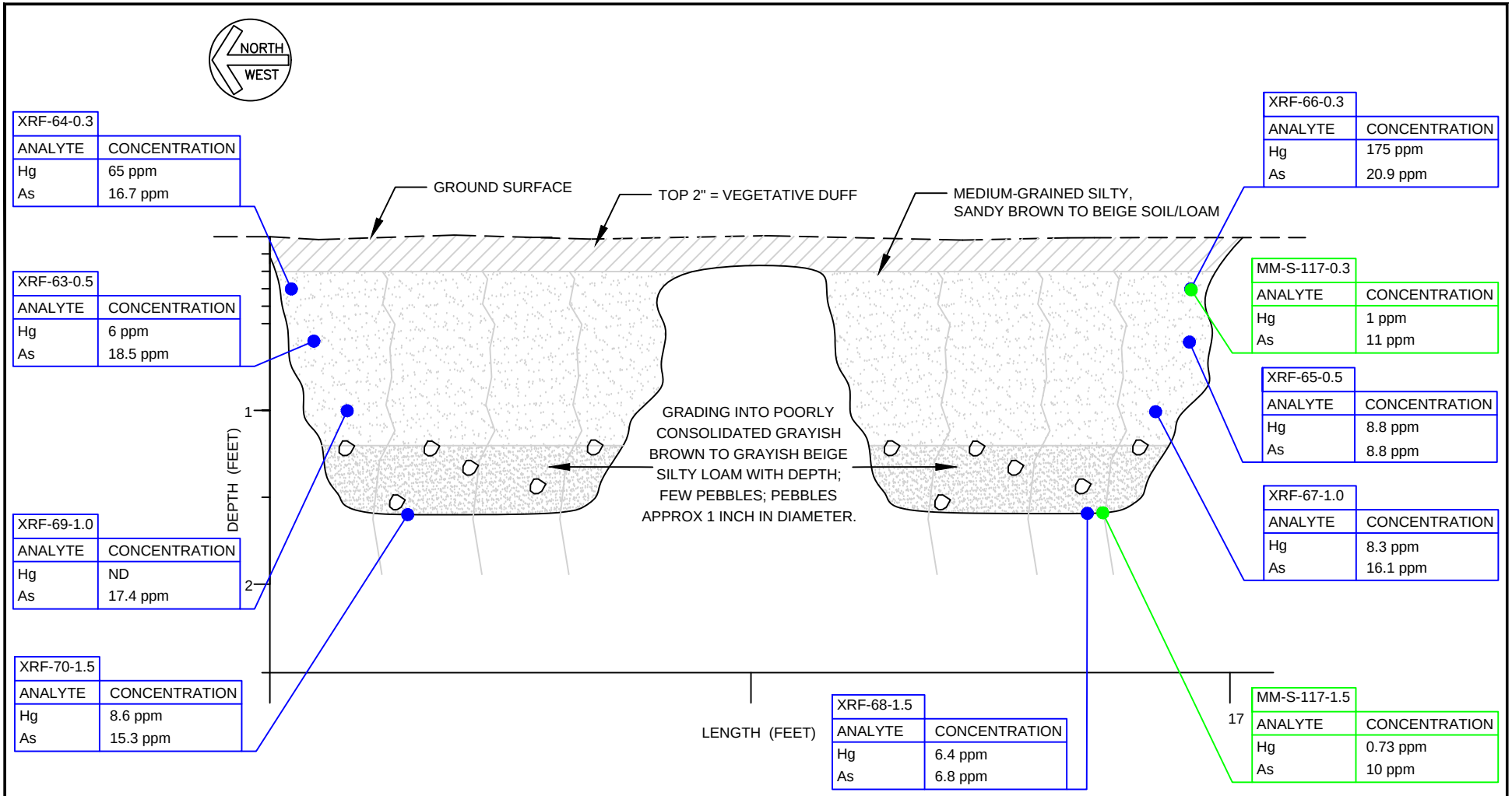
CHECKED BY:

P.E/P.G.:

TRENCH LOG T5

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	4	18	4

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL5.dwg LAYOUT NAME: 5 PLOTTED: Sunday, September 29, 2019 - 11:40am

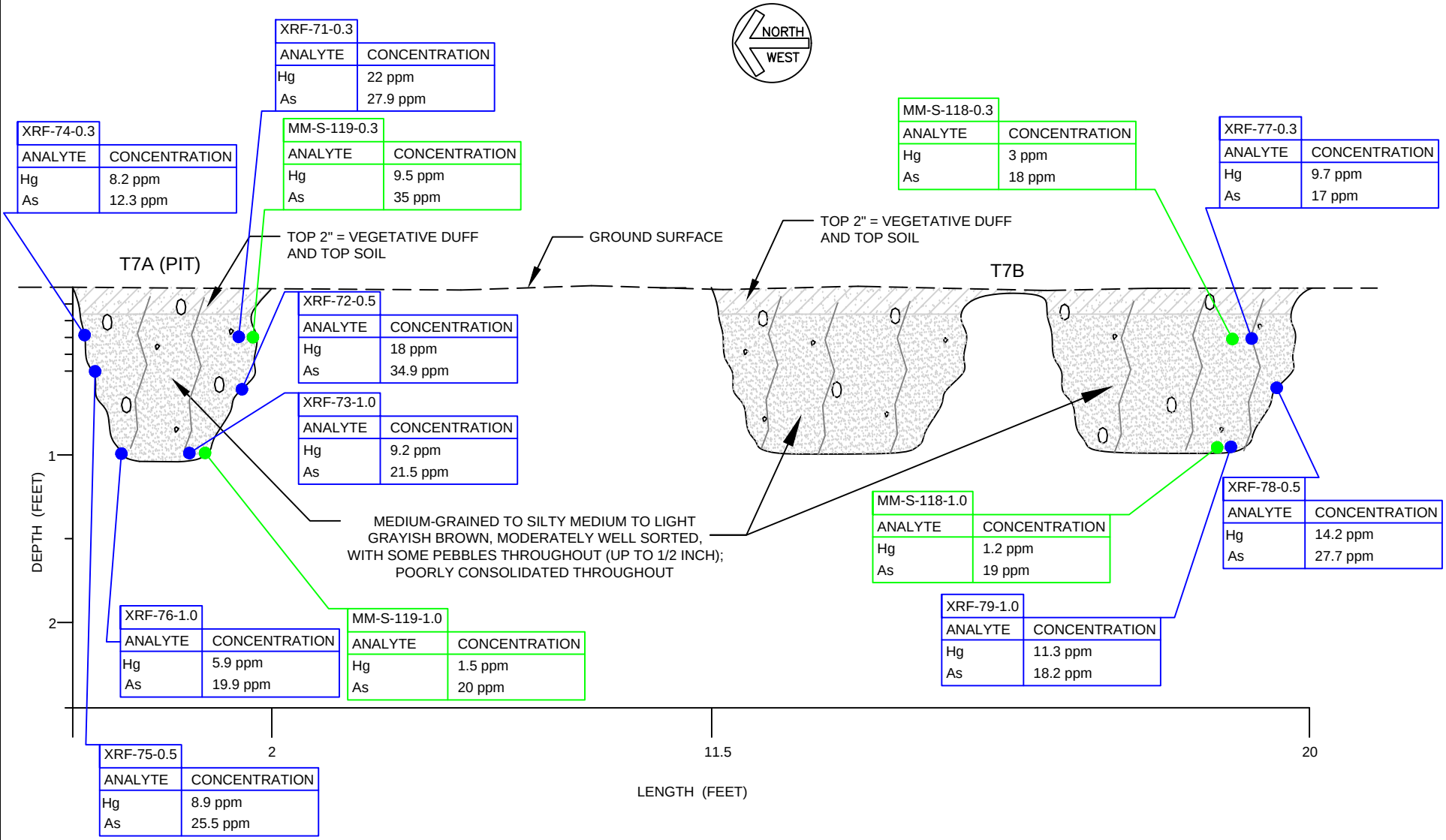


NOTE:
1. ROOTS PENETRATE TO APPROXIMATELY 24" BGS

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT:	DESIGNED BY:	TRENCH LOG T6				
U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	CHECKED BY:					
LOCATION: MAMMOTH, CALIFORNIA	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 5	OF 18	FIG NO. 5

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL6.dwg LAYOUT NAME: 6 PLOTTED: Sunday, September 29, 2019 - 11:40am

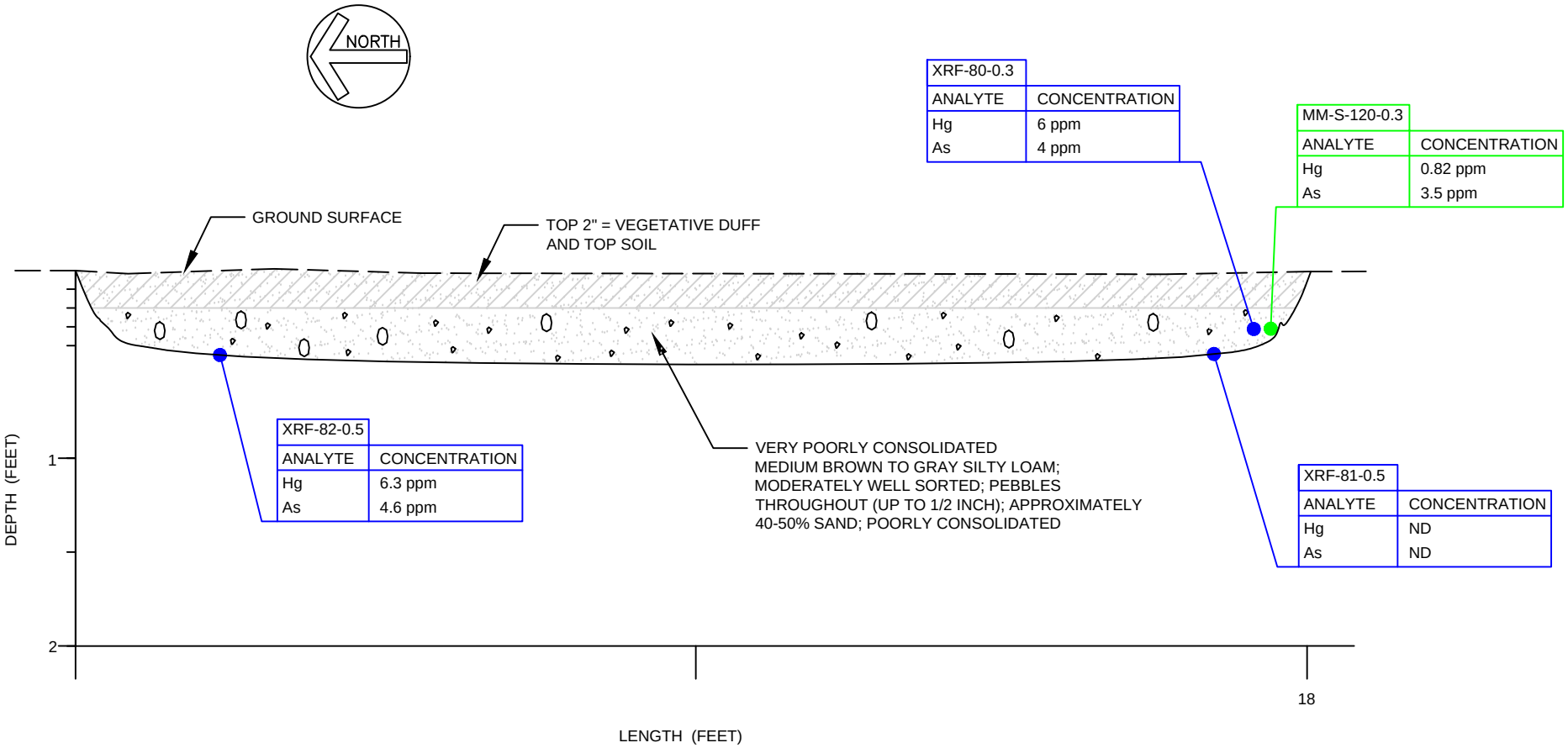


NOTE:
1. ROOTS PENETRATE TO APPROXIMATELY 12"

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT:	DESIGNED BY:	TRENCH LOG T7A AND B				
U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	CHECKED BY:					
LOCATION: MAMMOTH, CALIFORNIA	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 6	OF 18	FIG NO. 6

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL7.dwg LAYOUT NAME: 7A&B PLOTTED: Sunday, September 29, 2019 – 11:40am



XRF-80-0.3	
ANALYTE	CONCENTRATION
Hg	6 ppm
As	4 ppm

MM-S-120-0.3	
ANALYTE	CONCENTRATION
Hg	0.82 ppm
As	3.5 ppm

XRF-82-0.5	
ANALYTE	CONCENTRATION
Hg	6.3 ppm
As	4.6 ppm

XRF-81-0.5	
ANALYTE	CONCENTRATION
Hg	ND
As	ND

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

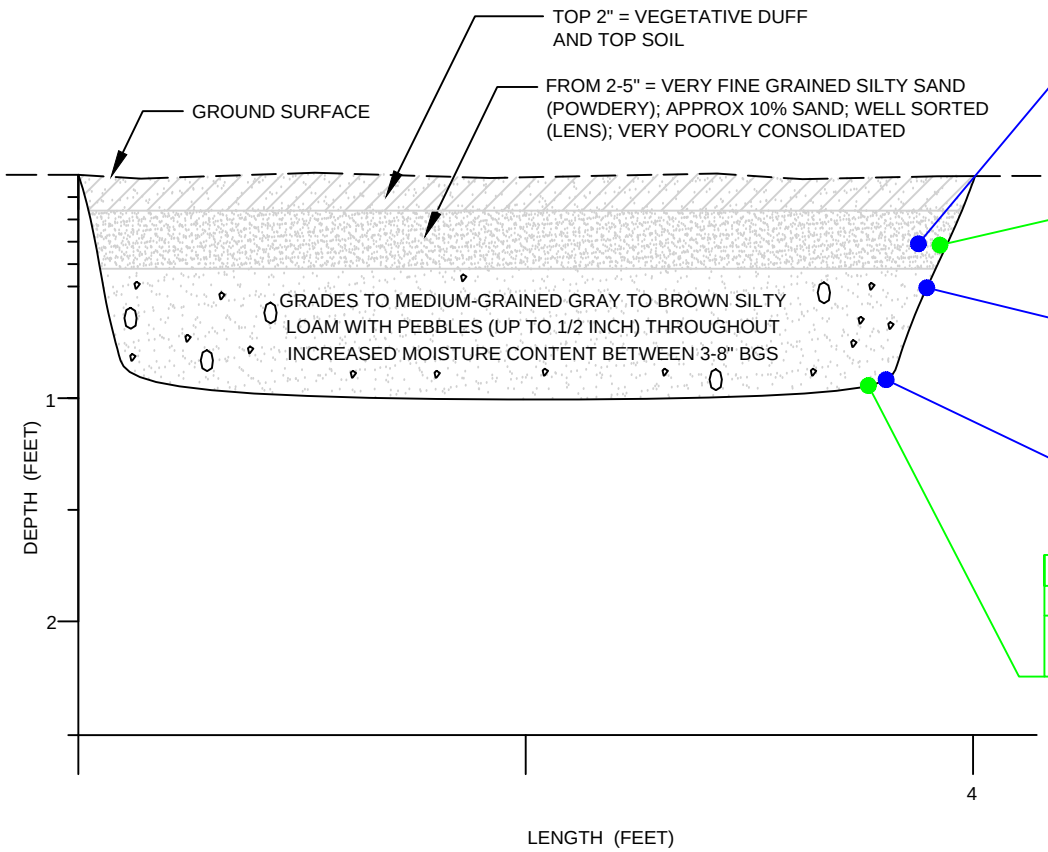
CHECKED BY:

P.E/P.G.:

TRENCH LOG T8

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	7	18	7

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\T1.8.dwg LAYOUT NAME: 8 PLOTTED: Sunday, September 29, 2019 – 11:40am



XRF-83-0.3

ANALYTE	CONCENTRATION
Hg	177 ppm
As	21.6 ppm

MM-S-121-0.3

ANALYTE	CONCENTRATION
Hg	80 ppm
As	18 ppm

XRF-84-0.5

ANALYTE	CONCENTRATION
Hg	5.5 ppm
As	4.5 ppm

XRF-85-1.0

ANALYTE	CONCENTRATION
Hg	12 ppm
As	5.7 ppm

MM-S-121-1.0

ANALYTE	CONCENTRATION
Hg	2.8 ppm
As	6.7 ppm

NOTE:
1. INCREASED MOISTURE CONTENT BETWEEN 3-8" BGS

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

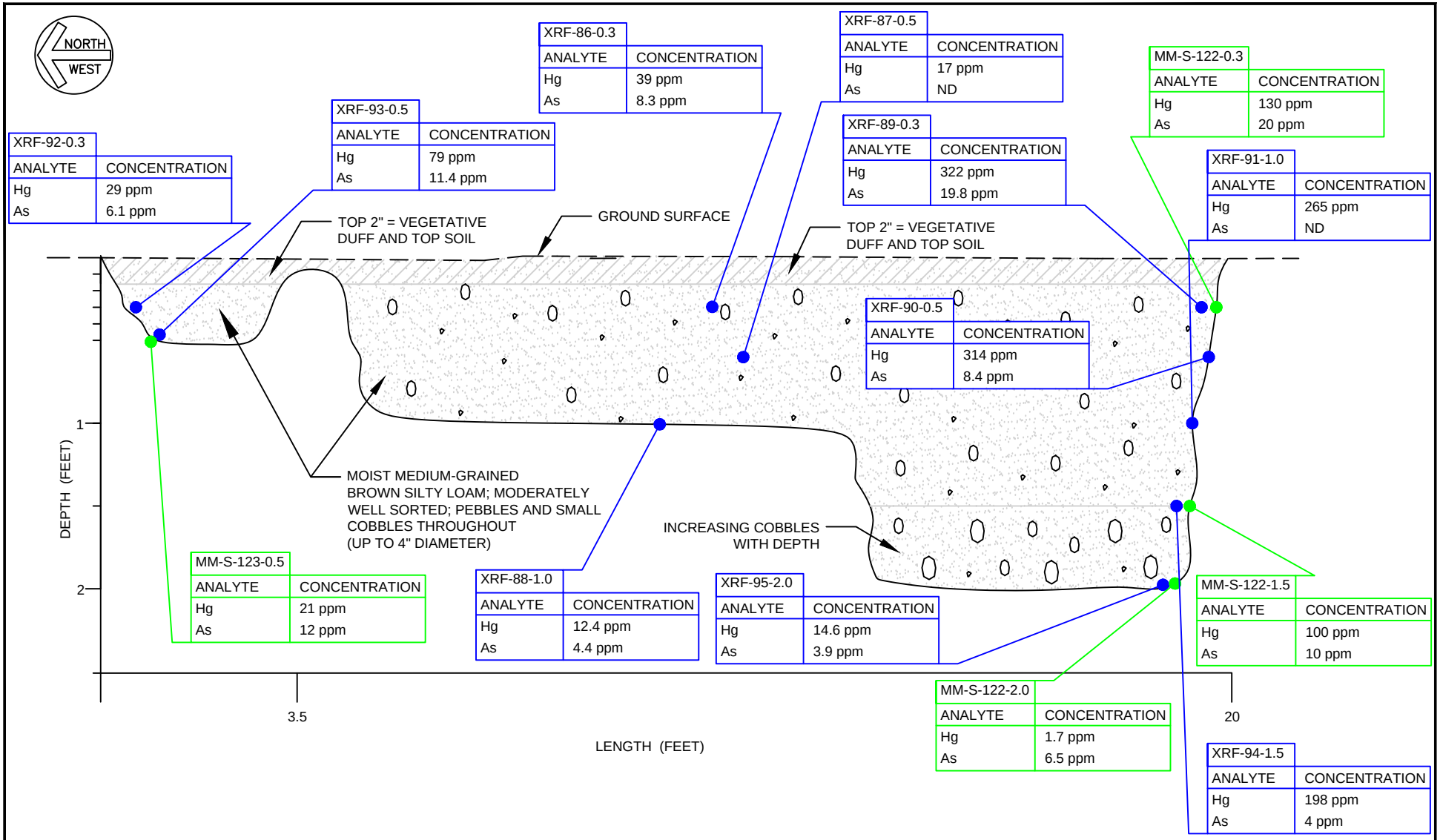
CHECKED BY:

P.E/P.G.:

TRENCH LOG T9

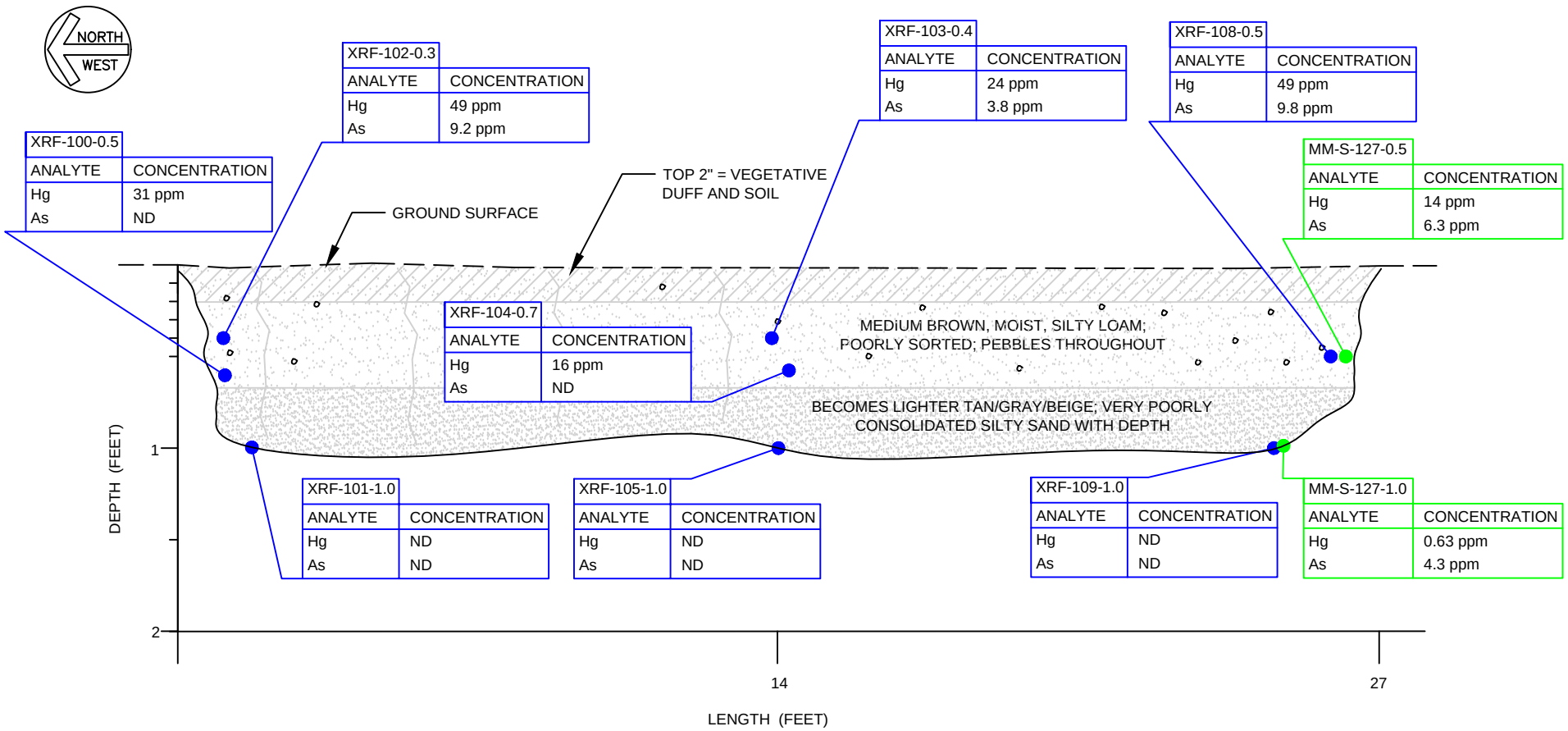
ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	8	18	8

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL9.dwg LAYOUT NAME: 9 PLOTTED: Sunday, September 29, 2019 – 11:40am



ERRG Engineering/Remediation Resources Group, Inc. 456 Mongomery St., Suite 900 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	DESIGNED BY:	TRENCH LOG T10				
	LOCATION: MAMMOTH, CALIFORNIA	CHECKED BY:					
		P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 9	OF 18	FIG NO. 9

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL10.dwg LAYOUT NAME: 10 PLOTTED: Sunday, September 29, 2019 – 11:40am

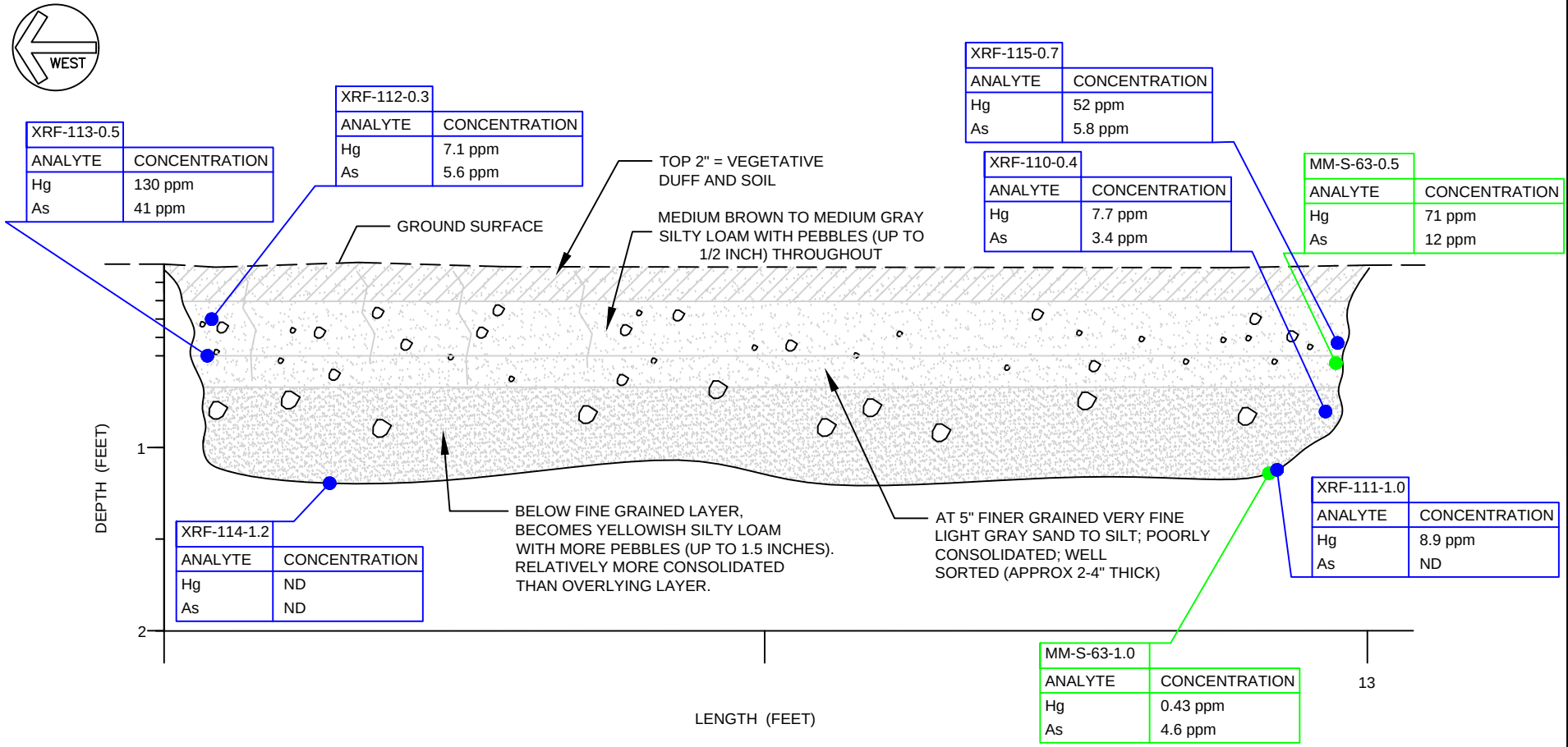


NOTE:
1. ROOTS PENETRATE TO APPROXIMATELY 12" BGS

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	DESIGNED BY:	TRENCH LOG T13				
LOCATION: MAMMOTH, CALIFORNIA	CHECKED BY:					
	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 10	OF 18	FIG NO. 10

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL13.dwg LAYOUT NAME: 13 PLOTTED: Sunday, September 29, 2019 - 11:41am

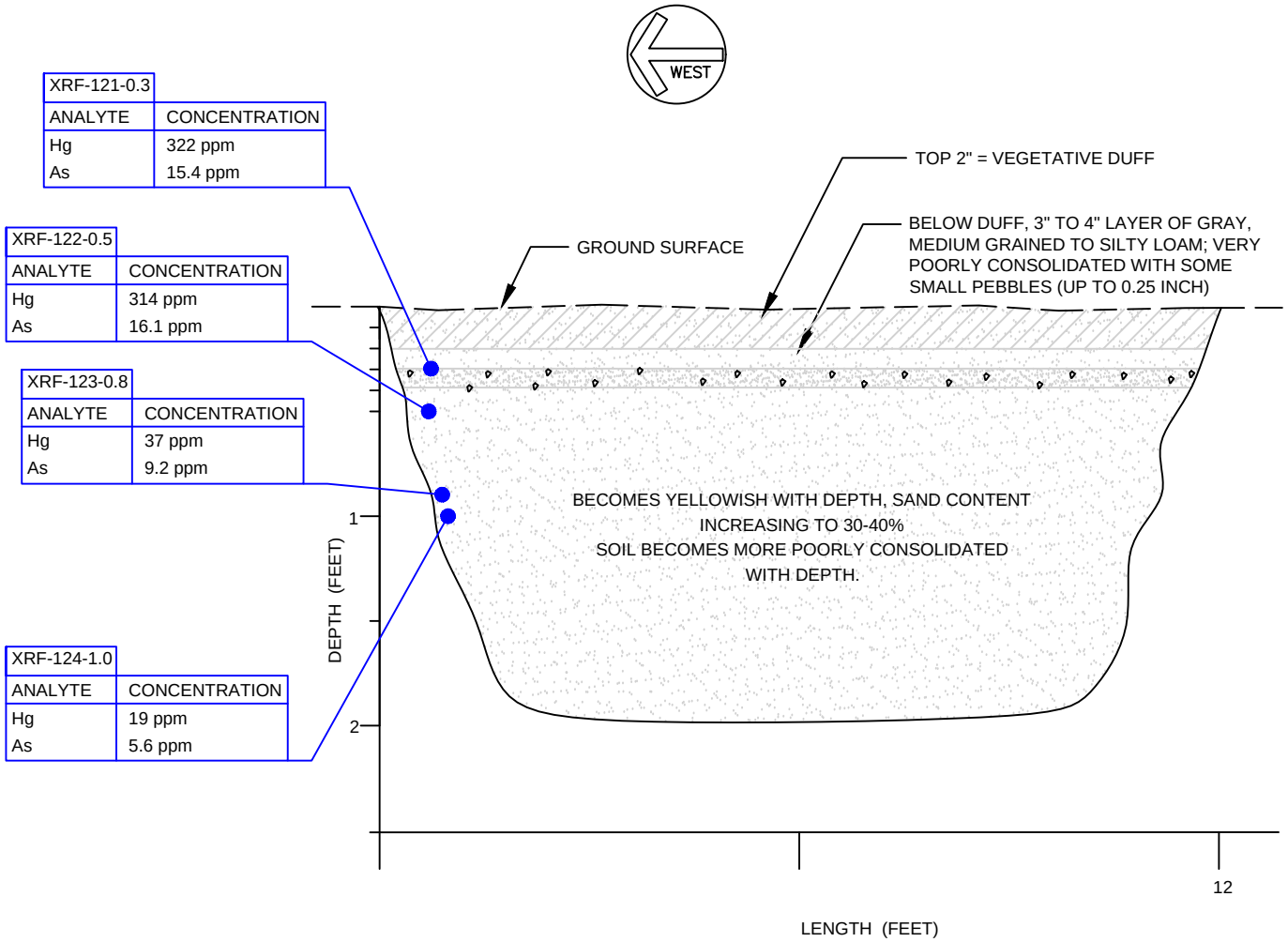


NOTE:
1. ROOTS PENETRATE TO APPROXIMATELY 8" BGS

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

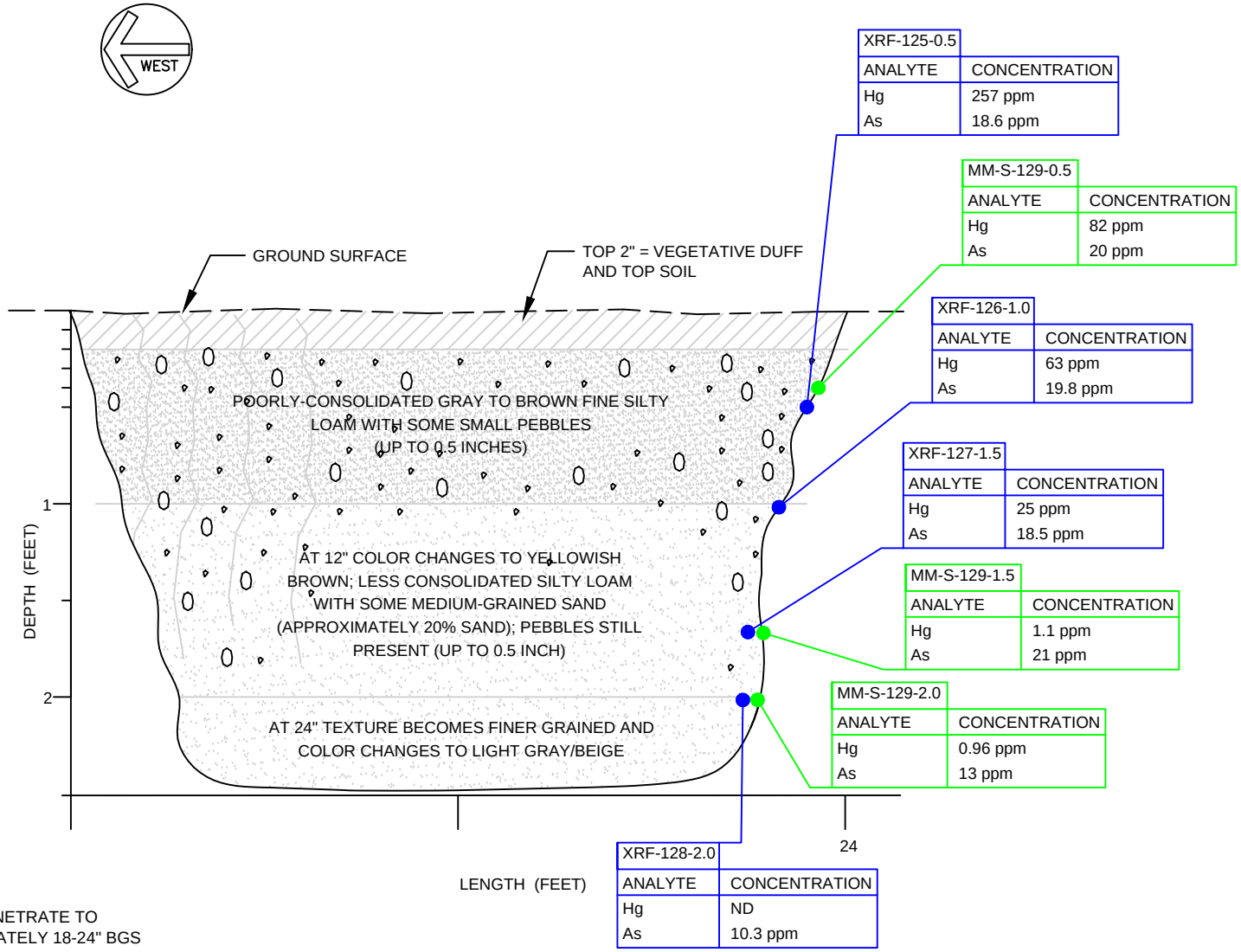
CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	DESIGNED BY:	TRENCH LOG T15				
LOCATION: MAMMOTH, CALIFORNIA	CHECKED BY:					
	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 11	OF 18	FIG NO. 11

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL15.dwg LAYOUT NAME: 15 PLOTTED: Sunday, September 29, 2019 - 11:41am



ERRG Engineering/Remediation Resources Group, Inc. 456 Mongomery St., Suite 900 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	DESIGNED BY:	TRENCH LOG T17				
	LOCATION: MAMMOTH, CALIFORNIA	CHECKED BY:					
		P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 12	OF 18	FIG NO. 12

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL17.dwg LAYOUT NAME: 17 PLOTTED: Sunday, September 29, 2019 – 11:41am



XRF-125-0.5	
ANALYTE	CONCENTRATION
Hg	257 ppm
As	18.6 ppm

MM-S-129-0.5	
ANALYTE	CONCENTRATION
Hg	82 ppm
As	20 ppm

XRF-126-1.0	
ANALYTE	CONCENTRATION
Hg	63 ppm
As	19.8 ppm

XRF-127-1.5	
ANALYTE	CONCENTRATION
Hg	25 ppm
As	18.5 ppm

MM-S-129-1.5	
ANALYTE	CONCENTRATION
Hg	1.1 ppm
As	21 ppm

MM-S-129-2.0	
ANALYTE	CONCENTRATION
Hg	0.96 ppm
As	13 ppm

XRF-128-2.0	
ANALYTE	CONCENTRATION
Hg	ND
As	10.3 ppm

NOTE:
1. ROOTS PENETRATE TO APPROXIMATELY 18-24" BGS

ERRG
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(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

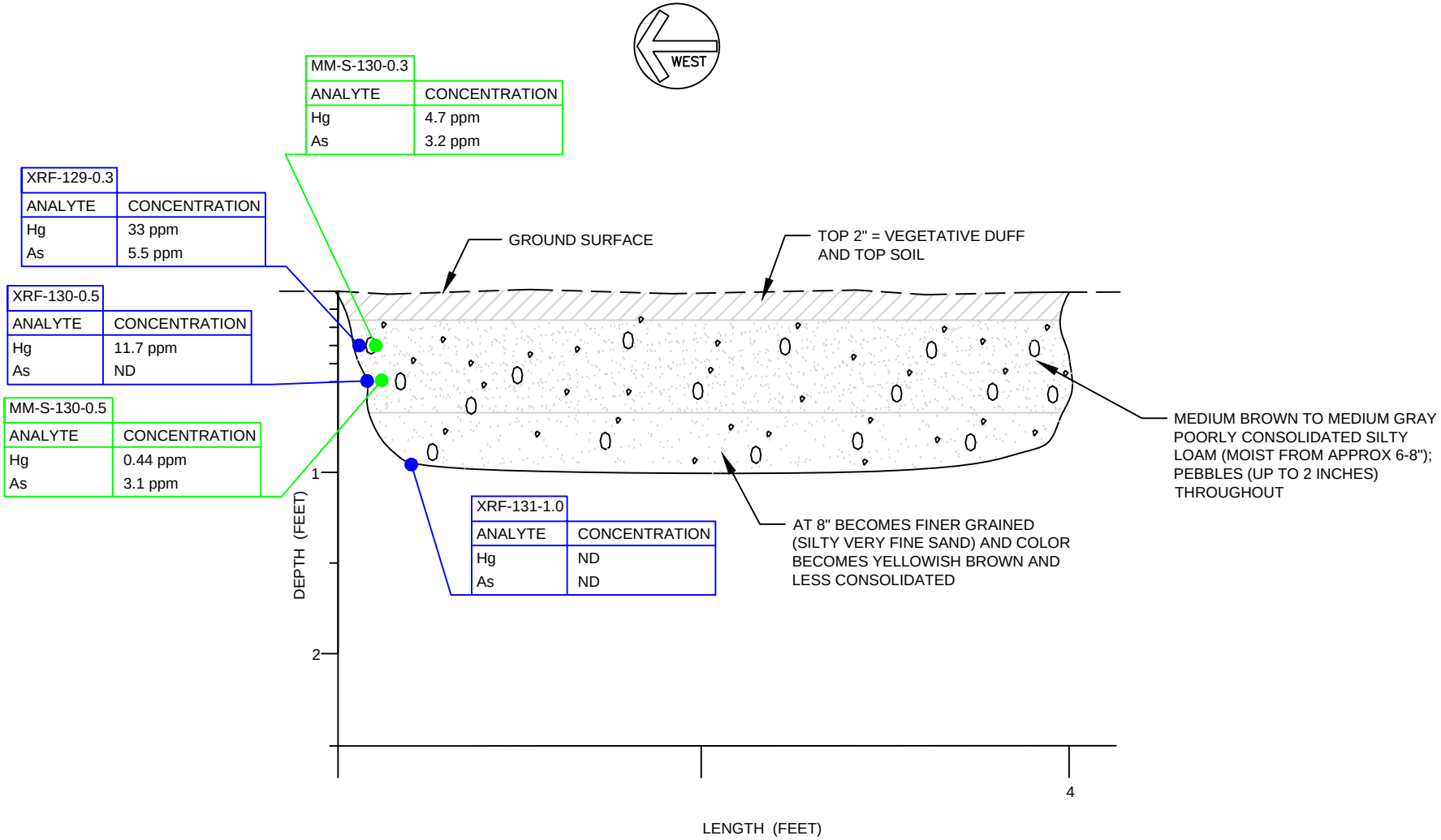
CHECKED BY:

P.E/P.G.:

TRENCH LOG T18

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	13	18	13

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL18.dwg LAYOUT NAME: 18 PLOTTED: Sunday, September 29, 2019 – 11:41am



ERRG
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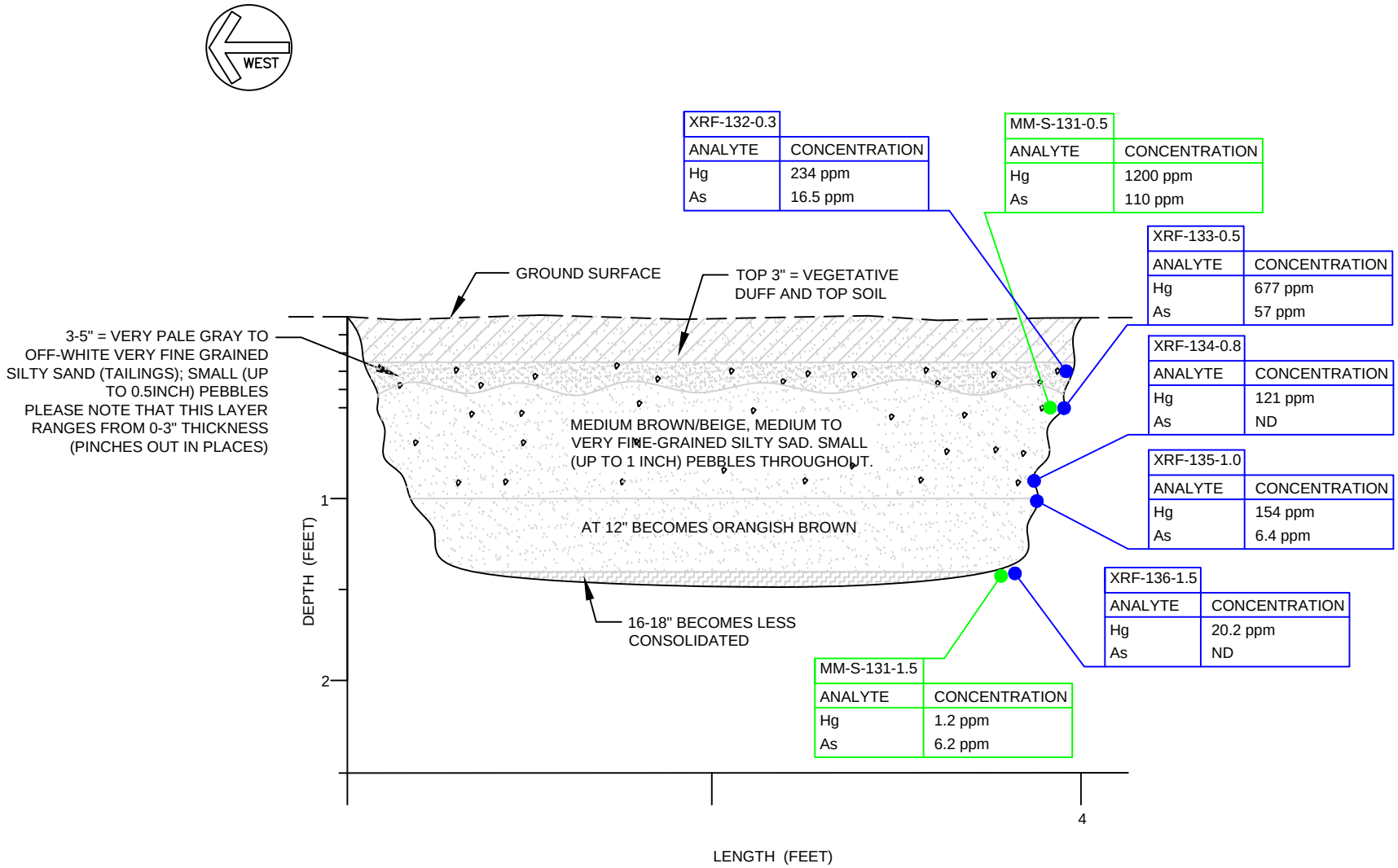
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	DESIGNED BY:	TRENCH LOG T19				
LOCATION: MAMMOTH, CALIFORNIA	CHECKED BY:					
	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 14	OF 18	FIG NO. 14

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL19.dwg LAYOUT NAME: 19 PLOTTED: Sunday, September 29, 2019 – 11:41am



XRF-132-0.3	
ANALYTE	CONCENTRATION
Hg	234 ppm
As	16.5 ppm

MM-S-131-0.5	
ANALYTE	CONCENTRATION
Hg	1200 ppm
As	110 ppm

XRF-133-0.5	
ANALYTE	CONCENTRATION
Hg	677 ppm
As	57 ppm

XRF-134-0.8	
ANALYTE	CONCENTRATION
Hg	121 ppm
As	ND

XRF-135-1.0	
ANALYTE	CONCENTRATION
Hg	154 ppm
As	6.4 ppm

XRF-136-1.5	
ANALYTE	CONCENTRATION
Hg	20.2 ppm
As	ND

MM-S-131-1.5	
ANALYTE	CONCENTRATION
Hg	1.2 ppm
As	6.2 ppm

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(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

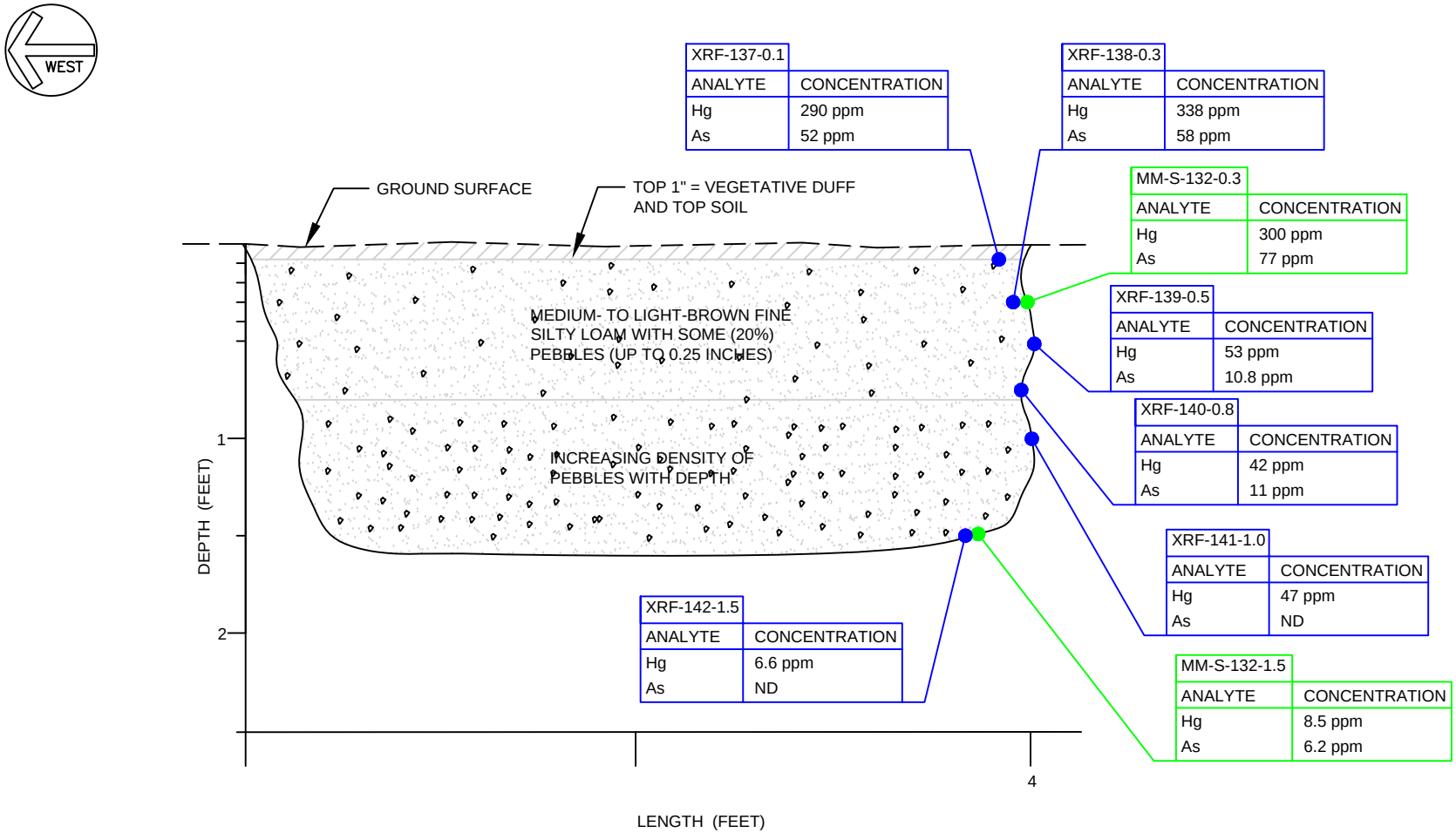
CHECKED BY:

P.E/P.G.:

TRENCH LOG T20

ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	15	18	15

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL20.dwg LAYOUT NAME: 20 PLOTTED: Sunday, September 29, 2019 - 11:41am



XRF-137-0.1

ANALYTE	CONCENTRATION
Hg	290 ppm
As	52 ppm

XRF-138-0.3

ANALYTE	CONCENTRATION
Hg	338 ppm
As	58 ppm

MM-S-132-0.3

ANALYTE	CONCENTRATION
Hg	300 ppm
As	77 ppm

XRF-139-0.5

ANALYTE	CONCENTRATION
Hg	53 ppm
As	10.8 ppm

XRF-140-0.8

ANALYTE	CONCENTRATION
Hg	42 ppm
As	11 ppm

XRF-141-1.0

ANALYTE	CONCENTRATION
Hg	47 ppm
As	ND

XRF-142-1.5

ANALYTE	CONCENTRATION
Hg	6.6 ppm
As	ND

MM-S-132-1.5

ANALYTE	CONCENTRATION
Hg	8.5 ppm
As	6.2 ppm

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San Francisco, California 94104
(415) 395-9974

CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE

LOCATION: MAMMOTH, CALIFORNIA

DESIGNED BY:

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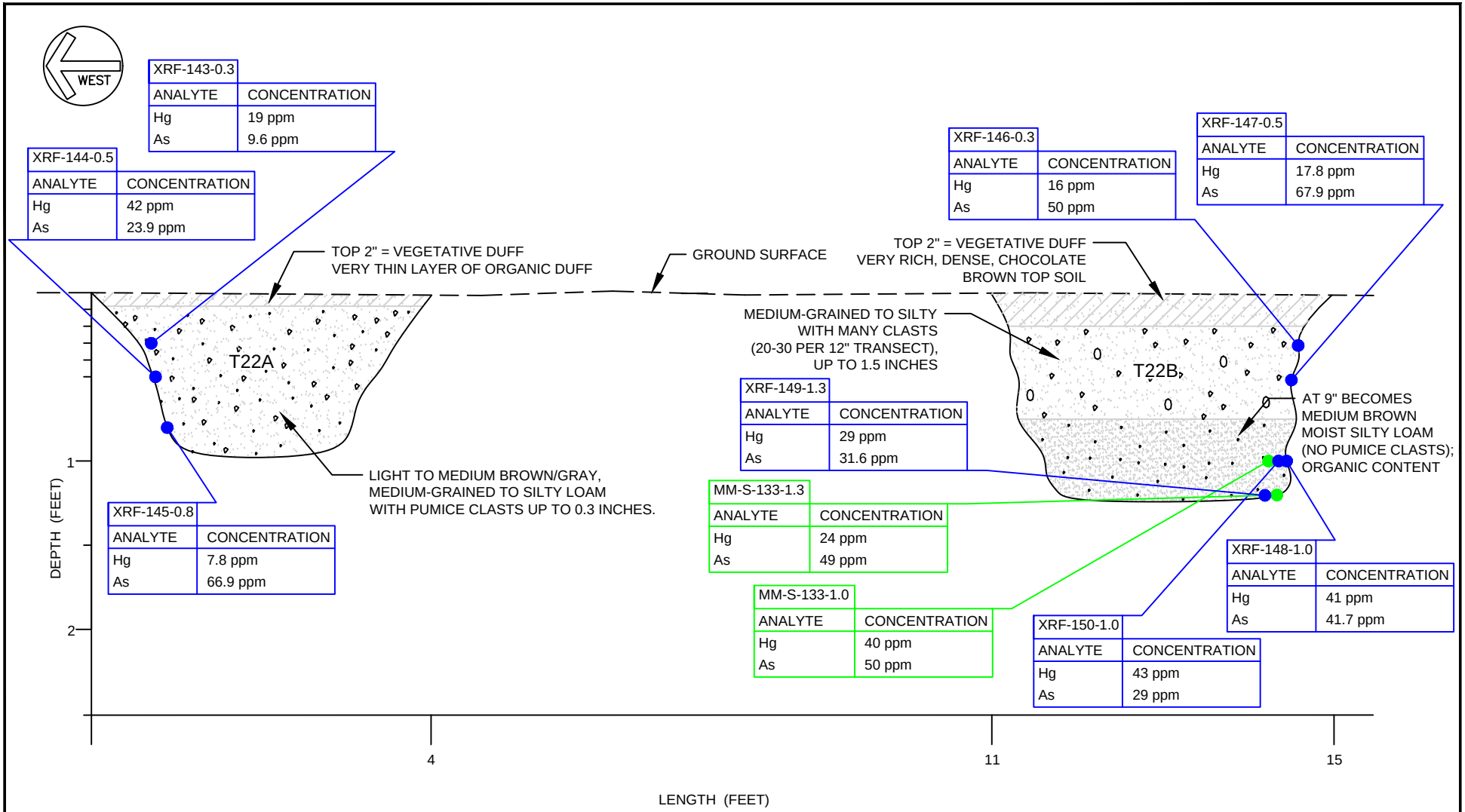
P.E/P.G.:

TRENCH LOG T21

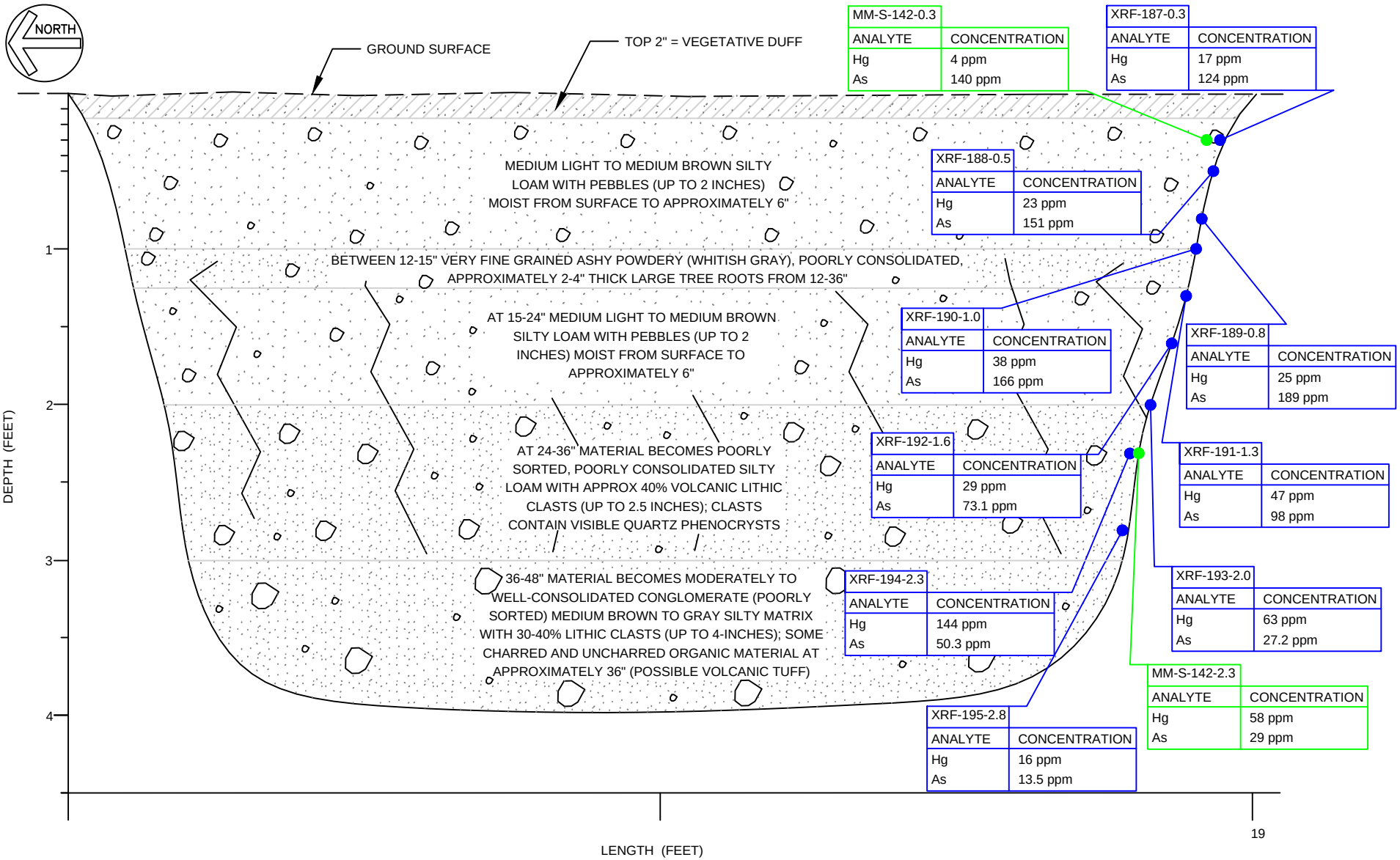
ERRG PROJECT NO.	REVISION NO.	SHEET	OF	FIG NO.
	0	16	18	16

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL21.dwg LAYOUT NAME: 21 PLOTTED: Sunday, September 29, 2019 - 11:41am



ERRG Engineering/Remediation Resources Group, Inc. 456 Mongomery St., Suite 900 San Francisco, California 94104 (415) 395-9974	CLIENT: U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	DESIGNED BY:	TRENCH LOG T22 A AND B				
	LOCATION: MAMMOTH, CALIFORNIA	CHECKED BY:					
		P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 17	OF 18	FIG NO. 17

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL22.dwg LAYOUT NAME: 22 PLOTTED: Sunday, September 29, 2019 – 11:41am



NOTE:
1. LARGE TREE ROOTS FROM 12"-36"

ERRG
Engineering/Remediation Resources Group, Inc.
456 Mongomery St., Suite 900
San Francisco, California 94104
(415) 395-9974

CLIENT:	DESIGNED BY:	TRENCH LOG T31				
U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE	CHECKED BY:					
LOCATION: MAMMOTH, CALIFORNIA	P.E/P.G.:	ERRG PROJECT NO.	REVISION NO. 0	SHEET 18	OF 18	FIG NO. 18

FILE NAME: C:\Civil 3D Projects\ERRG\Projects\20170115\TL31.dwg LAYOUT NAME: 31 PLOTTED: Sunday, September 29, 2019 – 11:41am

Appendix G. Analytical Laboratory Reports

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Pleasanton
1220 Quarry Lane
Pleasanton, CA 94566
Tel: (925)484-1919

TestAmerica Job ID: 720-89154-1
Client Project/Site: Mammoth 20170115

For:
Engineering Remediation Resources Group.
4585 Pacheco Boulevard
Suite 200
Martinez, California 94553-2233

Attn: Ms. Caitlin Gorman

Authorized for release by:
10/22/2018 4:05:18 PM

Micah Smith, Project Manager II
(916)374-4302
micah.smith@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at:
www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 720-89154-1

Laboratory: TestAmerica Pleasanton

Narrative

Job Narrative
720-89154-1

Comments
No additional comments.

Receipt
The samples were received on 10/15/2018 1:43 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.6º C and 1.7º C.

Metals
Method(s) 6010B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 720-253582 and analytical batch 720-253684 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 6010B: The serial dilution performed for the following sample associated with batch 720-253684 was outside control limits: (720-89154-A-1-C SD).

Method(s) 7471A: Due to the high concentration of Hg, the matrix spike / matrix spike duplicate (MS/MSD) for preparation batch 720-253594 and analytical batch 720-253710 could not be evaluated for accuracy and precision. The associated laboratory control sample (LCS) met acceptance criteria.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-111-0.3 — Lab Sample ID: 720-89154-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	110	F1	3.4	0.29	mg/Kg	4		6010B	Total/NA
Mercury	1100		15	2.2	mg/Kg	1000		7471A	Total/NA

Client Sample ID: MM-S-111-1.0 — Lab Sample ID: 720-89154-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.4		3.1	0.27	mg/Kg	4		6010B	Total/NA
Mercury	0.63		0.15	0.022	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-114-1.2 — Lab Sample ID: 720-89154-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.0		0.98	0.083	mg/Kg	1		6010B	Total/NA
Mercury	0.22		0.015	0.0022	mg/Kg	1		7471A	Total/NA

Client Sample ID: MM-S-114-0.5 — Lab Sample ID: 720-89154-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	2.3		0.84	0.071	mg/Kg	1		6010B	Total/NA
Mercury	2.8		0.15	0.022	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-115-2.7 — Lab Sample ID: 720-89154-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	7.0		3.4	0.29	mg/Kg	4		6010B	Total/NA
Mercury	20		0.31	0.046	mg/Kg	20		7471A	Total/NA

Client Sample ID: MM-S-115-0.3 — Lab Sample ID: 720-89154-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	150		2.5	0.21	mg/Kg	4		6010B	Total/NA
Mercury	870		16	2.3	mg/Kg	1000		7471A	Total/NA

Client Sample ID: MM-S-117-1.5 — Lab Sample ID: 720-89154-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	10		2.6	0.22	mg/Kg	4		6010B	Total/NA
Mercury	0.73		0.16	0.024	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-117-0.3 — Lab Sample ID: 720-89154-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	11		2.2	0.19	mg/Kg	4		6010B	Total/NA
Mercury	1.0		0.16	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-118-0.3 — Lab Sample ID: 720-89154-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	18		3.8	0.33	mg/Kg	4		6010B	Total/NA
Mercury	3.0		0.16	0.023	mg/Kg	10		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-118-1.0 — Lab Sample ID: 720-89154-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	19		2.2	0.19	mg/Kg	4		6010B	Total/NA
Mercury	1.2		0.15	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-120-0.3 — Lab Sample ID: 720-89154-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.5		2.7	0.23	mg/Kg	4		6010B	Total/NA
Mercury	0.82		0.14	0.021	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-121-1.0 — Lab Sample ID: 720-89154-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.7		3.2	0.27	mg/Kg	4		6010B	Total/NA
Mercury	2.8		0.14	0.021	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-121-0.3 — Lab Sample ID: 720-89154-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	18		2.6	0.22	mg/Kg	4		6010B	Total/NA
Mercury	80		1.6	0.23	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-122-2.0 — Lab Sample ID: 720-89154-14

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.5		3.4	0.29	mg/Kg	4		6010B	Total/NA
Mercury	1.7		0.15	0.022	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-122-1.5 — Lab Sample ID: 720-89154-15

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	10		3.2	0.27	mg/Kg	4		6010B	Total/NA
Mercury	100		1.6	0.23	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-122-0.3 — Lab Sample ID: 720-89154-16

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	20		3.6	0.31	mg/Kg	4		6010B	Total/NA
Mercury	130		1.6	0.23	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-123-0.5 — Lab Sample ID: 720-89154-17

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	12		3.5	0.30	mg/Kg	4		6010B	Total/NA
Mercury	21		0.32	0.047	mg/Kg	20		7471A	Total/NA

Client Sample ID: MM-S-124-0.3 — Lab Sample ID: 720-89154-18

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	4.9		2.7	0.23	mg/Kg	4		6010B	Total/NA
Mercury	2.9		0.17	0.025	mg/Kg	10		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-125-0.6 — Lab Sample ID: 720-89154-19

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	19		3.0	0.26	mg/Kg	4		6010B	Total/NA
Mercury	170		3.3	0.49	mg/Kg	200		7471A	Total/NA

Client Sample ID: MM-S-126-0.4 — Lab Sample ID: 720-89154-20

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	7.9		2.4	0.20	mg/Kg	4		6010B	Total/NA
Mercury	35		1.5	0.22	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-127-1.0 — Lab Sample ID: 720-89154-21

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	4.3		3.4	0.29	mg/Kg	4		6010B	Total/NA
Mercury	0.63		0.16	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-127-0.5 — Lab Sample ID: 720-89154-22

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.3		3.1	0.26	mg/Kg	4		6010B	Total/NA
Mercury	14		0.32	0.048	mg/Kg	20		7471A	Total/NA

Client Sample ID: MM-S-63-0.5 — Lab Sample ID: 720-89154-23

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	12		3.2	0.27	mg/Kg	4		6010B	Total/NA
Mercury	71		1.7	0.25	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-63-1.0 — Lab Sample ID: 720-89154-24

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	4.6		2.7	0.23	mg/Kg	4		6010B	Total/NA
Mercury	0.43		0.16	0.024	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-133-1.0 — Lab Sample ID: 720-89154-25

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	50		3.1	0.26	mg/Kg	4		6010B	Total/NA
Mercury	40		1.5	0.22	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-142-2.3 — Lab Sample ID: 720-89154-26

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	29		3.5	0.30	mg/Kg	4		6010B	Total/NA
Mercury	58		1.6	0.24	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-142-0.3 — Lab Sample ID: 720-89154-27

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	140		3.5	0.30	mg/Kg	4		6010B	Total/NA
Mercury	4.0		0.15	0.021	mg/Kg	10		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-112-1.0 — Lab Sample ID: 720-89154-28

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	7.7		3.3	0.28	mg/Kg	4		6010B	Total/NA
Mercury	9.7		0.17	0.025	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-112-0.3 — Lab Sample ID: 720-89154-29

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	9.1		3.3	0.28	mg/Kg	4		6010B	Total/NA
Mercury	22		0.59	0.087	mg/Kg	40		7471A	Total/NA

Client Sample ID: MM-S-110-1.0 — Lab Sample ID: 720-89154-30

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	9.2		3.3	0.28	mg/Kg	4		6010B	Total/NA
Mercury	0.33		0.15	0.021	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-110-0.3 — Lab Sample ID: 720-89154-31

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	15		3.7	0.31	mg/Kg	4		6010B	Total/NA
Mercury	17		0.30	0.044	mg/Kg	20		7471A	Total/NA

Client Sample ID: MM-S-138-0.3 — Lab Sample ID: 720-89154-32

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	22		2.9	0.24	mg/Kg	4		6010B	Total/NA
Mercury	4.1		0.17	0.025	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-141-1.7 — Lab Sample ID: 720-89154-33

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.6		3.6	0.30	mg/Kg	4		6010B	Total/NA
Mercury	0.84		0.16	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-141-1.3 — Lab Sample ID: 720-89154-34

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	2.8	J	3.8	0.32	mg/Kg	4		6010B	Total/NA
Mercury	1.5		0.17	0.025	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-141-0.3 — Lab Sample ID: 720-89154-35

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	15		2.4	0.21	mg/Kg	4		6010B	Total/NA
Mercury	220		6.7	0.98	mg/Kg	400		7471A	Total/NA

Client Sample ID: MM-S-139-0.3 — Lab Sample ID: 720-89154-36

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.0	J	3.7	0.31	mg/Kg	4		6010B	Total/NA
Mercury	0.61		0.16	0.023	mg/Kg	10		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-140-0.8 — Lab Sample ID: 720-89154-37

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	2.5	J	3.0	0.25	mg/Kg	4		6010B	Total/NA
Mercury	0.41		0.16	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-140-0.6 — Lab Sample ID: 720-89154-38

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	7.0		4.0	0.34	mg/Kg	4		6010B	Total/NA
Mercury	25		0.65	0.095	mg/Kg	40		7471A	Total/NA

Client Sample ID: MM-S-134-0.4 — Lab Sample ID: 720-89154-39

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	2.5	J	3.7	0.32	mg/Kg	4		6010B	Total/NA
Mercury	2.5		0.14	0.021	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-136-0.3 — Lab Sample ID: 720-89154-40

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.0	J	3.7	0.32	mg/Kg	4		6010B	Total/NA
Mercury	0.27		0.014	0.0021	mg/Kg	1		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-111-0.3

Lab Sample ID: 720-89154-1

Date Collected: 10/08/18 11:51

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	110	F1	3.4	0.29	mg/Kg		10/17/18 08:48	10/18/18 09:07	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1100		15	2.2	mg/Kg		10/17/18 10:08	10/18/18 13:58	1000

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-111-1.0

Lab Sample ID: 720-89154-2

Date Collected: 10/08/18 11:50

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.4		3.1	0.27	mg/Kg		10/17/18 08:48	10/18/18 09:12	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.63		0.15	0.022	mg/Kg		10/17/18 10:08	10/18/18 14:00	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-114-1.2

Lab Sample ID: 720-89154-3

Date Collected: 10/08/18 14:20

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.0		0.98	0.083	mg/Kg		10/17/18 08:48	10/19/18 15:10	1

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.22		0.015	0.0022	mg/Kg		10/17/18 10:08	10/18/18 15:37	1

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-114-0.5

Lab Sample ID: 720-89154-4

Date Collected: 10/08/18 14:23

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.3		0.84	0.071	mg/Kg		10/17/18 08:48	10/19/18 15:14	1

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	2.8		0.15	0.022	mg/Kg		10/17/18 10:08	10/18/18 14:05	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-115-2.7

Lab Sample ID: 720-89154-5

Date Collected: 10/08/18 14:40

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.0		3.4	0.29	mg/Kg		10/17/18 08:48	10/18/18 09:35	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	20		0.31	0.046	mg/Kg		10/17/18 10:08	10/18/18 14:08	20

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-115-0.3

Lab Sample ID: 720-89154-6

Date Collected: 10/08/18 14:30

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	150		2.5	0.21	mg/Kg		10/17/18 08:48	10/18/18 09:40	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	870		16	2.3	mg/Kg		10/17/18 10:08	10/18/18 14:10	1000

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-117-1.5

Lab Sample ID: 720-89154-7

Date Collected: 10/09/18 09:21

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	10		2.6	0.22	mg/Kg		10/17/18 08:48	10/18/18 09:44	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.73		0.16	0.024	mg/Kg		10/17/18 10:08	10/18/18 14:18	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-117-0.3

Lab Sample ID: 720-89154-8

Date Collected: 10/09/18 09:22

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	11		2.2	0.19	mg/Kg		10/17/18 08:48	10/18/18 09:49	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.0		0.16	0.023	mg/Kg		10/17/18 10:08	10/18/18 14:20	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-118-0.3

Lab Sample ID: 720-89154-9

Date Collected: 10/09/18 10:18

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	18		3.8	0.33	mg/Kg		10/17/18 08:48	10/18/18 09:53	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	3.0		0.16	0.023	mg/Kg		10/17/18 10:08	10/18/18 14:23	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-118-1.0

Lab Sample ID: 720-89154-10

Date Collected: 10/09/18 10:16

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	19		2.2	0.19	mg/Kg		10/17/18 08:48	10/18/18 09:58	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.2		0.15	0.023	mg/Kg		10/17/18 10:08	10/18/18 14:25	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-120-0.3

Lab Sample ID: 720-89154-11

Date Collected: 10/09/18 11:02

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.5		2.7	0.23	mg/Kg		10/17/18 08:48	10/18/18 10:03	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.82		0.14	0.021	mg/Kg		10/17/18 10:08	10/18/18 14:27	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-121-1.0

Lab Sample ID: 720-89154-12

Date Collected: 10/09/18 11:35

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.7		3.2	0.27	mg/Kg		10/17/18 08:48	10/18/18 10:07	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	2.8		0.14	0.021	mg/Kg		10/17/18 10:08	10/18/18 14:30	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-121-0.3

Lab Sample ID: 720-89154-13

Date Collected: 10/09/18 11:37

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	18		2.6	0.22	mg/Kg		10/17/18 08:48	10/18/18 10:12	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	80		1.6	0.23	mg/Kg		10/17/18 10:08	10/18/18 14:32	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-122-2.0

Lab Sample ID: 720-89154-14

Date Collected: 10/09/18 13:03

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.5		3.4	0.29	mg/Kg		10/17/18 08:48	10/18/18 10:16	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.7		0.15	0.022	mg/Kg		10/17/18 10:08	10/18/18 14:34	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-122-1.5

Lab Sample ID: 720-89154-15

Date Collected: 10/09/18 13:05

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	10		3.2	0.27	mg/Kg		10/17/18 08:48	10/18/18 10:30	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	100		1.6	0.23	mg/Kg		10/17/18 10:08	10/18/18 14:37	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-122-0.3

Lab Sample ID: 720-89154-16

Date Collected: 10/09/18 13:06

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	20		3.6	0.31	mg/Kg		10/17/18 08:48	10/18/18 10:35	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	130		1.6	0.23	mg/Kg		10/17/18 10:08	10/18/18 14:39	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-123-0.5

Lab Sample ID: 720-89154-17

Date Collected: 10/09/18 13:19

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	12		3.5	0.30	mg/Kg		10/17/18 08:48	10/18/18 10:39	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	21		0.32	0.047	mg/Kg		10/17/18 10:08	10/18/18 14:47	20

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-124-0.3

Lab Sample ID: 720-89154-18

Date Collected: 10/09/18 13:24

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.9		2.7	0.23	mg/Kg		10/17/18 08:48	10/18/18 10:44	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	2.9		0.17	0.025	mg/Kg		10/17/18 10:08	10/18/18 14:49	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-125-0.6

Lab Sample ID: 720-89154-19

Date Collected: 10/09/18 14:15

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	19		3.0	0.26	mg/Kg		10/17/18 08:48	10/18/18 10:49	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	170		3.3	0.49	mg/Kg		10/17/18 10:08	10/18/18 14:52	200

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-126-0.4

Lab Sample ID: 720-89154-20

Date Collected: 10/09/18 14:50

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.9		2.4	0.20	mg/Kg		10/17/18 08:48	10/18/18 10:53	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	35		1.5	0.22	mg/Kg		10/17/18 10:08	10/18/18 14:55	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-127-1.0

Lab Sample ID: 720-89154-21

Date Collected: 10/09/18 15:18

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.3		3.4	0.29	mg/Kg		10/17/18 09:34	10/18/18 16:13	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.63		0.16	0.023	mg/Kg		10/17/18 21:20	10/18/18 18:22	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-127-0.5

Lab Sample ID: 720-89154-22

Date Collected: 10/09/18 15:19

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.3		3.1	0.26	mg/Kg		10/17/18 09:34	10/18/18 16:18	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	14		0.32	0.048	mg/Kg		10/17/18 21:20	10/18/18 18:24	20

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-63-0.5

Lab Sample ID: 720-89154-23

Date Collected: 10/09/18 15:56

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	12		3.2	0.27	mg/Kg		10/17/18 09:34	10/18/18 16:22	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	71		1.7	0.25	mg/Kg		10/17/18 21:20	10/18/18 18:27	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-63-1.0

Lab Sample ID: 720-89154-24

Date Collected: 10/09/18 16:00

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.6		2.7	0.23	mg/Kg		10/17/18 09:34	10/18/18 16:27	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.43		0.16	0.024	mg/Kg		10/17/18 21:20	10/18/18 18:29	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-133-1.0

Lab Sample ID: 720-89154-25

Date Collected: 10/10/18 13:07

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	50		3.1	0.26	mg/Kg		10/17/18 09:34	10/18/18 16:41	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	40		1.5	0.22	mg/Kg		10/17/18 21:20	10/18/18 18:32	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-142-2.3

Lab Sample ID: 720-89154-26

Date Collected: 10/11/18 11:36

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	29		3.5	0.30	mg/Kg		10/17/18 09:34	10/18/18 16:46	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	58		1.6	0.24	mg/Kg		10/17/18 21:20	10/18/18 18:34	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-142-0.3

Lab Sample ID: 720-89154-27

Date Collected: 10/11/18 11:46

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	140		3.5	0.30	mg/Kg		10/17/18 09:34	10/18/18 16:50	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	4.0		0.15	0.021	mg/Kg		10/17/18 21:20	10/18/18 18:42	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-112-1.0

Lab Sample ID: 720-89154-28

Date Collected: 10/08/18 11:35

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.7		3.3	0.28	mg/Kg		10/17/18 09:34	10/18/18 16:55	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	9.7		0.17	0.025	mg/Kg		10/17/18 21:20	10/18/18 18:44	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-112-0.3

Lab Sample ID: 720-89154-29

Date Collected: 10/08/18 11:36

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	9.1		3.3	0.28	mg/Kg		10/17/18 09:34	10/18/18 17:00	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	22		0.59	0.087	mg/Kg		10/17/18 21:20	10/18/18 18:46	40

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-110-1.0

Lab Sample ID: 720-89154-30

Date Collected: 10/08/18 11:22
Matrix: Solid
Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	9.2		3.3	0.28	mg/Kg		10/17/18 09:34	10/18/18 17:04	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.33		0.15	0.021	mg/Kg		10/17/18 21:20	10/18/18 18:49	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-110-0.3

Lab Sample ID: 720-89154-31

Date Collected: 10/08/18 11:26

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	15		3.7	0.31	mg/Kg		10/17/18 09:34	10/18/18 17:09	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	17		0.30	0.044	mg/Kg		10/17/18 21:20	10/18/18 18:52	20

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-138-0.3

Lab Sample ID: 720-89154-32

Date Collected: 10/11/18 07:47

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	22		2.9	0.24	mg/Kg		10/17/18 09:34	10/18/18 17:14	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	4.1		0.17	0.025	mg/Kg		10/17/18 21:20	10/18/18 18:54	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-141-1.7

Lab Sample ID: 720-89154-33

Date Collected: 10/11/18 09:55

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.6		3.6	0.30	mg/Kg		10/17/18 09:34	10/18/18 17:18	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.84		0.16	0.023	mg/Kg		10/17/18 21:20	10/18/18 18:56	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-141-1.3

Lab Sample ID: 720-89154-34

Date Collected: 10/11/18 10:04

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.8	J	3.8	0.32	mg/Kg		10/17/18 09:34	10/18/18 17:23	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.5		0.17	0.025	mg/Kg		10/17/18 21:20	10/18/18 18:59	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-141-0.3

Lab Sample ID: 720-89154-35

Date Collected: 10/11/18 10:06

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	15		2.4	0.21	mg/Kg		10/17/18 09:34	10/18/18 17:37	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	220		6.7	0.98	mg/Kg		10/17/18 21:20	10/18/18 19:21	400

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-139-0.3

Lab Sample ID: 720-89154-36

Date Collected: 10/11/18 08:26

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.0	J	3.7	0.31	mg/Kg		10/17/18 09:34	10/18/18 17:41	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.61		0.16	0.023	mg/Kg		10/17/18 21:20	10/18/18 19:23	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-140-0.8

Lab Sample ID: 720-89154-37

Date Collected: 10/11/18 09:00

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.5	J	3.0	0.25	mg/Kg		10/17/18 09:34	10/18/18 17:46	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.41		0.16	0.023	mg/Kg		10/17/18 21:20	10/18/18 19:11	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-140-0.6

Lab Sample ID: 720-89154-38

Date Collected: 10/11/18 09:03

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	7.0		4.0	0.34	mg/Kg		10/17/18 09:34	10/18/18 17:50	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	25		0.65	0.095	mg/Kg		10/17/18 21:20	10/18/18 19:13	40

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-134-0.4

Lab Sample ID: 720-89154-39

Date Collected: 10/10/18 13:45

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	2.5	J	3.7	0.32	mg/Kg		10/17/18 09:34	10/18/18 17:55	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	2.5		0.14	0.021	mg/Kg		10/17/18 21:20	10/18/18 19:16	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-136-0.3

Lab Sample ID: 720-89154-40

Date Collected: 10/10/18 14:31

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.0	J	3.7	0.32	mg/Kg		10/17/18 09:34	10/18/18 18:00	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.27		0.014	0.0021	mg/Kg		10/17/18 21:20	10/18/18 19:18	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 720-253582/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253684 — **Prep Batch: 253582**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.0	0.085	mg/Kg		10/17/18 08:48	10/18/18 08:40	1

Lab Sample ID: LCS 720-253582/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253684 — **Prep Batch: 253582**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	50.0	46.3		mg/Kg		93	80 - 120

Lab Sample ID: 720-89154-1 MS — **Client Sample ID: MM-S-111-0.3**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253684 — **Prep Batch: 253582**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	110	F1	42.4	176	F1	mg/Kg		150	75 - 125

Lab Sample ID: 720-89154-1 MSD — **Client Sample ID: MM-S-111-0.3**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253684 — **Prep Batch: 253582**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	110	F1	43.1	169	F1	mg/Kg		131	75 - 125	4	20

Lab Sample ID: MB 720-253587/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253752 — **Prep Batch: 253587**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		1.0	0.085	mg/Kg		10/17/18 09:34	10/18/18 15:46	1

Lab Sample ID: LCS 720-253587/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253752 — **Prep Batch: 253587**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	50.0	47.8		mg/Kg		96	80 - 120

Lab Sample ID: 720-89154-21 MS — **Client Sample ID: MM-S-127-1.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253752 — **Prep Batch: 253587**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	4.3		42.4	44.8		mg/Kg		95	75 - 125

Lab Sample ID: 720-89154-21 MSD — **Client Sample ID: MM-S-127-1.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253752 — **Prep Batch: 253587**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	4.3		41.7	44.3		mg/Kg		96	75 - 125	1	20

QC Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Method: 7471A - Mercury (CVAA)

Lab Sample ID: MB 720-253594/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253710 — **Prep Batch: 253594**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.017	0.0025	mg/Kg		10/17/18 10:08	10/18/18 13:48	1

Lab Sample ID: LCS 720-253594/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253710 — **Prep Batch: 253594**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.833	0.728		mg/Kg		87	80 - 120

Lab Sample ID: 720-89154-1 MS — **Client Sample ID: MM-S-111-0.3**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253710 — **Prep Batch: 253594**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	1100		0.725	878	4	mg/Kg		-26789	75 - 125

Lab Sample ID: 720-89154-1 MSD — **Client Sample ID: MM-S-111-0.3**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253710 — **Prep Batch: 253594**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	1100		0.735	876	4	mg/Kg		-26719	75 - 125	0	20

Lab Sample ID: MB 720-253610/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253760 — **Prep Batch: 253610**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.017	0.0025	mg/Kg		10/17/18 21:20	10/18/18 18:13	1

Lab Sample ID: LCS 720-253610/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253760 — **Prep Batch: 253610**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.833	0.736		mg/Kg		88	80 - 120

Lab Sample ID: 720-89154-21 MS — **Client Sample ID: MM-S-127-1.0**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253760 — **Prep Batch: 253610**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.63		0.769	1.20		mg/Kg		75	75 - 125

Method: 7471A - Mercury (CVAA) (Continued)

Lab Sample ID: 720-89154-21 MSD | **Client Sample ID: MM-S-127-1.0**
Matrix: Solid | **Prep Type: Total/NA**
Analysis Batch: 253760 | **Prep Batch: 253610**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.63		0.794	1.23		mg/Kg		75	75 - 125	2	20

Metals

Prep Batch: 253582

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-1	MM-S-111-0.3	Total/NA	Solid	3050B	
720-89154-2	MM-S-111-1.0	Total/NA	Solid	3050B	
720-89154-3	MM-S-114-1.2	Total/NA	Solid	3050B	
720-89154-4	MM-S-114-0.5	Total/NA	Solid	3050B	
720-89154-5	MM-S-115-2.7	Total/NA	Solid	3050B	
720-89154-6	MM-S-115-0.3	Total/NA	Solid	3050B	
720-89154-7	MM-S-117-1.5	Total/NA	Solid	3050B	
720-89154-8	MM-S-117-0.3	Total/NA	Solid	3050B	
720-89154-9	MM-S-118-0.3	Total/NA	Solid	3050B	
720-89154-10	MM-S-118-1.0	Total/NA	Solid	3050B	
720-89154-11	MM-S-120-0.3	Total/NA	Solid	3050B	
720-89154-12	MM-S-121-1.0	Total/NA	Solid	3050B	
720-89154-13	MM-S-121-0.3	Total/NA	Solid	3050B	
720-89154-14	MM-S-122-2.0	Total/NA	Solid	3050B	
720-89154-15	MM-S-122-1.5	Total/NA	Solid	3050B	
720-89154-16	MM-S-122-0.3	Total/NA	Solid	3050B	
720-89154-17	MM-S-123-0.5	Total/NA	Solid	3050B	
720-89154-18	MM-S-124-0.3	Total/NA	Solid	3050B	
720-89154-19	MM-S-125-0.6	Total/NA	Solid	3050B	
720-89154-20	MM-S-126-0.4	Total/NA	Solid	3050B	
MB 720-253582/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 720-253582/2-A	Lab Control Sample	Total/NA	Solid	3050B	
720-89154-1 MS	MM-S-111-0.3	Total/NA	Solid	3050B	
720-89154-1 MSD	MM-S-111-0.3	Total/NA	Solid	3050B	

Prep Batch: 253587

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-21	MM-S-127-1.0	Total/NA	Solid	3050B	
720-89154-22	MM-S-127-0.5	Total/NA	Solid	3050B	
720-89154-23	MM-S-63-0.5	Total/NA	Solid	3050B	
720-89154-24	MM-S-63-1.0	Total/NA	Solid	3050B	
720-89154-25	MM-S-133-1.0	Total/NA	Solid	3050B	
720-89154-26	MM-S-142-2.3	Total/NA	Solid	3050B	
720-89154-27	MM-S-142-0.3	Total/NA	Solid	3050B	
720-89154-28	MM-S-112-1.0	Total/NA	Solid	3050B	
720-89154-29	MM-S-112-0.3	Total/NA	Solid	3050B	
720-89154-30	MM-S-110-1.0	Total/NA	Solid	3050B	
720-89154-31	MM-S-110-0.3	Total/NA	Solid	3050B	
720-89154-32	MM-S-138-0.3	Total/NA	Solid	3050B	
720-89154-33	MM-S-141-1.7	Total/NA	Solid	3050B	
720-89154-34	MM-S-141-1.3	Total/NA	Solid	3050B	
720-89154-35	MM-S-141-0.3	Total/NA	Solid	3050B	
720-89154-36	MM-S-139-0.3	Total/NA	Solid	3050B	
720-89154-37	MM-S-140-0.8	Total/NA	Solid	3050B	
720-89154-38	MM-S-140-0.6	Total/NA	Solid	3050B	
720-89154-39	MM-S-134-0.4	Total/NA	Solid	3050B	
720-89154-40	MM-S-136-0.3	Total/NA	Solid	3050B	
MB 720-253587/1-A	Method Blank	Total/NA	Solid	3050B	
LCS 720-253587/2-A	Lab Control Sample	Total/NA	Solid	3050B	
720-89154-21 MS	MM-S-127-1.0	Total/NA	Solid	3050B	
720-89154-21 MSD	MM-S-127-1.0	Total/NA	Solid	3050B	

QC Association Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Prep Batch: 253594

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-1	MM-S-111-0.3	Total/NA	Solid	7471A	
720-89154-2	MM-S-111-1.0	Total/NA	Solid	7471A	
720-89154-3	MM-S-114-1.2	Total/NA	Solid	7471A	
720-89154-4	MM-S-114-0.5	Total/NA	Solid	7471A	
720-89154-5	MM-S-115-2.7	Total/NA	Solid	7471A	
720-89154-6	MM-S-115-0.3	Total/NA	Solid	7471A	
720-89154-7	MM-S-117-1.5	Total/NA	Solid	7471A	
720-89154-8	MM-S-117-0.3	Total/NA	Solid	7471A	
720-89154-9	MM-S-118-0.3	Total/NA	Solid	7471A	
720-89154-10	MM-S-118-1.0	Total/NA	Solid	7471A	
720-89154-11	MM-S-120-0.3	Total/NA	Solid	7471A	
720-89154-12	MM-S-121-1.0	Total/NA	Solid	7471A	
720-89154-13	MM-S-121-0.3	Total/NA	Solid	7471A	
720-89154-14	MM-S-122-2.0	Total/NA	Solid	7471A	
720-89154-15	MM-S-122-1.5	Total/NA	Solid	7471A	
720-89154-16	MM-S-122-0.3	Total/NA	Solid	7471A	
720-89154-17	MM-S-123-0.5	Total/NA	Solid	7471A	
720-89154-18	MM-S-124-0.3	Total/NA	Solid	7471A	
720-89154-19	MM-S-125-0.6	Total/NA	Solid	7471A	
720-89154-20	MM-S-126-0.4	Total/NA	Solid	7471A	
MB 720-253594/1-A	Method Blank	Total/NA	Solid	7471A	
LCS 720-253594/2-A	Lab Control Sample	Total/NA	Solid	7471A	
720-89154-1 MS	MM-S-111-0.3	Total/NA	Solid	7471A	
720-89154-1 MSD	MM-S-111-0.3	Total/NA	Solid	7471A	

Prep Batch: 253610

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-21	MM-S-127-1.0	Total/NA	Solid	7471A	
720-89154-22	MM-S-127-0.5	Total/NA	Solid	7471A	
720-89154-23	MM-S-63-0.5	Total/NA	Solid	7471A	
720-89154-24	MM-S-63-1.0	Total/NA	Solid	7471A	
720-89154-25	MM-S-133-1.0	Total/NA	Solid	7471A	
720-89154-26	MM-S-142-2.3	Total/NA	Solid	7471A	
720-89154-27	MM-S-142-0.3	Total/NA	Solid	7471A	
720-89154-28	MM-S-112-1.0	Total/NA	Solid	7471A	
720-89154-29	MM-S-112-0.3	Total/NA	Solid	7471A	
720-89154-30	MM-S-110-1.0	Total/NA	Solid	7471A	
720-89154-31	MM-S-110-0.3	Total/NA	Solid	7471A	
720-89154-32	MM-S-138-0.3	Total/NA	Solid	7471A	
720-89154-33	MM-S-141-1.7	Total/NA	Solid	7471A	
720-89154-34	MM-S-141-1.3	Total/NA	Solid	7471A	
720-89154-35	MM-S-141-0.3	Total/NA	Solid	7471A	
720-89154-36	MM-S-139-0.3	Total/NA	Solid	7471A	
720-89154-37	MM-S-140-0.8	Total/NA	Solid	7471A	
720-89154-38	MM-S-140-0.6	Total/NA	Solid	7471A	
720-89154-39	MM-S-134-0.4	Total/NA	Solid	7471A	
720-89154-40	MM-S-136-0.3	Total/NA	Solid	7471A	
MB 720-253610/1-A	Method Blank	Total/NA	Solid	7471A	
LCS 720-253610/2-A	Lab Control Sample	Total/NA	Solid	7471A	
720-89154-21 MS	MM-S-127-1.0	Total/NA	Solid	7471A	
720-89154-21 MSD	MM-S-127-1.0	Total/NA	Solid	7471A	

Metals (Continued)

Analysis Batch: 253684

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-1	MM-S-111-0.3	Total/NA	Solid	6010B	253582
720-89154-2	MM-S-111-1.0	Total/NA	Solid	6010B	253582
720-89154-5	MM-S-115-2.7	Total/NA	Solid	6010B	253582
720-89154-6	MM-S-115-0.3	Total/NA	Solid	6010B	253582
720-89154-7	MM-S-117-1.5	Total/NA	Solid	6010B	253582
720-89154-8	MM-S-117-0.3	Total/NA	Solid	6010B	253582
720-89154-9	MM-S-118-0.3	Total/NA	Solid	6010B	253582
720-89154-10	MM-S-118-1.0	Total/NA	Solid	6010B	253582
720-89154-11	MM-S-120-0.3	Total/NA	Solid	6010B	253582
720-89154-12	MM-S-121-1.0	Total/NA	Solid	6010B	253582
720-89154-13	MM-S-121-0.3	Total/NA	Solid	6010B	253582
720-89154-14	MM-S-122-2.0	Total/NA	Solid	6010B	253582
720-89154-15	MM-S-122-1.5	Total/NA	Solid	6010B	253582
720-89154-16	MM-S-122-0.3	Total/NA	Solid	6010B	253582
720-89154-17	MM-S-123-0.5	Total/NA	Solid	6010B	253582
720-89154-18	MM-S-124-0.3	Total/NA	Solid	6010B	253582
720-89154-19	MM-S-125-0.6	Total/NA	Solid	6010B	253582
720-89154-20	MM-S-126-0.4	Total/NA	Solid	6010B	253582
MB 720-253582/1-A	Method Blank	Total/NA	Solid	6010B	253582
LCS 720-253582/2-A	Lab Control Sample	Total/NA	Solid	6010B	253582
720-89154-1 MS	MM-S-111-0.3	Total/NA	Solid	6010B	253582
720-89154-1 MSD	MM-S-111-0.3	Total/NA	Solid	6010B	253582

Analysis Batch: 253710

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-1	MM-S-111-0.3	Total/NA	Solid	7471A	253594
720-89154-2	MM-S-111-1.0	Total/NA	Solid	7471A	253594
720-89154-3	MM-S-114-1.2	Total/NA	Solid	7471A	253594
720-89154-4	MM-S-114-0.5	Total/NA	Solid	7471A	253594
720-89154-5	MM-S-115-2.7	Total/NA	Solid	7471A	253594
720-89154-6	MM-S-115-0.3	Total/NA	Solid	7471A	253594
720-89154-7	MM-S-117-1.5	Total/NA	Solid	7471A	253594
720-89154-8	MM-S-117-0.3	Total/NA	Solid	7471A	253594
720-89154-9	MM-S-118-0.3	Total/NA	Solid	7471A	253594
720-89154-10	MM-S-118-1.0	Total/NA	Solid	7471A	253594
720-89154-11	MM-S-120-0.3	Total/NA	Solid	7471A	253594
720-89154-12	MM-S-121-1.0	Total/NA	Solid	7471A	253594
720-89154-13	MM-S-121-0.3	Total/NA	Solid	7471A	253594
720-89154-14	MM-S-122-2.0	Total/NA	Solid	7471A	253594
720-89154-15	MM-S-122-1.5	Total/NA	Solid	7471A	253594
720-89154-16	MM-S-122-0.3	Total/NA	Solid	7471A	253594
720-89154-17	MM-S-123-0.5	Total/NA	Solid	7471A	253594
720-89154-18	MM-S-124-0.3	Total/NA	Solid	7471A	253594
720-89154-19	MM-S-125-0.6	Total/NA	Solid	7471A	253594
720-89154-20	MM-S-126-0.4	Total/NA	Solid	7471A	253594
MB 720-253594/1-A	Method Blank	Total/NA	Solid	7471A	253594
LCS 720-253594/2-A	Lab Control Sample	Total/NA	Solid	7471A	253594
720-89154-1 MS	MM-S-111-0.3	Total/NA	Solid	7471A	253594
720-89154-1 MSD	MM-S-111-0.3	Total/NA	Solid	7471A	253594

Metals (Continued)

Analysis Batch: 253752

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-21	MM-S-127-1.0	Total/NA	Solid	6010B	253587
720-89154-22	MM-S-127-0.5	Total/NA	Solid	6010B	253587
720-89154-23	MM-S-63-0.5	Total/NA	Solid	6010B	253587
720-89154-24	MM-S-63-1.0	Total/NA	Solid	6010B	253587
720-89154-25	MM-S-133-1.0	Total/NA	Solid	6010B	253587
720-89154-26	MM-S-142-2.3	Total/NA	Solid	6010B	253587
720-89154-27	MM-S-142-0.3	Total/NA	Solid	6010B	253587
720-89154-28	MM-S-112-1.0	Total/NA	Solid	6010B	253587
720-89154-29	MM-S-112-0.3	Total/NA	Solid	6010B	253587
720-89154-30	MM-S-110-1.0	Total/NA	Solid	6010B	253587
720-89154-31	MM-S-110-0.3	Total/NA	Solid	6010B	253587
720-89154-32	MM-S-138-0.3	Total/NA	Solid	6010B	253587
720-89154-33	MM-S-141-1.7	Total/NA	Solid	6010B	253587
720-89154-34	MM-S-141-1.3	Total/NA	Solid	6010B	253587
720-89154-35	MM-S-141-0.3	Total/NA	Solid	6010B	253587
720-89154-36	MM-S-139-0.3	Total/NA	Solid	6010B	253587
720-89154-37	MM-S-140-0.8	Total/NA	Solid	6010B	253587
720-89154-38	MM-S-140-0.6	Total/NA	Solid	6010B	253587
720-89154-39	MM-S-134-0.4	Total/NA	Solid	6010B	253587
720-89154-40	MM-S-136-0.3	Total/NA	Solid	6010B	253587
MB 720-253587/1-A	Method Blank	Total/NA	Solid	6010B	253587
LCS 720-253587/2-A	Lab Control Sample	Total/NA	Solid	6010B	253587
720-89154-21 MS	MM-S-127-1.0	Total/NA	Solid	6010B	253587
720-89154-21 MSD	MM-S-127-1.0	Total/NA	Solid	6010B	253587

Analysis Batch: 253760

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-21	MM-S-127-1.0	Total/NA	Solid	7471A	253610
720-89154-22	MM-S-127-0.5	Total/NA	Solid	7471A	253610
720-89154-23	MM-S-63-0.5	Total/NA	Solid	7471A	253610
720-89154-24	MM-S-63-1.0	Total/NA	Solid	7471A	253610
720-89154-25	MM-S-133-1.0	Total/NA	Solid	7471A	253610
720-89154-26	MM-S-142-2.3	Total/NA	Solid	7471A	253610
720-89154-27	MM-S-142-0.3	Total/NA	Solid	7471A	253610
720-89154-28	MM-S-112-1.0	Total/NA	Solid	7471A	253610
720-89154-29	MM-S-112-0.3	Total/NA	Solid	7471A	253610
720-89154-30	MM-S-110-1.0	Total/NA	Solid	7471A	253610
720-89154-31	MM-S-110-0.3	Total/NA	Solid	7471A	253610
720-89154-32	MM-S-138-0.3	Total/NA	Solid	7471A	253610
720-89154-33	MM-S-141-1.7	Total/NA	Solid	7471A	253610
720-89154-34	MM-S-141-1.3	Total/NA	Solid	7471A	253610
720-89154-35	MM-S-141-0.3	Total/NA	Solid	7471A	253610
720-89154-36	MM-S-139-0.3	Total/NA	Solid	7471A	253610
720-89154-37	MM-S-140-0.8	Total/NA	Solid	7471A	253610
720-89154-38	MM-S-140-0.6	Total/NA	Solid	7471A	253610
720-89154-39	MM-S-134-0.4	Total/NA	Solid	7471A	253610
720-89154-40	MM-S-136-0.3	Total/NA	Solid	7471A	253610
MB 720-253610/1-A	Method Blank	Total/NA	Solid	7471A	253610
LCS 720-253610/2-A	Lab Control Sample	Total/NA	Solid	7471A	253610
720-89154-21 MS	MM-S-127-1.0	Total/NA	Solid	7471A	253610
720-89154-21 MSD	MM-S-127-1.0	Total/NA	Solid	7471A	253610

QC Association Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Analysis Batch: 253798

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89154-3	MM-S-114-1.2	Total/NA	Solid	6010B	253582
720-89154-4	MM-S-114-0.5	Total/NA	Solid	6010B	253582

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-111-0.3 — Lab Sample ID: 720-89154-1

Date Collected: 10/08/18 11:51 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:07	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		1000	253710	10/18/18 13:58	MAG	TAL PLS

Client Sample ID: MM-S-111-1.0 — Lab Sample ID: 720-89154-2

Date Collected: 10/08/18 11:50 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:12	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:00	MAG	TAL PLS

Client Sample ID: MM-S-114-1.2 — Lab Sample ID: 720-89154-3

Date Collected: 10/08/18 14:20 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		1	253798	10/19/18 15:10	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		1	253710	10/18/18 15:37	MAG	TAL PLS

Client Sample ID: MM-S-114-0.5 — Lab Sample ID: 720-89154-4

Date Collected: 10/08/18 14:23 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		1	253798	10/19/18 15:14	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:05	MAG	TAL PLS

Client Sample ID: MM-S-115-2.7 — Lab Sample ID: 720-89154-5

Date Collected: 10/08/18 14:40 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:35	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-115-2.7 — Lab Sample ID: 720-89154-5

Date Collected: 10/08/18 14:40 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	7471A		20	253710	10/18/18 14:08	MAG	TAL PLS

Client Sample ID: MM-S-115-0.3 — Lab Sample ID: 720-89154-6

Date Collected: 10/08/18 14:30 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:40	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		1000	253710	10/18/18 14:10	MAG	TAL PLS

Client Sample ID: MM-S-117-1.5 — Lab Sample ID: 720-89154-7

Date Collected: 10/09/18 09:21 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:44	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:18	MAG	TAL PLS

Client Sample ID: MM-S-117-0.3 — Lab Sample ID: 720-89154-8

Date Collected: 10/09/18 09:22 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:49	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:20	MAG	TAL PLS

Client Sample ID: MM-S-118-0.3 — Lab Sample ID: 720-89154-9

Date Collected: 10/09/18 10:18 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:53	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:23	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-118-1.0 — Lab Sample ID: 720-89154-10

Date Collected: 10/09/18 10:16 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 09:58	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:25	MAG	TAL PLS

Client Sample ID: MM-S-120-0.3 — Lab Sample ID: 720-89154-11

Date Collected: 10/09/18 11:02 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:03	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:27	MAG	TAL PLS

Client Sample ID: MM-S-121-1.0 — Lab Sample ID: 720-89154-12

Date Collected: 10/09/18 11:35 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:07	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:30	MAG	TAL PLS

Client Sample ID: MM-S-121-0.3 — Lab Sample ID: 720-89154-13

Date Collected: 10/09/18 11:37 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:12	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		100	253710	10/18/18 14:32	MAG	TAL PLS

Client Sample ID: MM-S-122-2.0 — Lab Sample ID: 720-89154-14

Date Collected: 10/09/18 13:03 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:16	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-122-2.0 — Lab Sample ID: 720-89154-14

Date Collected: 10/09/18 13:03 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	7471A		10	253710	10/18/18 14:34	MAG	TAL PLS

Client Sample ID: MM-S-122-1.5 — Lab Sample ID: 720-89154-15

Date Collected: 10/09/18 13:05 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:30	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		100	253710	10/18/18 14:37	MAG	TAL PLS

Client Sample ID: MM-S-122-0.3 — Lab Sample ID: 720-89154-16

Date Collected: 10/09/18 13:06 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:35	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		100	253710	10/18/18 14:39	MAG	TAL PLS

Client Sample ID: MM-S-123-0.5 — Lab Sample ID: 720-89154-17

Date Collected: 10/09/18 13:19 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:39	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		20	253710	10/18/18 14:47	MAG	TAL PLS

Client Sample ID: MM-S-124-0.3 — Lab Sample ID: 720-89154-18

Date Collected: 10/09/18 13:24 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:44	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		10	253710	10/18/18 14:49	MAG	TAL PLS

Client Sample ID: MM-S-125-0.6 — Lab Sample ID: 720-89154-19

Date Collected: 10/09/18 14:15 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:49	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		200	253710	10/18/18 14:52	MAG	TAL PLS

Client Sample ID: MM-S-126-0.4 — Lab Sample ID: 720-89154-20

Date Collected: 10/09/18 14:50 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253582	10/17/18 08:48	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253684	10/18/18 10:53	OBI	TAL PLS
Total/NA	Prep	7471A			253594	10/17/18 10:08	MAG	TAL PLS
Total/NA	Analysis	7471A		100	253710	10/18/18 14:55	MAG	TAL PLS

Client Sample ID: MM-S-127-1.0 — Lab Sample ID: 720-89154-21

Date Collected: 10/09/18 15:18 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:13	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:22	MAG	TAL PLS

Client Sample ID: MM-S-127-0.5 — Lab Sample ID: 720-89154-22

Date Collected: 10/09/18 15:19 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:18	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		20	253760	10/18/18 18:24	MAG	TAL PLS

Client Sample ID: MM-S-63-0.5 — Lab Sample ID: 720-89154-23

Date Collected: 10/09/18 15:56 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:22	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-63-0.5 — Lab Sample ID: 720-89154-23

Date Collected: 10/09/18 15:56 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	7471A		100	253760	10/18/18 18:27	MAG	TAL PLS

Client Sample ID: MM-S-63-1.0 — Lab Sample ID: 720-89154-24

Date Collected: 10/09/18 16:00 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:27	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:29	MAG	TAL PLS

Client Sample ID: MM-S-133-1.0 — Lab Sample ID: 720-89154-25

Date Collected: 10/10/18 13:07 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:41	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		100	253760	10/18/18 18:32	MAG	TAL PLS

Client Sample ID: MM-S-142-2.3 — Lab Sample ID: 720-89154-26

Date Collected: 10/11/18 11:36 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:46	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		100	253760	10/18/18 18:34	MAG	TAL PLS

Client Sample ID: MM-S-142-0.3 — Lab Sample ID: 720-89154-27

Date Collected: 10/11/18 11:46 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:50	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:42	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-112-1.0 — Lab Sample ID: 720-89154-28

Date Collected: 10/08/18 11:35 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 16:55	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:44	MAG	TAL PLS

Client Sample ID: MM-S-112-0.3 — Lab Sample ID: 720-89154-29

Date Collected: 10/08/18 11:36 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:00	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		40	253760	10/18/18 18:46	MAG	TAL PLS

Client Sample ID: MM-S-110-1.0 — Lab Sample ID: 720-89154-30

Date Collected: 10/08/18 11:22 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:04	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:49	MAG	TAL PLS

Client Sample ID: MM-S-110-0.3 — Lab Sample ID: 720-89154-31

Date Collected: 10/08/18 11:26 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:09	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		20	253760	10/18/18 18:52	MAG	TAL PLS

Client Sample ID: MM-S-138-0.3 — Lab Sample ID: 720-89154-32

Date Collected: 10/11/18 07:47 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:14	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-138-0.3 — Lab Sample ID: 720-89154-32

Date Collected: 10/11/18 07:47 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	7471A		10	253760	10/18/18 18:54	MAG	TAL PLS

Client Sample ID: MM-S-141-1.7 — Lab Sample ID: 720-89154-33

Date Collected: 10/11/18 09:55 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:18	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:56	MAG	TAL PLS

Client Sample ID: MM-S-141-1.3 — Lab Sample ID: 720-89154-34

Date Collected: 10/11/18 10:04 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:23	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 18:59	MAG	TAL PLS

Client Sample ID: MM-S-141-0.3 — Lab Sample ID: 720-89154-35

Date Collected: 10/11/18 10:06 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:37	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		400	253760	10/18/18 19:21	MAG	TAL PLS

Client Sample ID: MM-S-139-0.3 — Lab Sample ID: 720-89154-36

Date Collected: 10/11/18 08:26 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:41	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 19:23	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Client Sample ID: MM-S-140-0.8 — Lab Sample ID: 720-89154-37

Date Collected: 10/11/18 09:00 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:46	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 19:11	MAG	TAL PLS

Client Sample ID: MM-S-140-0.6 — Lab Sample ID: 720-89154-38

Date Collected: 10/11/18 09:03 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:50	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		40	253760	10/18/18 19:13	MAG	TAL PLS

Client Sample ID: MM-S-134-0.4 — Lab Sample ID: 720-89154-39

Date Collected: 10/10/18 13:45 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 17:55	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		10	253760	10/18/18 19:16	MAG	TAL PLS

Client Sample ID: MM-S-136-0.3 — Lab Sample ID: 720-89154-40

Date Collected: 10/10/18 14:31 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			253587	10/17/18 09:34	SUN	TAL PLS
Total/NA	Analysis	6010B		4	253752	10/18/18 18:00	OBI	TAL PLS
Total/NA	Prep	7471A			253610	10/17/18 21:20	GLL	TAL PLS
Total/NA	Analysis	7471A		1	253760	10/18/18 19:18	MAG	TAL PLS

Laboratory References:

TAL PLS = TestAmerica Pleasanton, 1220 Quarry Lane, Pleasanton, CA 94566, TEL (925)484-1919

Accreditation/Certification Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Laboratory: TestAmerica Pleasanton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	2496	01-31-20
USDA	Federal		P330-17-00380	12-11-20

Method Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PLS
7471A	Mercury (CVAA)	SW846	TAL PLS
3050B	Preparation, Metals	SW846	TAL PLS
7471A	Preparation, Mercury	SW846	TAL PLS

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PLS = TestAmerica Pleasanton, 1220 Quarry Lane, Pleasanton, CA 94566, TEL (925)484-1919

Sample Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 20170115

TestAmerica Job ID: 720-89154-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
720-89154-1	MM-S-111-0.3	Solid	10/08/18 11:51	10/15/18 13:43
720-89154-2	MM-S-111-1.0	Solid	10/08/18 11:50	10/15/18 13:43
720-89154-3	MM-S-114-1.2	Solid	10/08/18 14:20	10/15/18 13:43
720-89154-4	MM-S-114-0.5	Solid	10/08/18 14:23	10/15/18 13:43
720-89154-5	MM-S-115-2.7	Solid	10/08/18 14:40	10/15/18 13:43
720-89154-6	MM-S-115-0.3	Solid	10/08/18 14:30	10/15/18 13:43
720-89154-7	MM-S-117-1.5	Solid	10/09/18 09:21	10/15/18 13:43
720-89154-8	MM-S-117-0.3	Solid	10/09/18 09:22	10/15/18 13:43
720-89154-9	MM-S-118-0.3	Solid	10/09/18 10:18	10/15/18 13:43
720-89154-10	MM-S-118-1.0	Solid	10/09/18 10:16	10/15/18 13:43
720-89154-11	MM-S-120-0.3	Solid	10/09/18 11:02	10/15/18 13:43
720-89154-12	MM-S-121-1.0	Solid	10/09/18 11:35	10/15/18 13:43
720-89154-13	MM-S-121-0.3	Solid	10/09/18 11:37	10/15/18 13:43
720-89154-14	MM-S-122-2.0	Solid	10/09/18 13:03	10/15/18 13:43
720-89154-15	MM-S-122-1.5	Solid	10/09/18 13:05	10/15/18 13:43
720-89154-16	MM-S-122-0.3	Solid	10/09/18 13:06	10/15/18 13:43
720-89154-17	MM-S-123-0.5	Solid	10/09/18 13:19	10/15/18 13:43
720-89154-18	MM-S-124-0.3	Solid	10/09/18 13:24	10/15/18 13:43
720-89154-19	MM-S-125-0.6	Solid	10/09/18 14:15	10/15/18 13:43
720-89154-20	MM-S-126-0.4	Solid	10/09/18 14:50	10/15/18 13:43
720-89154-21	MM-S-127-1.0	Solid	10/09/18 15:18	10/15/18 13:43
720-89154-22	MM-S-127-0.5	Solid	10/09/18 15:19	10/15/18 13:43
720-89154-23	MM-S-63-0.5	Solid	10/09/18 15:56	10/15/18 13:43
720-89154-24	MM-S-63-1.0	Solid	10/09/18 16:00	10/15/18 13:43
720-89154-25	MM-S-133-1.0	Solid	10/10/18 13:07	10/15/18 13:43
720-89154-26	MM-S-142-2.3	Solid	10/11/18 11:36	10/15/18 13:43
720-89154-27	MM-S-142-0.3	Solid	10/11/18 11:46	10/15/18 13:43
720-89154-28	MM-S-112-1.0	Solid	10/08/18 11:35	10/15/18 13:43
720-89154-29	MM-S-112-0.3	Solid	10/08/18 11:36	10/15/18 13:43
720-89154-30	MM-S-110-1.0	Solid	10/08/18 11:22	10/15/18 13:43
720-89154-31	MM-S-110-0.3	Solid	10/08/18 11:26	10/15/18 13:43
720-89154-32	MM-S-138-0.3	Solid	10/11/18 07:47	10/15/18 13:43
720-89154-33	MM-S-141-1.7	Solid	10/11/18 09:55	10/15/18 13:43
720-89154-34	MM-S-141-1.3	Solid	10/11/18 10:04	10/15/18 13:43
720-89154-35	MM-S-141-0.3	Solid	10/11/18 10:06	10/15/18 13:43
720-89154-36	MM-S-139-0.3	Solid	10/11/18 08:26	10/15/18 13:43
720-89154-37	MM-S-140-0.8	Solid	10/11/18 09:00	10/15/18 13:43
720-89154-38	MM-S-140-0.6	Solid	10/11/18 09:03	10/15/18 13:43
720-89154-39	MM-S-134-0.4	Solid	10/10/18 13:45	10/15/18 13:43
720-89154-40	MM-S-136-0.3	Solid	10/10/18 14:31	10/15/18 13:43

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TESTAMERICA Pleasanton Chain of Custody
1220 Quarry Lane • Pleasanton CA 94566-4756
Phone: (925) 484-1919 • Fax: (925) 600-3002

720-89154

Reference #: 2017-0115
186080

Date 10-8-18 Page 1 of 4

10/22/2018

Report To

Attn: CAITLIN GORMAN
Company: ERRG
Address: 456 Montgomery, Ste 900
Email: caitlin.gorman@~~gmail~~errg.com
Bill To: 2017-0115
Sampled By: CG, AL
Attn: C.GORMAN
Phone: 415-425-2675

Analysis Request

Sample ID	Date	Time	Matrix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA, EDB ☐ Etherol	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other ___	SemiVolatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides ☐ EPA 8081 PCBs ☐ EPA 8082	CAM17 Metals (EPA 6010/7470/7471)	Metals ☐ 6010B ☐ 200.7 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other ___	Metals ☒ 6020 ☐ 200.8 (ICP-MS) AS only	☐ WET (STLC) ☐ WET (DI) ☐ TCLP	Hex Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH ☐ 9040 ☐ SM4500	☐ Spec Cond. ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4	☐ Perchlorate by EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	EPA7471 Hg	
MM-S-111-0.3	10/8/18	11:51	SOIL	ICE											X							X	
MM-S-111-1.0	10/8/18	11:50																					
MM-S-114-1.2	10/8/18	14:20																					
MM-S-114-0.5	10/8/18	14:23																					
MM-S-115-2.7	10/8/18	14:40																					
MM-S-115-0.3	10/8/18	14:30																					
MM-S-117-1.5	10/9/18	09:21																					
MM-S-117-0.3	10/9/18	09:22																					
MM-S-118-0.3	10/9/18	10:18																					
MM-S-118-1.0	10/9/18	10:16																					

720-89154 Chain of Custody

Project Info

Project Name/ #: Mammoth 20170115
PO#:
Credit Card Y/N: If yes, please call with payment information ASAP

Sample Receipt

of Containers:
Head Space:
Temp:

TAT	10 Day	5 Day	4 Day	3 Day	2 Day	1 Day	Other.

Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments: ☐ Global ID _____

See Terms and Conditions on reverse

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature: [signature] Time: 1135	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: CAITLIN GORMAN Date: 10/15/18	Printed Name: Date: 10/15/18	Printed Name: Date:
Company: ERRG	Company: TAPLS	Company:

1) Received by:	2) Received by:	3) Received by:
Signature: [signature] Time: 1135	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: Date: 10/15/18	Printed Name: Hurley Date: 10/15/18	Printed Name: Date:
Company: TAPLS	Company: TAPLS	Company:

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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TESTAMERICA Pleasanton Chain of Custody
1220 Quarry Lane • Pleasanton CA 94566-4756
Phone: (925) 484-1919 • Fax: (925) 600-3002
720-5954

Reference #: 2017-0115
186080
Date 10/9/18 Page 2 of 4

10/22/2018

Report To

Attn: Caitlin Gorman
Company: ERRG
Address: 456 Montgomery St, Ste 900
Email: caitlin.gorman@errg.com
Bill To: 2017-0115
Sampled By: CG, AL
Attn: C. Gorman
Phone: 415-425-2075

Analysis Request

Sample ID	Date	Time	Matrix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA, EDB ☐ Ethanol	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other	SemiVolatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides ☐ EPA 8081 PCBs ☐ EPA 8082	CAM17 Metals (EPA 6010/7470/7471)	Metals ☐ 6010B ☐ 2007 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other	Metals: ☒ 6020 ☐ 2008 (ICP-MS) As only	WET (STLC) ☐ WET (DI) ☐ TCLP	Hex Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH ☐ 9040 ☐ SM4500	☐ Spec. Cond. ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4	☐ Perchlorate by EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	EPA 7471 Hg		Number of Containers
MM-S-120-0.3	10/9/18	11:02	Soil	ICE											X								X	1
MM-S-121-1.0	10/9/18	11:35																						
MM-S-121-0.3	10/9/18	11:37																						
MM-S-122-2.0	10/9/18	13:03																						
MM-S-122-1.5	10/9/18	13:05																						
MM-S-122-0.3	10/9/18	13:06																						
MM-S-123-0.5	10/9/18	13:19																						
MM-S-124-0.3	10/9/18	13:24																						
MM-S-125-0.6	10/9/18	14:15																						
MM-S-126-0.4	10/9/18	14:50																						

Project Info.

Project Name/#: Mammoth 20170115
PO#:
Credit Card Y/N: If yes, please call with payment information ASAP

Sample Receipt

of Containers:
Head Space:
Temp:

TAT	10 Day	5 Day	4 Day	3 Day	2 Day	1 Day	Other

Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments: ☐ Global ID

See Terms and Conditions on reverse

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature: [signature] Time: 1136	Signature: [signature] Time: 1743	Signature: Time:
Printed Name: CAITLIN GORMAN Date: 10/15/18	Printed Name: Date: 10/15/18	Printed Name: Date:
Company: ERRG	Company: TAPLS	Company:

1) Received by:	2) Received by:	3) Received by:
Signature: [signature] Time: 1136	Signature: [signature] Time: 1743	Signature: Time:
Printed Name: Date: 10/15/18	Printed Name: Miller Date: 10/15/18	Printed Name: Date:
Company: TAPLS	Company: TAPLS	Company:

Rev.10/20

6/1-7C

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TESTAMERICA Pleasanton Chain of Custody
1220 Quarry Lane • Pleasanton CA 94566-4756
Phone: (925) 484-1919 • Fax: (925) 600-3002
720-89154

Reference #: 2017-0115
186 080
Date 10/9/18 Page 3 of 4

10/22/2018

Report To

Attn: Caitlin Gorman
Company: ERRG
Address: 456 Montgomery St, Ste 900
Email: caitlin.gorman@errg.com
Bill To: 2017-0115
Sampled By: CG, MZ
Attn: C. Gorman
Phone: 415-425-2075

Analysis Request

Sample ID	Date	Time	Matrix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA, EDB ☐ Ethanol	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other	SemiVolatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides ☐ EPA 8081 PCBs ☐ EPA 8082	CAM17 Metals (EPA 6010/7470/7471)	Metals: ☐ 6010B ☐ 200.7 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other	Metals: ☐ 6020 ☐ 200.8 (ICP-MS) AS only	☐ W.E.T (STLC) ☐ W.E.T (DI) ☐ TCLP	Hex Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH ☐ 9040 ☐ SM4500	☐ Spec. Cond ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions: ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4	☐ Perchlorate by EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	EPA 7471 Hg		Number of containers
MM-S-127-1.0	10/9/18	15:18	SOIL	ice											X							X		1
MM-S-127-0.5	10/9/18	15:19																						1
MM-S-63-0.5	10/9/18	15:56																						1
MM-S-63-1.0	10/9/18	16:00																						1
MM-S-133-1.0	10/10/18	13:07																						1
MM-S-142-2.3	10/11/18	11:36																						1
MM-S-142-0.3	10/11/18	11:46																						1
MM-S-112-1.0	10/8/18	11:35																						1
MM-S-112-0.3	10/8/18	11:36																						1
MM-S-110-1.0	10/8/18	11:22																						1

Project Info.
Project Name/#: Mammoth 20170115
PO#:

Sample Receipt
# of Containers:
Head Space:
Temp:

Credit Card Y/N: If yes, please call with payment information ASAP

TAT	10 Day	5 Day	4 Day	3 Day	2 Day	1 Day	Other

Report ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments: ☐ Global ID

See Terms and Conditions on reverse

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature: [signature] Time: 1136	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: CAITLIN GORMAN Date: 10/15/18	Printed Name: Date: 10/15/18	Printed Name: Date:
Company: ERRG	Company: TAPLS	Company:

1) Received by:	2) Received by:	3) Received by:
Signature: [signature] Time: 1136	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: Date: 10/15/18	Printed Name: Mulley Date: 10-15-18	Printed Name: Date:
Company: TAPLS	Company: TAPLS	Company:

Rev. 10/20

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TestAmerica
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TESTAMERICA Pleasanton Chain of Custody

1220 Quarry Lane • Pleasanton CA 94566-4756
Phone. (925) 484-1919 • Fax (925) 600-3002
720-891-5U

Reference #: 2017-0115
10/11/18 AL 186080
Date 10/11/18 Page 4 of 4

10/22/2018

Report To

Attn Caitlin Gorman
Company ERRG
Address 456 Montgomery St, Ste 900
Email caitlin.gorman@errg.com
Bill To 2017-0115
Sampled By CG, AL
Attn C. Gorman
Phone 415-425-2075

Analysis Request

Sample ID	Date	Time	Mat rix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA ☐ EDB ☐ Ethanol	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other	Semi-Volatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides ☐ EPA 8081 ☐ EPA 8082 PCBs	CAM17 Metals (EPA 6010/7470/7471)	Metals ☐ 6010B ☐ 200.7 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other	Metals ☐ 6020 ☐ 200.8 (ICP-MS) HG only	WET (STLC) ☐ WET (DI) ☐ TCLP	Hex Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH ☐ 9040 ☐ SM4500	☐ Spec Cond ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4	☐ Perchlorate by EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	EPA 7471 Hg		
MM-S-110-0.3	10/8/18	11:26	SOIL	ICE											X								X	
MM-S-138-0.3	10/11/18	07:47																						
MM-S-141-1.7	10/11/18	09:55																						
MM-S-141-1.3	10/11/18	10:04																						
MM-S-141-0.3	10/11/18	10:06																						
MM-S-139-0.3	10/11/18	08:26																						
MM-S-140-0.8	10/11/18	09:00																						
MM-S-140-0.6	10/11/18	09:03																						
MM-S-134-0.4	10/10/18	13:45																						
MM-S-136-0.3	10/10/18	14:31																						

Project Info.

Project Name/ #: Mammoth 20170115
PO#
Credit Card Y/N — If yes, please call with payment information ASAP

Sample Receipt

of Containers:
Head Space:
Temp:

TAT: 10 Day | 5 Day | 4 Day | 3 Day | 2 Day | 1 Day | Other.

Report ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments. ☐ Global ID

See Terms and Conditions on reverse

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature: 1136	Signature: 1343	Signature / Time
Printed Name: CAITLIN GORMAN 10/15/18	Printed Name: 10/15/18	Printed Name / Date
Company: ERRG	Company: TAPLS	Company

1) Received by	2) Received by	3) Received by
Signature: 1175	Signature: 1343	Signature / Time
Printed Name: 10/15/18	Printed Name: 10-15-18	Printed Name / Date
Company: TAPLS	Company: TAPLS	Company

Rev 10/20

6/1.7 C

Login Sample Receipt Checklist

Client: Engineering Remediation Resources Group.

Job Number: 720-89154-1

Login Number: 89154
List Number: 1
Creator: Mullen, Joan

List Source: TestAmerica Pleasanton

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Pleasanton
1220 Quarry Lane
Pleasanton, CA 94566
Tel: (925)484-1919

TestAmerica Job ID: 720-89157-1
Client Project/Site: Mammoth 2017-0115

For:
Engineering Remediation Resources Group.
4585 Pacheco Boulevard
Suite 200
Martinez, California 94553-2233

Attn: Ms. Caitlin Gorman

Authorized for release by:
11/12/2018 5:25:05 PM

Micah Smith, Project Manager II
(916)374-4302
micah.smith@testamericainc.com

LINKS

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Visit us at:
www.testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

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Definitions/Glossary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Qualifiers

Metals

Qualifier	Qualifier Description
H	Sample was prepped or analyzed beyond the specified holding time
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Job ID: 720-89157-1

Laboratory: TestAmerica Pleasanton

Narrative

Job Narrative
720-89157-1

Comments
No additional comments.

Receipt
The samples were received on 10/15/2018 1:43 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 0.6º C and 1.7º C.

Metals
Method(s) 6010B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for preparation batch 720-254805 and analytical batch 720-255202 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

Method(s) 6010B: The following sample was diluted due to the abundance of non-target analytes: (720-89533-A-1-F). Elevated reporting limits (RLs) are provided.

Method(s) 7471A: The following samples were analyzed outside of analytical holding time upon client request: MM-S-129-2.0 (720-89157-6), MM-S-129-0.5 (720-89157-7), MM-S-129-1.5 (720-89157-8), MM-S-130-0.5 (720-89157-9), MM-S-130-0.3 (720-89157-10), MM-S-131-1.5 (720-89157-11), MM-S-131-0.5 (720-89157-12), MM-S-132-1.5 (720-89157-13), MM-S-132-0.3 (720-89157-14), MM-S-135-0.3 (720-89157-15), MM-S-119-1.0 (720-89157-20), MM-S-119-0.3 (720-89157-21) and MM-S-133-1.3 (720-89157-23).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-129-2.0 — Lab Sample ID: 720-89157-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	13		3.7	0.31	mg/Kg	4		6010B	Total/NA
Mercury	0.96	H	0.016	0.0024	mg/Kg	1		7471A	Total/NA

Client Sample ID: MM-S-129-0.5 — Lab Sample ID: 720-89157-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	20		3.7	0.31	mg/Kg	4		6010B	Total/NA
Mercury	82	H	1.6	0.23	mg/Kg	100		7471A	Total/NA

Client Sample ID: MM-S-129-1.5 — Lab Sample ID: 720-89157-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	21		2.8	0.24	mg/Kg	4		6010B	Total/NA
Mercury	1.1	H	0.015	0.0022	mg/Kg	1		7471A	Total/NA

Client Sample ID: MM-S-130-0.5 — Lab Sample ID: 720-89157-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.1	J	3.4	0.29	mg/Kg	4		6010B	Total/NA
Mercury	0.44	H	0.017	0.0025	mg/Kg	1		7471A	Total/NA

Client Sample ID: MM-S-130-0.3 — Lab Sample ID: 720-89157-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.2	J	3.7	0.31	mg/Kg	4		6010B	Total/NA
Mercury	4.7	H	0.16	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-131-1.5 — Lab Sample ID: 720-89157-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.2		2.4	0.20	mg/Kg	4		6010B	Total/NA
Mercury	1.2	H	0.015	0.0023	mg/Kg	1		7471A	Total/NA

Client Sample ID: MM-S-131-0.5 — Lab Sample ID: 720-89157-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	110		3.3	0.28	mg/Kg	4		6010B	Total/NA
Mercury	1200	H	15	2.3	mg/Kg	1000		7471A	Total/NA

Client Sample ID: MM-S-132-1.5 — Lab Sample ID: 720-89157-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.2		3.7	0.31	mg/Kg	4		6010B	Total/NA
Mercury	8.5	H	0.14	0.021	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-132-0.3 — Lab Sample ID: 720-89157-14

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	77		2.8	0.24	mg/Kg	4		6010B	Total/NA
Mercury	300	H	6.0	0.88	mg/Kg	400		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-135-0.3 — Lab Sample ID: 720-89157-15

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	4.1		3.1	0.26	mg/Kg	4		6010B	Total/NA
Mercury	2.1	H	0.15	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-119-1.0 — Lab Sample ID: 720-89157-20

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	20		3.0	0.25	mg/Kg	4		6010B	Total/NA
Mercury	1.5	H	0.18	0.026	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-119-0.3 — Lab Sample ID: 720-89157-21

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	35		3.5	0.30	mg/Kg	4		6010B	Total/NA
Mercury	9.5	H	0.16	0.023	mg/Kg	10		7471A	Total/NA

Client Sample ID: MM-S-133-1.3 — Lab Sample ID: 720-89157-23

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	49		3.0	0.25	mg/Kg	4		6010B	Total/NA
Mercury	24	H	0.60	0.088	mg/Kg	40		7471A	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-129-2.0

Lab Sample ID: 720-89157-6

Date Collected: 10/10/18 09:30

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	13		3.7	0.31	mg/Kg		11/08/18 19:32	11/09/18 13:36	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.96	H	0.016	0.0024	mg/Kg		11/06/18 10:19	11/08/18 17:40	1

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-129-0.5

Lab Sample ID: 720-89157-7

Date Collected: 10/10/18 09:35

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	20		3.7	0.31	mg/Kg		11/08/18 19:32	11/09/18 13:41	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	82	H	1.6	0.23	mg/Kg		11/06/18 10:19	11/08/18 20:23	100

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-129-1.5

Lab Sample ID: 720-89157-8

Date Collected: 10/10/18 09:36

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	21		2.8	0.24	mg/Kg		11/08/18 19:32	11/09/18 13:45	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.1	H	0.015	0.0022	mg/Kg		11/06/18 10:19	11/08/18 19:42	1

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-130-0.5

Lab Sample ID: 720-89157-9

Date Collected: 10/10/18 10:11

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.1	J	3.4	0.29	mg/Kg		11/08/18 19:32	11/09/18 13:50	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	0.44	H	0.017	0.0025	mg/Kg		11/06/18 10:19	11/08/18 19:44	1

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-130-0.3

Lab Sample ID: 720-89157-10

Date Collected: 10/10/18 10:12

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	3.2	J	3.7	0.31	mg/Kg		11/08/18 19:32	11/09/18 13:54	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	4.7	H	0.16	0.023	mg/Kg		11/06/18 10:19	11/08/18 19:47	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-131-1.5

Lab Sample ID: 720-89157-11

Date Collected: 10/10/18 10:56
Matrix: Solid
Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.2		2.4	0.20	mg/Kg		11/08/18 19:32	11/09/18 13:59	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.2	H	0.015	0.0023	mg/Kg		11/06/18 10:19	11/08/18 19:49	1

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-131-0.5

Lab Sample ID: 720-89157-12

Date Collected: 10/10/18 10:58

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	110		3.3	0.28	mg/Kg		11/08/18 19:32	11/09/18 14:03	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1200	H	15	2.3	mg/Kg		11/06/18 10:19	11/08/18 20:26	1000

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-132-1.5

Lab Sample ID: 720-89157-13

Date Collected: 10/10/18 11:34

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	6.2		3.7	0.31	mg/Kg		11/08/18 19:32	11/09/18 14:08	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	8.5	H	0.14	0.021	mg/Kg		11/06/18 10:19	11/08/18 19:54	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-132-0.3

Lab Sample ID: 720-89157-14

Date Collected: 10/10/18 11:35

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	77		2.8	0.24	mg/Kg		11/08/18 19:32	11/09/18 14:13	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	300	H	6.0	0.88	mg/Kg		11/06/18 10:19	11/08/18 20:28	400

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-135-0.3

Lab Sample ID: 720-89157-15

Date Collected: 10/10/18 14:09

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	4.1		3.1	0.26	mg/Kg		11/08/18 19:32	11/09/18 14:17	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	2.1	H	0.15	0.023	mg/Kg		11/06/18 10:19	11/08/18 19:59	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-119-1.0

Lab Sample ID: 720-89157-20

Date Collected: 10/09/18 10:23

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	20		3.0	0.25	mg/Kg		11/08/18 19:32	11/09/18 14:31	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	1.5	H	0.18	0.026	mg/Kg		11/06/18 10:19	11/08/18 20:02	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-119-0.3

Lab Sample ID: 720-89157-21

Date Collected: 10/09/18 10:25

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	35		3.5	0.30	mg/Kg		11/08/18 19:32	11/09/18 14:36	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	9.5	H	0.16	0.023	mg/Kg		11/06/18 10:19	11/08/18 20:04	10

Client Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-133-1.3

Lab Sample ID: 720-89157-23

Date Collected: 10/10/18 13:05

Matrix: Solid

Date Received: 10/15/18 13:43

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	49		3.0	0.25	mg/Kg		11/08/18 19:32	11/09/18 14:41	4

Method: 7471A - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	24	H	0.60	0.088	mg/Kg		11/06/18 10:19	11/08/18 20:37	40

QC Sample Results

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Method: 7471A - Mercury (CVAA)

Lab Sample ID: MB 720-254811/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 255025 — **Prep Batch: 254811**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.017	0.0025	mg/Kg		11/06/18 10:19	11/08/18 17:22	1

Lab Sample ID: LCS 720-254811/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 255025 — **Prep Batch: 254811**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.833	0.842		mg/Kg		101	80 - 120

QC Association Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Metals

Prep Batch: 254805

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89157-6	MM-S-129-2.0	Total/NA	Solid	3050B	
720-89157-7	MM-S-129-0.5	Total/NA	Solid	3050B	
720-89157-8	MM-S-129-1.5	Total/NA	Solid	3050B	
720-89157-9	MM-S-130-0.5	Total/NA	Solid	3050B	
720-89157-10	MM-S-130-0.3	Total/NA	Solid	3050B	
720-89157-11	MM-S-131-1.5	Total/NA	Solid	3050B	
720-89157-12	MM-S-131-0.5	Total/NA	Solid	3050B	
720-89157-13	MM-S-132-1.5	Total/NA	Solid	3050B	
720-89157-14	MM-S-132-0.3	Total/NA	Solid	3050B	
720-89157-15	MM-S-135-0.3	Total/NA	Solid	3050B	
720-89157-20	MM-S-119-1.0	Total/NA	Solid	3050B	
720-89157-21	MM-S-119-0.3	Total/NA	Solid	3050B	
720-89157-23	MM-S-133-1.3	Total/NA	Solid	3050B	

Prep Batch: 254811

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89157-6	MM-S-129-2.0	Total/NA	Solid	7471A	
720-89157-7	MM-S-129-0.5	Total/NA	Solid	7471A	
720-89157-8	MM-S-129-1.5	Total/NA	Solid	7471A	
720-89157-9	MM-S-130-0.5	Total/NA	Solid	7471A	
720-89157-10	MM-S-130-0.3	Total/NA	Solid	7471A	
720-89157-11	MM-S-131-1.5	Total/NA	Solid	7471A	
720-89157-12	MM-S-131-0.5	Total/NA	Solid	7471A	
720-89157-13	MM-S-132-1.5	Total/NA	Solid	7471A	
720-89157-14	MM-S-132-0.3	Total/NA	Solid	7471A	
720-89157-15	MM-S-135-0.3	Total/NA	Solid	7471A	
720-89157-20	MM-S-119-1.0	Total/NA	Solid	7471A	
720-89157-21	MM-S-119-0.3	Total/NA	Solid	7471A	
720-89157-23	MM-S-133-1.3	Total/NA	Solid	7471A	
MB 720-254811/1-A	Method Blank	Total/NA	Solid	7471A	
LCS 720-254811/2-A	Lab Control Sample	Total/NA	Solid	7471A	

Analysis Batch: 255025

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89157-6	MM-S-129-2.0	Total/NA	Solid	7471A	254811
720-89157-7	MM-S-129-0.5	Total/NA	Solid	7471A	254811
720-89157-8	MM-S-129-1.5	Total/NA	Solid	7471A	254811
720-89157-9	MM-S-130-0.5	Total/NA	Solid	7471A	254811
720-89157-10	MM-S-130-0.3	Total/NA	Solid	7471A	254811
720-89157-11	MM-S-131-1.5	Total/NA	Solid	7471A	254811
720-89157-12	MM-S-131-0.5	Total/NA	Solid	7471A	254811
720-89157-13	MM-S-132-1.5	Total/NA	Solid	7471A	254811
720-89157-14	MM-S-132-0.3	Total/NA	Solid	7471A	254811
720-89157-15	MM-S-135-0.3	Total/NA	Solid	7471A	254811
720-89157-20	MM-S-119-1.0	Total/NA	Solid	7471A	254811
720-89157-21	MM-S-119-0.3	Total/NA	Solid	7471A	254811
720-89157-23	MM-S-133-1.3	Total/NA	Solid	7471A	254811
MB 720-254811/1-A	Method Blank	Total/NA	Solid	7471A	254811
LCS 720-254811/2-A	Lab Control Sample	Total/NA	Solid	7471A	254811

Metals (Continued)

Analysis Batch: 255084

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
720-89157-6	MM-S-129-2.0	Total/NA	Solid	6010B	254805
720-89157-7	MM-S-129-0.5	Total/NA	Solid	6010B	254805
720-89157-8	MM-S-129-1.5	Total/NA	Solid	6010B	254805
720-89157-9	MM-S-130-0.5	Total/NA	Solid	6010B	254805
720-89157-10	MM-S-130-0.3	Total/NA	Solid	6010B	254805
720-89157-11	MM-S-131-1.5	Total/NA	Solid	6010B	254805
720-89157-12	MM-S-131-0.5	Total/NA	Solid	6010B	254805
720-89157-13	MM-S-132-1.5	Total/NA	Solid	6010B	254805
720-89157-14	MM-S-132-0.3	Total/NA	Solid	6010B	254805
720-89157-15	MM-S-135-0.3	Total/NA	Solid	6010B	254805
720-89157-20	MM-S-119-1.0	Total/NA	Solid	6010B	254805
720-89157-21	MM-S-119-0.3	Total/NA	Solid	6010B	254805
720-89157-23	MM-S-133-1.3	Total/NA	Solid	6010B	254805

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-129-2.0 — Lab Sample ID: 720-89157-6

Date Collected: 10/10/18 09:30 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 13:36	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		1	255025	11/08/18 17:40	MAG	TAL PLS

Client Sample ID: MM-S-129-0.5 — Lab Sample ID: 720-89157-7

Date Collected: 10/10/18 09:35 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 13:41	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		100	255025	11/08/18 20:23	MAG	TAL PLS

Client Sample ID: MM-S-129-1.5 — Lab Sample ID: 720-89157-8

Date Collected: 10/10/18 09:36 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 13:45	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		1	255025	11/08/18 19:42	MAG	TAL PLS

Client Sample ID: MM-S-130-0.5 — Lab Sample ID: 720-89157-9

Date Collected: 10/10/18 10:11 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 13:50	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		1	255025	11/08/18 19:44	MAG	TAL PLS

Client Sample ID: MM-S-130-0.3 — Lab Sample ID: 720-89157-10

Date Collected: 10/10/18 10:12 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 13:54	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-130-0.3 — Lab Sample ID: 720-89157-10

Date Collected: 10/10/18 10:12 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	7471A		10	255025	11/08/18 19:47	MAG	TAL PLS

Client Sample ID: MM-S-131-1.5 — Lab Sample ID: 720-89157-11

Date Collected: 10/10/18 10:56 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 13:59	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		1	255025	11/08/18 19:49	MAG	TAL PLS

Client Sample ID: MM-S-131-0.5 — Lab Sample ID: 720-89157-12

Date Collected: 10/10/18 10:58 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:03	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		1000	255025	11/08/18 20:26	MAG	TAL PLS

Client Sample ID: MM-S-132-1.5 — Lab Sample ID: 720-89157-13

Date Collected: 10/10/18 11:34 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:08	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		10	255025	11/08/18 19:54	MAG	TAL PLS

Client Sample ID: MM-S-132-0.3 — Lab Sample ID: 720-89157-14

Date Collected: 10/10/18 11:35 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:13	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		400	255025	11/08/18 20:28	MAG	TAL PLS

Lab Chronicle

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Client Sample ID: MM-S-135-0.3 — Lab Sample ID: 720-89157-15

Date Collected: 10/10/18 14:09 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:17	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		10	255025	11/08/18 19:59	MAG	TAL PLS

Client Sample ID: MM-S-119-1.0 — Lab Sample ID: 720-89157-20

Date Collected: 10/09/18 10:23 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:31	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		10	255025	11/08/18 20:02	MAG	TAL PLS

Client Sample ID: MM-S-119-0.3 — Lab Sample ID: 720-89157-21

Date Collected: 10/09/18 10:25 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:36	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		10	255025	11/08/18 20:04	MAG	TAL PLS

Client Sample ID: MM-S-133-1.3 — Lab Sample ID: 720-89157-23

Date Collected: 10/10/18 13:05 — **Matrix: Solid**
Date Received: 10/15/18 13:43

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			254805	11/08/18 19:32	GLL	TAL PLS
Total/NA	Analysis	6010B		4	255084	11/09/18 14:41	BKR	TAL PLS
Total/NA	Prep	7471A			254811	11/06/18 10:19	MAG	TAL PLS
Total/NA	Analysis	7471A		40	255025	11/08/18 20:37	MAG	TAL PLS

Laboratory References:

TAL PLS = TestAmerica Pleasanton, 1220 Quarry Lane, Pleasanton, CA 94566, TEL (925)484-1919

Accreditation/Certification Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Laboratory: TestAmerica Pleasanton

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	EPA Region	Identification Number	Expiration Date
California	State Program	9	2496	01-31-20
USDA	Federal		P330-17-00380	12-11-20

Method Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PLS
7471A	Mercury (CVAA)	SW846	TAL PLS
3050B	Preparation, Metals	SW846	TAL PLS
7471A	Preparation, Mercury	SW846	TAL PLS

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PLS = TestAmerica Pleasanton, 1220 Quarry Lane, Pleasanton, CA 94566, TEL (925)484-1919

Sample Summary

Client: Engineering Remediation Resources Group.
Project/Site: Mammoth 2017-0115

TestAmerica Job ID: 720-89157-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
720-89157-6	MM-S-129-2.0	Solid	10/10/18 09:30	10/15/18 13:43
720-89157-7	MM-S-129-0.5	Solid	10/10/18 09:35	10/15/18 13:43
720-89157-8	MM-S-129-1.5	Solid	10/10/18 09:36	10/15/18 13:43
720-89157-9	MM-S-130-0.5	Solid	10/10/18 10:11	10/15/18 13:43
720-89157-10	MM-S-130-0.3	Solid	10/10/18 10:12	10/15/18 13:43
720-89157-11	MM-S-131-1.5	Solid	10/10/18 10:56	10/15/18 13:43
720-89157-12	MM-S-131-0.5	Solid	10/10/18 10:58	10/15/18 13:43
720-89157-13	MM-S-132-1.5	Solid	10/10/18 11:34	10/15/18 13:43
720-89157-14	MM-S-132-0.3	Solid	10/10/18 11:35	10/15/18 13:43
720-89157-15	MM-S-135-0.3	Solid	10/10/18 14:09	10/15/18 13:43
720-89157-20	MM-S-119-1.0	Solid	10/09/18 10:23	10/15/18 13:43
720-89157-21	MM-S-119-0.3	Solid	10/09/18 10:25	10/15/18 13:43
720-89157-23	MM-S-133-1.3	Solid	10/10/18 13:05	10/15/18 13:43

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

720-89157

TESTAMERICA Pleasanton Chain of Custody
1220 Quarry Lane • Pleasanton CA 94566-4756
Phone: (925) 484-1919 • Fax: (925) 600-3002

Reference # 2017-0115
186079
Date 10/12/18 Page 1 of 2 3

11/12/2018

Report To

Attn: Caitlin Gorman
Company: ERRG
Address: 456 Montgomery St, Ste 900
Email: caitlin.gorman@errg.com
Bill To: 2017-0115
Sampled By: CG, AL
Attn: C. Gorman
Phone: 415-425-2075

Analysis Request

Sample ID	Date	Time	Matrix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA ☐ EDB ☐ Ethano	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other	SemiVolatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides PCBs ☐ EPA 8081 ☐ EPA 8082	CAM17 Metals (EPA 6010/7470/7471)	Metals ☐ 6010B ☐ 2007 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other	Metals ☐ 6020 ☐ 2008 (ICP-MS)	☐ W.E.T (STLC) ☐ W.E.T (DI) ☐ TCLP	Hex Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH ☐ 9040 ☐ SM4500	☐ Spec Cond ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4	☐ Perchlorate by EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	HOLD	Number of Containers
MM-S-116-4.0	10/9/18	08:20	SOIL	ICE																		X		1
MM-S-116-2.3	10/9/18	08:23																						1
MM-S-116-0.5	10/9/18	08:29																						1
MM-S-128-1.0	10/10/18	09:00																						1
MM-S-128-0.5	10/10/18	09:03																						1
MM-S-129-2.0	10/10/18	09:30																						1
MM-S-129-0.5	10/10/18	09:35																						1
MM-S-129-1.5	10/10/18	09:36																						1
MM-S-130-0.5	10/10/18	10:11																						1
MM-S-130-0.3	10/10/18	10:12																						1

Project Info.

Project Name/ #: Mammoth 20170115
PO#:

Sample Receipt

of Containers:
Head Space:
Temp:

Credit Card Y/N — If yes, please call with payment information ASAP

TAT: 10 Day | 5 Day | 4 Day | 3 Day | 2 Day | 1 Day | Other:

Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments: ☐ Global ID

See Terms and Conditions on reverse

	1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature	1134	1343	
Time			
Printed Name	CAITLIN GORMAN	10/15/18	
Date	10/15/18		
Company	ERRG	TAPLS	

	1) Received by:	2) Received by:	3) Received by:
Signature	1121	Mullen 1343	
Time			
Printed Name	10/15/18	Mullen 10-15-18	
Date			
Company	TAPLS	TAPLS	

720-89157 Chain of Custody

Rev. 10/20

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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

720-89157

TESTAMERICA Pleasanton Chain of Custody
1220 Quarry Lane • Pleasanton CA 94566-4756
Phone (925) 484-1919 • Fax (925) 600-3002

Reference #: 2017-0115
186079
Date 10/12/18 Page 2 of 3

11/12/2018

Report To

Attn: Caitlin Gorman
Company: ERRG
Address: 456 Montgomery St. Ste900
Email: caitlin.gorman@errg.com
Bill To: 2017-0115
Sampled By: CG, AL
Attn: C. Gorman
Phone: 415-425-7075

Analysis Request

Sample ID	Date	Time	Matrix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA, EDB ☐ Ethanol	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other	SemiVolatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides ☐ EPA 8081 PCBs ☐ EPA 8082	CAM17 Metals (EPA 6010/7470/7471)	Metals ☐ 6010B ☐ 200.7 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other	Metals ☐ 6020 ☐ 200.8 (ICP-MS)	☐ W.E.T (STLC) ☐ W.E.T (DI) ☐ TCLP	Hex. Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH ☐ 9040 ☐ SM4500	☐ Spec. Cond ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br ☐ NO_2 ☐ PO_4	☐ Perchlorate by EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	HOLD	Number of jars
MM-S-131-1.5	10/10/18	10:56	SOIL	ICE																	X		1
MM-S-131-0.5	10/10/18	10:58																					1
MM-S-132-1.5	10/10/18	11:34																					1
MM-S-132-0.3	10/10/18	11:35																					1
MM-S-135-0.3	10/10/18	14:09																					1
MM-S-137-0.5	10/10/18	14:58																					1
MM-S-137-0.3	10/10/18	15:00																					1

Project Info.

Project Name/ #: Mammoth 20170115
PO#:
Credit Card Y/N: If yes, please call with payment information ASAP

Sample Receipt

of Containers:
Head Space:
Temp:

TAT	10 Day	5 Day	4 Day	3 Day	2 Day	1 Day	Other.

Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments: ☐ Global ID

See Terms and Conditions on reverse

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature: [signature] Time: 1134	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: Caitlin Gorman Date: 10/12/18	Printed Name: Date: 10/12/18	Printed Name: Date:
Company: ERRG	Company: TAPLS	Company:

1) Received by:	2) Received by:	3) Received by:
Signature: [signature] Time: 1134	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: Date: 10/12/18	Printed Name: Mulley Date: 10/12/18	Printed Name: Date:
Company: TAPLS	Company: TAPLS	Company:

Rev 10/20

-6/1-7(

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

720-89157

TESTAMERICA Pleasanton Chain of Custody
1220 Quarry Lane • Pleasanton CA 94566-4756
Phone: (925) 484-1919 • Fax: (925) 600-3002

Reference #: 2017-0115
186079
Date 10/12/18 Page 3 of 3

11/12/2018

Report To

Attn: Caitlin Gorman
Company: ERG
Address: 456 Montgomery St, Ste 900
Email: caitlin.gorman@erg.com
Bill To: 2017-0115
Sampled By: CG, AL
Attn: C. Gorman
Phone: 415-425-2075

Analysis Request

Sample ID	Date	Time	Matrix	Preserv	Volatile Organics GC/MS (VOCs) ☐ EPA 8260B	HVOCs by ☐ EPA 8260B	EPA 8260B ☐ Gas ☐ BTEX ☐ 5 Oxygenates ☐ DCA, EDC ☐ Ethanol	TEPH EPA 8015B ☐ Silica Gel ☐ Diesel ☐ Motor Oil ☐ Other	SemiVolatile Organics GC/MS ☐ EPA 8270C	PNA/PAH's by ☐ 8270C ☐ 8270C SIM	Oil and Grease (EPA 1664/9071) ☐ Petroleum ☐ Total	Pesticides ☐ EPA 8081 PCBs ☐ EPA 8082	CAM17 Metals (EPA 6010/7470/7471)	Metals ☐ 6010B ☐ 200.7 ☐ Lead ☐ LUFT ☐ RCRA ☐ Other	Metals ☐ 8020 ☐ 200.8 (ICP-MS)	☐ WET (STLC) ☐ WET (DI) ☐ TCLP	Hex Chrom by ☐ EPA 7196 ☐ or EPA 7199	pH: ☐ 9040 ☐ SM4500	☐ Spec Cond ☐ Alkalinity ☐ TSS ☐ SS ☐ TDS	Anions ☐ Cl ☐ SO_4 ☐ NO_3 ☐ F ☐ Br^- ☐ NO_2 ☐ PO_4	☐ Perchlorate by: EPA 314.0	COD ☐ EPA 410.4 ☐ SM5220D ☐ Turbidity	HOLD	Number of jars
MM-S-113-0.3	10/8/18	14:10	SOIL	ICE																	X		1
MM-S-113-0.7	10/8/18	14:12																					1
MM-S-119-1.0	10/9/18	10:23																					1
MM-S-119-0.3	10/9/18	10:25																					1
MM-S-133-0.3	10/10/18	13:10																					1
MM-S-133-1.3	10/10/18	13:05																					1

Project Info.

Project Name/#: Mammoth 2017-0115
PO#:
Credit Card Y/N: If yes, please call with payment information ASAP

Sample Receipt

of Containers:
Head Space:
Temp

TAT	10 Day	5 Day	4 Day	3 Day	2 Day	1 Day	Other

Report: ☐ Routine ☐ Level 3 ☐ Level 4 ☐ EDD ☐ EDF
Special Instructions / Comments: ☐ Global ID _____

See Terms and Conditions on reverse

1) Relinquished by:	2) Relinquished by:	3) Relinquished by:
Signature: [signature] Time: 1135	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: CAITLIN GORMAN Date: 10/15/18	Printed Name: Date: 10/15/18	Printed Name: Date:
Company: ERG	Company: TA PLS	Company:

1) Received by:	2) Received by:	3) Received by:
Signature: [signature] Time: 1135	Signature: [signature] Time: 1343	Signature: Time:
Printed Name: Date: 10/15/18	Printed Name: Mullen Date: 10/15/18	Printed Name: Date:
Company: TA PLS	Company: TA PLS	Company:

Rev. 10/20

*6 1.7C

720-89157

720-89157-1 Mammoth

SM Smith, Micah
Fri 11/2 4:00 PM
Pleasanton - Sample Receiving

Reply all |

Inbox

This message was sent with high importance

Can you add these methods for analysis as requested?
Thank you.

MICAH SMITH
Project Manager

720-89157-02 Chain of Custody

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

1220 Quarry lane
Pleasanton, CA 94566
Phone: 925.484.1919 x137

880 Riverside Parkway
West Sacramento, CA 95605
Tel 916 374-4302 Direct
916 373-5600 Main | Fax 916 379-1059

www.testamericainc.com

Please let us know if we met your expectations by rating the service you received from TestAmerica on this project by visiting our website at: Project Feedback

From: Caitlin Gorman [mailto:caitlin.gorman@errg.com]
Sent: Friday, November 02, 2018 3:50 PM
To: Smith, Micah
Subject: RE: TestAmerica invoice, report and EDD files from 720-89154-1 Mammoth 20170115

-External Email-

Thank you, Micah.

We would like to run the following 13 samples for Arsenic (by 6010B) and Mercury (by 7471A), same as before:

#20 – MM-S-119-0.3
#20 – MM-S-119-1.0
#7 – MM-S-129-0.5
#8 – MM-S-129-1.5
#6 – MM-S-129-2.0
#10 – MM-S-130-0.3
#9 – MM-S-130-0.5
#12 – MM-S-131-0.5
11 #13 – MM-S-131-1.5
#14 – MM-S-132-0.3
#13 – MM-S-132-1.5
#23 MM-S-133-1.3
#15 MM-S-135-0.3

Let me know if you need any additional information from me for these.
Thank you,
Caitlin

Caitlin Gorman, P.G.
Regional Manager
Engineering/Remediation Resources Group, Inc. (ERRG)
456 Montgomery St , Suite 900
San Francisco, CA 94104
415 395-9974 - Tel
415-425-2075 - Mobile
415 395-9983 - Fax
caitlin.gorman@errg.com

From: Smith, Micah <Micah.Smith@testamericainc.com>
Sent: Thursday, November 1, 2018 10:22 AM
To: Caitlin Gorman <caitlin.gorman@errg.com>
Subject: RE: TestAmerica invoice, report and EDD files from 720-89154-1 Mammoth 20170115

Yes we are still in hold. The hold is 28 days.
Thank you.

MICAH SMITH
Project Manager

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

1220 Quarry lane
Pleasanton, CA 94566
Phone: 925.484.1919 x137

880 Riverside Parkway
West Sacramento, CA 95605
Tel 916 374-4302 Direct
916 373-5600 Main | Fax 916 379-1059

www.testamericainc.com

Please let us know if we met your expectations by rating the service you received from TestAmerica on this project by visiting our website at: Project Feedback

From: Caitlin Gorman [mailto:caitlin.gorman@errg.com]
Sent: Thursday, November 01, 2018 9:22 AM
To: Smith, Micah
Subject: RE: TestAmerica invoice, report and EDD files from 720-89154-1 Mammoth 20170115

-External Email-

Hi Micah,
I am getting approval from my client to run some of the samples we have on hold for this project.
Can you let me know if we are still within the hold times for Hg? I believe we are, but I think it's close.
-Caitlin

Caitlin Gorman, P.G.
Regional Manager
Engineering/Remediation Resources Group, Inc. (ERRG)
456 Montgomery St., Suite 900
San Francisco, CA 94104
415 395-9974 - Tel
415-425-2075 - Mobile
415 395-9983 - Fax
caitlin.gorman@errg.com

From: Smith, Micah <micah.smith@testamericainc.com>
Sent: Monday, October 22, 2018 4:11 PM
To: Caitlin Gorman <caitlin.gorman@errg.com>
Subject: TestAmerica invoice, report and EDD files from 720-89154-1 Mammoth 20170115

Hello,

Attached please find the invoice, report and EDD files for job 720-89154-1, Mammoth 20170115

Please feel free to contact me if you have any questions

Thank you

Please let us know if we met your expectations by rating the service you received from TestAmerica on this project by visiting our website at: Project Feedback

MICAH SMITH
Project Manager

TestAmerica Pleasanton
THE LEADER IN ENVIRONMENTAL TESTING

Tel. 916.374 4302
www.testamericainc.com

Reference: [289487]
Attachments: 2

Login Sample Receipt Checklist

Client: Engineering Remediation Resources Group.

Job Number: 720-89157-1

Login Number: 89157

List Source: TestAmerica Pleasanton

List Number: 1

Creator: Bullock, Tracy

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Refer to Job Narrative for details.
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix H. XRF and Laboratory Correlation Evaluation

Section 1. Introduction

Engineering/Remediation Resources Group, Inc. (ERRG) completed this correlation evaluation in support of the supplemental characterization investigation of the Cabins Area. This evaluation was performed to demonstrate the relationship between x-ray fluorescence (XRF) field screening data and laboratory results. ERRG concluded that XRF screening is an accurate predictor of laboratory results. The following sections describe correlation results for both mercury and arsenic, identify outliers in the data, and provide potential explanations for the presence of the outliers.

1.1. XRF-LABORATORY CORRELATION IN SITE DATA

ERRG compiled XRF screening and laboratory data and plotted for mercury and arsenic (Figures H-1 and H-2, respectively). The results suggest that a relatively well-defined positive correlation exists between XRF screening and laboratory results for both analytes.

1.1.1. Outliers

The graphs on Figures H-1 and H-2 contained seven statistical outliers where XRF screening results disproportionately exceeded laboratory results or vice versa. The seven outliers (four for mercury and three for arsenic) were removed to more accurately reflect the relationship between the XRF screening and laboratory results demonstrated by most of the data. See Table H-1 for the complete list of removed outliers.

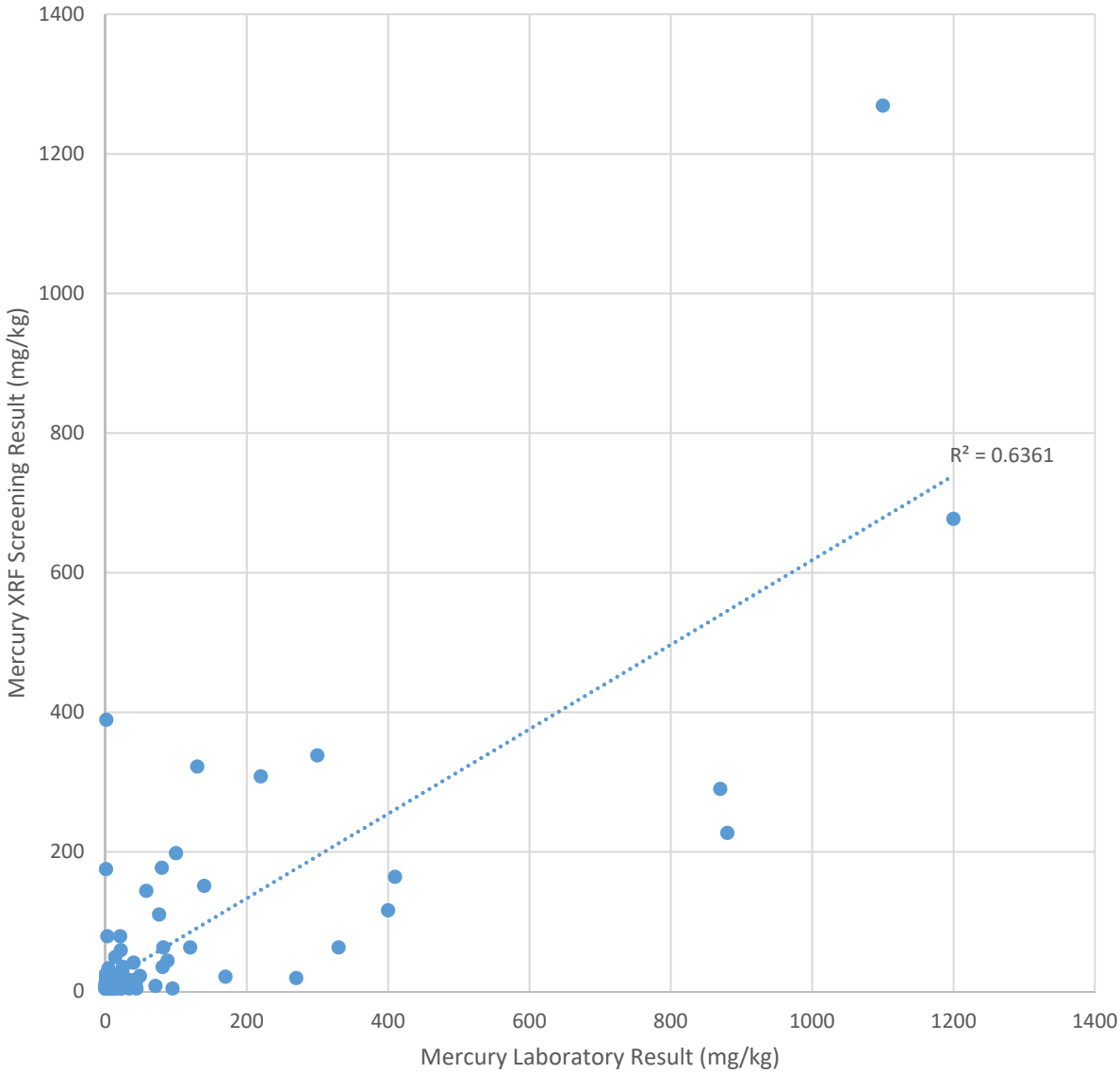
Figures H-3 and H-4 present the graphs for mercury and arsenic following removal of the seven statistical outliers. Eliminating these outliers from both the mercury and arsenic data sets led to stronger correlation between the two. This stronger correlation is reflected in the graphs' R-squared, "goodness-of-fit" indicators; after outliers were removed, the R-squared value of the XRF–laboratory correlation for mercury increased from 0.64 to 0.77, and the R-squared value of the XRF–laboratory correlation for arsenic increased from 0.59 to 0.74. All of the R-squared values are shown on their respective graphs (Figures H-1 through H-4).

1.1.2. Potential Explanations for Outliers

The primary explanation for the seven removed outliers is heterogeneity in soil within the Cabins Area. In many cases, field observations noted the presence of a very thin (sometimes less than 1 inch thick), discontinuous tailings layer. These field observations were recorded in the trench logs provided in Appendix F of the Supplemental Characterization Report and documented in the photographic log provided in Appendix C of the Supplemental Characterization Report. The field XRF requires only a few inches of surface area to run an analysis. The analytical laboratory required that at least 4 ounces of material be

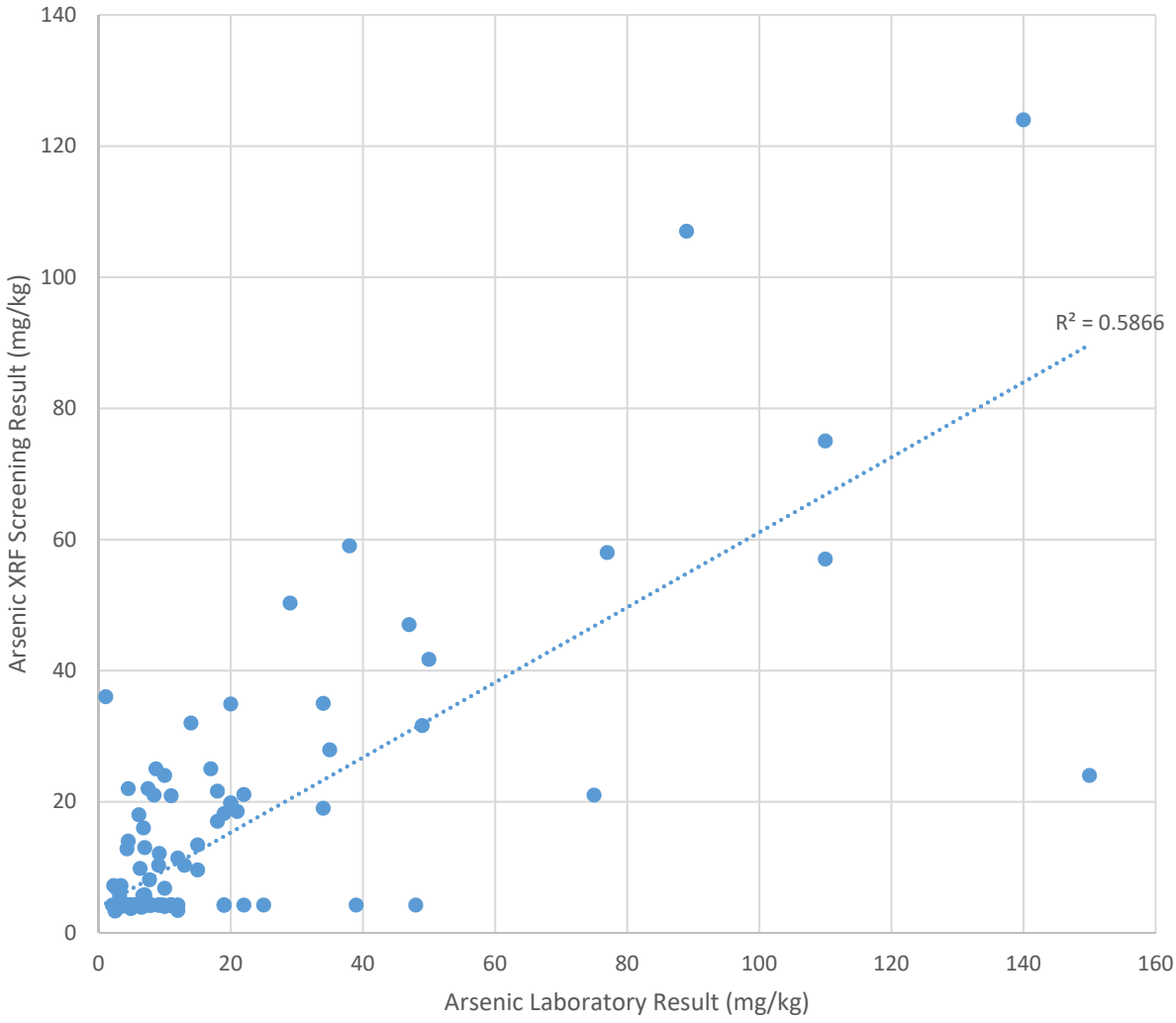
collected (preferably 8 ounces). Field samplers made every effort to collect samples of material for laboratory analysis from the exact XRF screening spots; however, sometimes this goal could not be achieved due to the thin discontinuous nature of the tailings. XRF readings and laboratory samples may have also captured this tailings material, causing disparities between screened and analyzed concentrations for collocated samples. Additionally, one pair of XRF screening and laboratory results was removed from the mercury and arsenic data sets as an outlier because the screening and sampled depths did not match; the XRF reading (XRF-50-0.5) was taken at 0.5 foot below ground surface (bgs), and the laboratory sample (MM-S-115-0.3) was collected at 0.3 foot bgs (not a true collocation). The shallower laboratory sample yielded a significantly higher concentration for both analytes than the deeper XRF screening result (see Table H-1). This pair of results had been erroneously collocated and was removed as an outlier, but also exemplifies the soil heterogeneity within the Cabins Area.

Figure H-1. XRF-Laboratory Correlation for Mercury



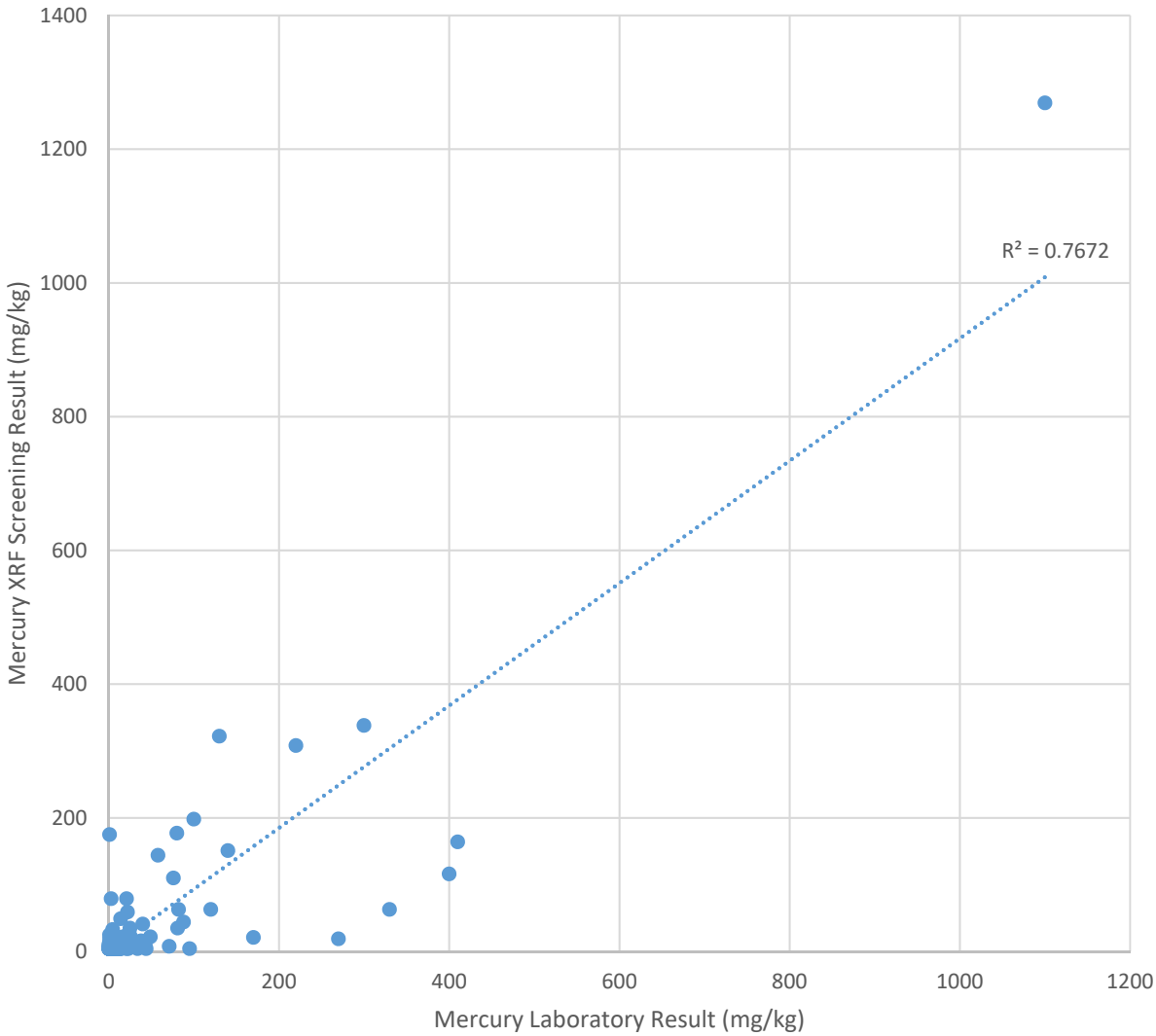
Notes:
mg/kg = milligrams per kilogram
R^2 = R-squared ("goodness-of-fit" indicator)
XRF = x-ray fluorescence

Figure H-2. XRF-Laboratory Correlation for Arsenic



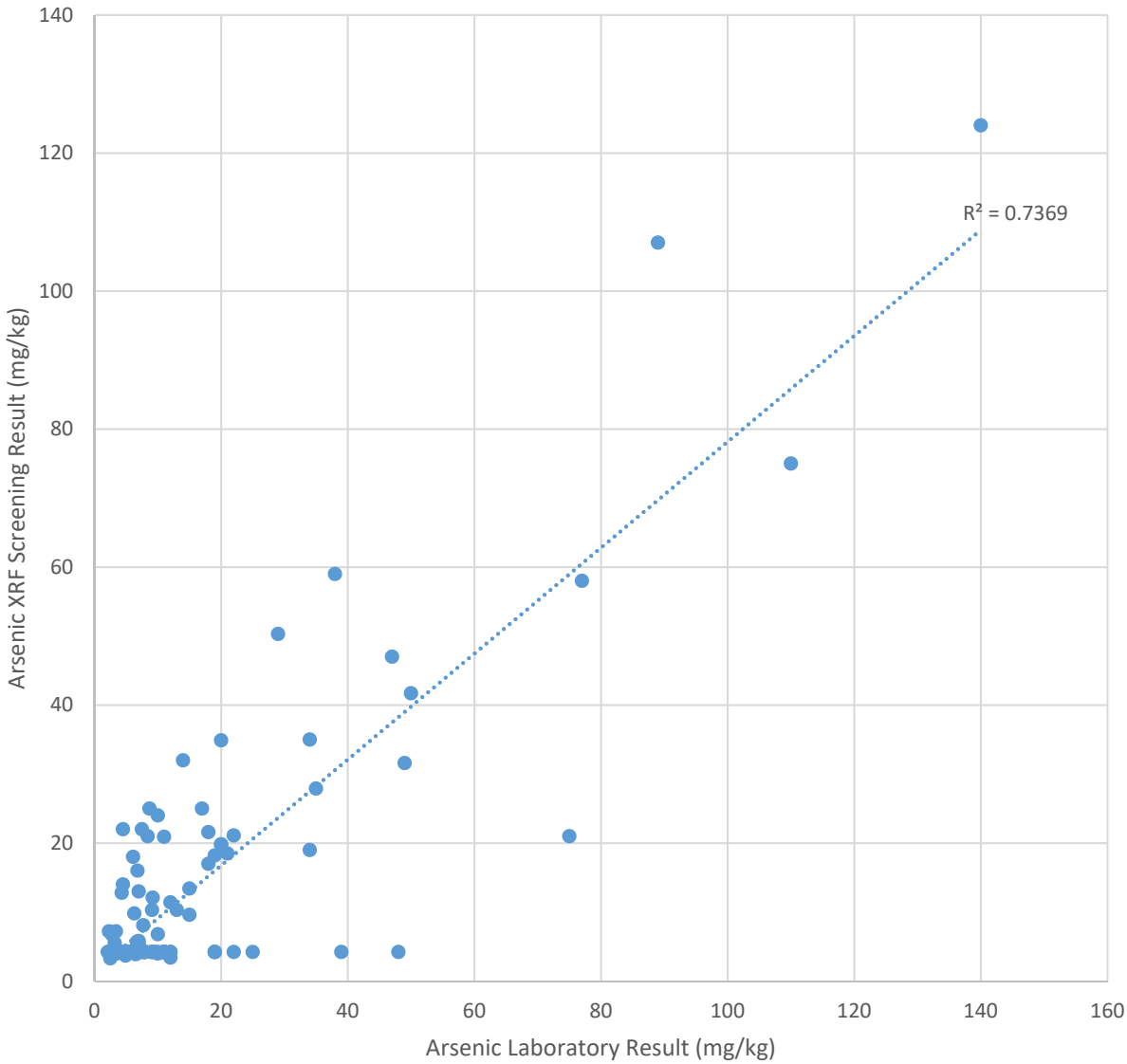
Notes:
mg/kg = milligrams per kilogram
R^2 = R-squared ("goodness-of-fit" indicator)
XRF = x-ray fluorescence

Figure H-3. XRF-Laboratory Correlation for Mercury (Outliers Removed)



Notes:
mg/kg = milligrams per kilogram
R^2 = R-squared ("goodness-of-fit" indicator)
XRF = x-ray fluorescence

Figure H-4. XRF-Laboratory Correlation for Arsenic (Outliers Removed)



Notes:
mg/kg = milligrams per kilogram
R^2 = R-squared ("goodness-of-fit" indicator)
XRF = x-ray fluorescence

Table 1. Outlying Data Points Removed

XRF Location ID No.	XRF Screening Result (mg/kg)	Laboratory Sample ID No.	Laboratory Result (mg/kg)
Mercury			
XRF-14-0.0	227	MM-S-105-0.0	880
XRF-50-0.5	290	MM-S-115-0.3	870
XRF-133-0.5	677	MM-S-131-0.5	1200
XRF-184-1.3	389	MM-S-141-1.3	1.5
Arsenic			
XRF-33-1.0	36	MM-S-108-1.0	1.1
XRF-50-0.5	24	MM-S-115-0.3	150
XRF-133-0.5	57	MM-S-131-0.5	110

Notes:
mg/kg = milligrams per kilogram
XRF = x-ray fluorescence

Appendix I. Mercury and Arsenic Concentration Correlation Evaluation

Section 1. Introduction

Engineering/Remediation Resources Group, Inc. (ERRG) performed a correlation evaluation in support of the supplemental characterization investigation at the Cabins Area. This appendix summarizes the correlation between mercury and arsenic concentrations in both areas and discusses potential sources of elevated arsenic concentrations in the area east of the creek.

1.1. MERCURY–ARSENIC CORRELATION AT THE SITE

Field x-ray fluorescence (XRF) readings and soil sample results were used to evaluate the correlation between mercury and arsenic concentrations in site soil. The XRF and laboratory data from both the Cabins Area and the area east of the creek were compiled and plotted (Figure I-1).

As shown on Figure I-1, the XRF and laboratory results show a well-defined positive correlation between mercury and arsenic concentrations in soil within the Cabins Area. However, the XRF and laboratory results show poor correlation between mercury and arsenic concentrations in soil within areas east of the creek. All data points are clustered near the horizontal axis (i.e., arsenic), demonstrating that soil in this area has elevated arsenic concentrations with relatively low mercury concentrations. Additionally, several XRF results for soil within the area east of the creek contain arsenic concentrations that are significantly higher than those in soil within the Cabins Area. The maximum XRF results for arsenic in the Cabins Area was 140 milligrams per kilogram (mg/kg); eight XRF results for arsenic in the area east of the creek exceeded 140 mg/kg, with a maximum detected concentration of 266 mg/kg. These differences suggest that soil in the area east of the creek is chemically distinct from soil in the Cabins Area.

1.2. POTENTIAL SOURCES OF ARSENIC EAST OF CREEK

The source of elevated arsenic concentrations detected in the chemically distinct soil east of the creek is unknown; it could be natural and/or anthropogenic. Additional studies would be needed to confirm the source of this chemically distinct contamination.

One possible source of naturally occurring arsenic in the area east of the creek is geothermal activity in the region. High arsenic concentrations are common in areas with geothermal activity[1] especially in the Long Valley area. Significant discharges of arsenic to surficial tributaries in the Long Valley area of Mono County where the site is located have been attributed to geothermal activity. Streams impacted by

[1] National Research Council Committee, 1977. *Arsenic: Medical and Biologic Effects of Environmental Pollutants.* Washington, DC. National Academies Press (US). Available Online at: <https://www.ncbi.nlm.nih.gov/pubmed/25101467>.

groundwater that has been affected by geothermal activity has long been documented throughout the Long Valley area.[2] Dissolved arsenic in geothermal waters can result in elevated concentrations of arsenic in waters that are in hydraulic communication, including associated sedimentary deposits.

Another possible source of naturally occurring arsenic is local volcanic bedrock. Arsenic concentrations in volcanic deposits can often be elevated relative to other types of bedrock, especially in areas where volcanic deposits have experienced subsequent hydrothermal alteration. A more thorough evaluation of local geologic formations and their geochemistry (including range of arsenic concentrations) would be required to fully evaluate the potential contribution from natural sources.

It is also possible that the source of high arsenic on the east side of the creek is an adjacent or upgradient mine or mill site. The Doyle Mill is a former mill site approximately 0.5 mile upgradient and southwest of the Mammoth Mill site. An initial site visit describes the Doyle Mill[3] as located within the SW ¼ of the NE ¼ of Section 9, Township 4 South, Range 27 East at an elevation of 8,661 feet; the Mammoth Mill is located in NE ¼ of the NE ¼ of the same section (see starred locations on Figure I-2).

During the initial site visit to Doyle Mill,[4] two field XRF readings were collected from tailings material at the site to assess their heavy metal concentrations. These readings showed relatively high arsenic concentrations (71.4 and 42.24 mg/kg), although the analytical errors on the XRF were also high (±47.19 and ±29.62 mg/kg, respectively). The assessor also noted that the tailings sampled were adjacent to a stream[4]. Historical notes on Doyle Mill indicate that the site operated from 1885 to 1889 as a small water-powered stamp mill, with 10 stamps and 6 cyanide tanks that were destroyed in an avalanche[3].

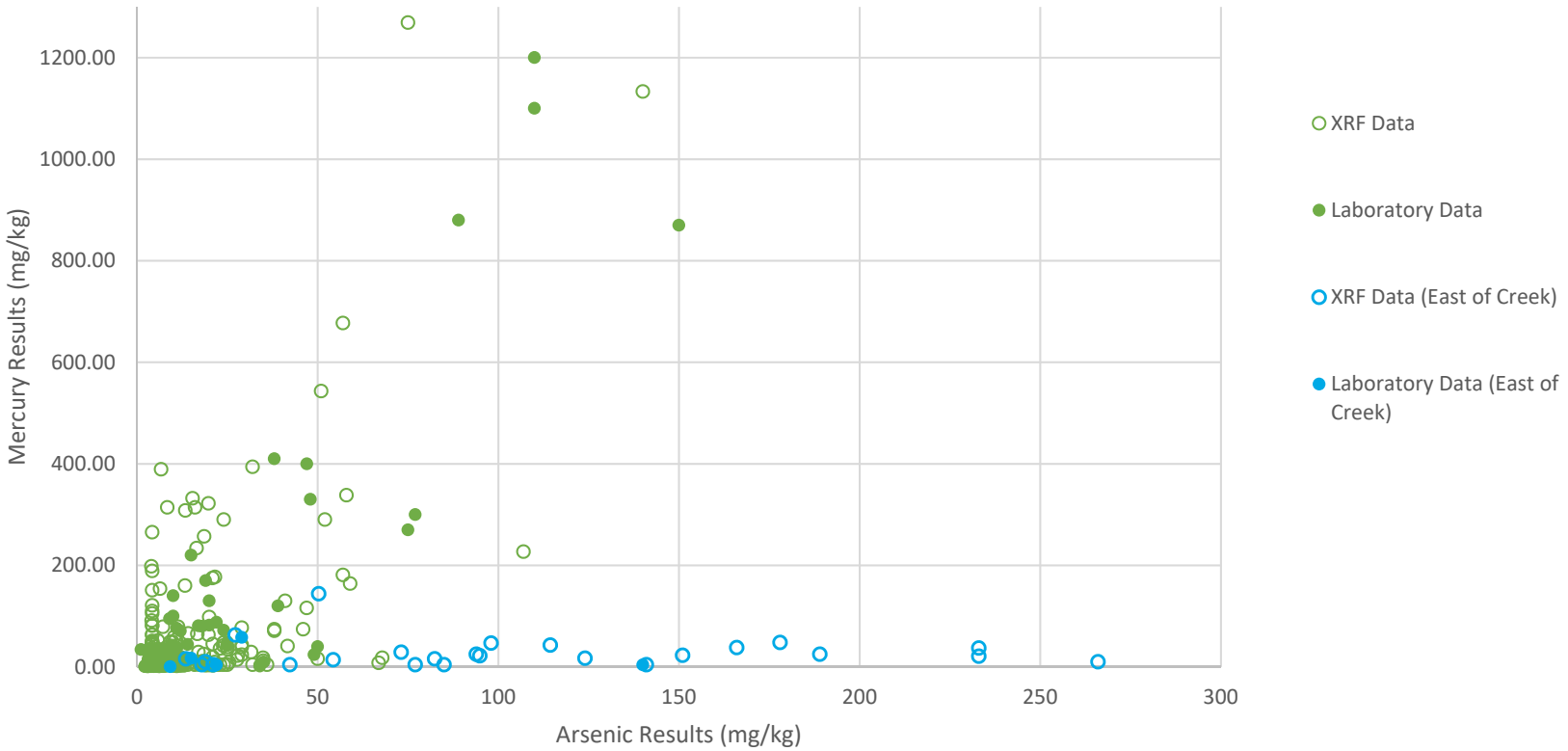
The limited data suggest that Doyle Mill tailings may have contributed elevated concentrations of arsenic to areas upgradient of the Mammoth Mill. However, additional studies would be needed to evaluate whether the Doyle Mill or other upgradient mines and mills may have contributed elevated arsenic concentrations in the area east of the creek.

[2] U.S. Geological Survey, 1976. "Sources of Arsenic in Streams Tributary to Lake Crowley, California." *Water-Resources Investigations 76-36.* June.

[3] Caldwell, Gary. 1990. "Mammoth Gold: The Ghost Towns of Lake District." G. Smith, Editor.

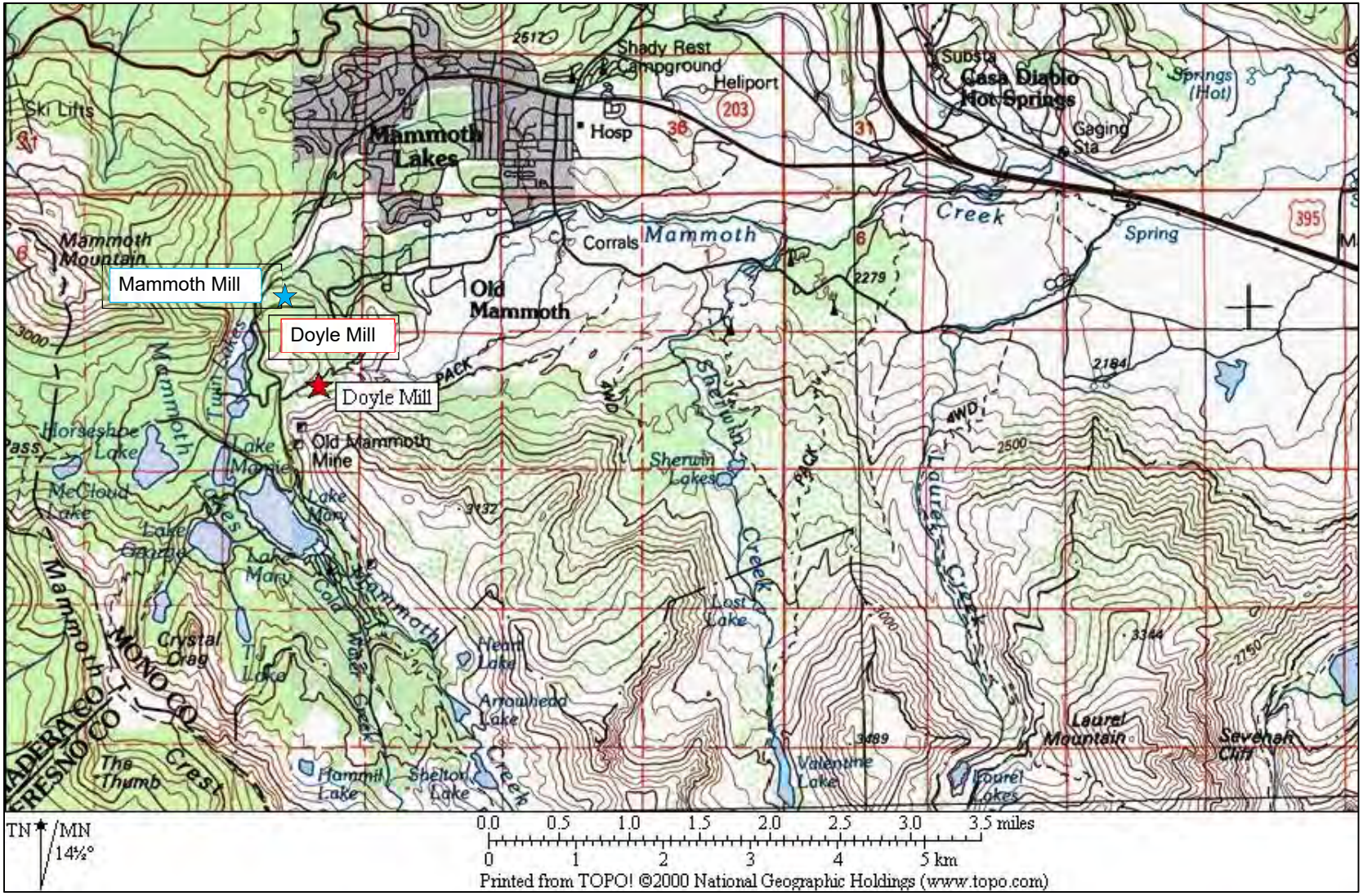
[4] U.S. Department of Agriculture Forest Service, 2007. "Abandoned/Inactive Mine Land Inventory: PA Checklist. Site/Mine Name: Doyle Mill Site." June 1.

Figure I-1. Mercury-Arsenic Correlation



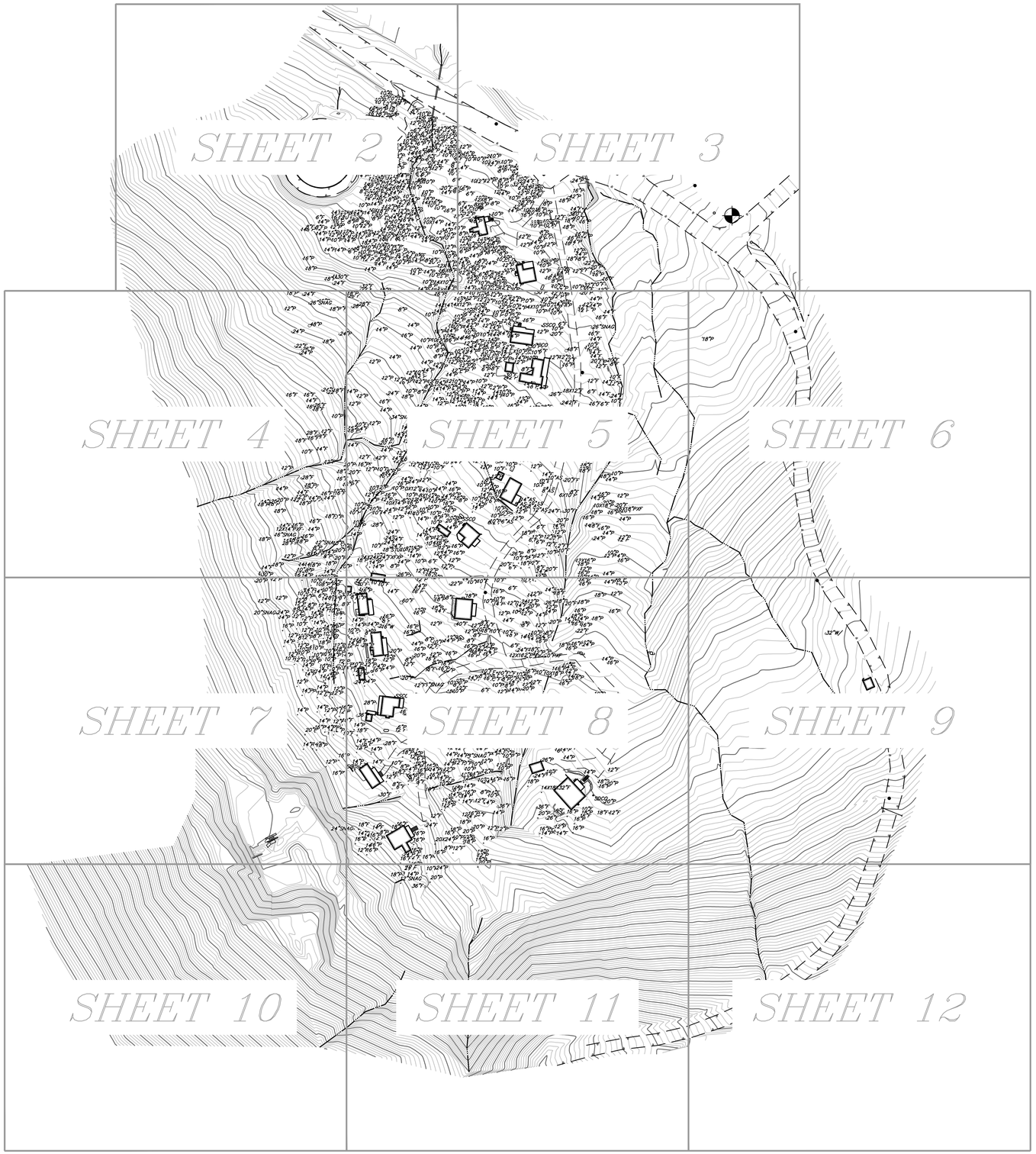
Notes:
mg/kg = milligrams per kilogram
XRF = x-ray fluorescence

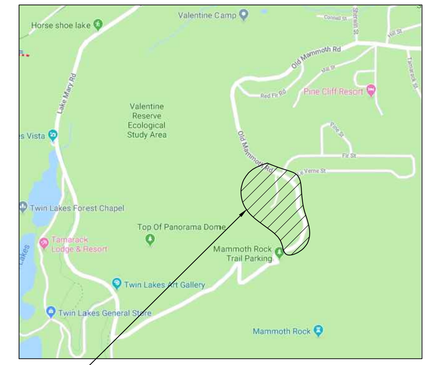
Figure I-2. Doyle Mill Location Map



Source: from U.S. Department of Agriculture Forest Service, 2007. "Abandoned/Inactive Mine Land Inventory PA Checklist. Site/Mine Name: Doyle Mill Site." June 1.

Appendix J. Land and Topographic Survey





VICINITY MAP

N.T.S.

PROJECT LOCATION

SURVEY NOTES

TEMPORARY BENCHMARK IS 5/8" REBAR 12.5' NORTHEAST STOP SIGN

NAVD 88 ELEVATION=8282.74'

BASED FROM AN OPUS SOLUTION
CA SPC ZONE 3

N: 2052634.038
E: 6998220.712

DISTANCES ARE GROUND DISTANCE, GRID BEARING.

SCALE: 1"=80'
CONTOUR INTERVAL: 1'
GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

I HEREBY STATE THAT I AM A LICENSED LAND SURVEYOR OF THE STATE OF CALIFORNIA, THAT THIS MAP CORRECTLY REPRESENTS A SURVEY MADE UNDER MY SUPERVISION IN JULY 2019, THAT PROPERTY LINES SHOWN HEREON ARE COMPILED FROM RECORD DATA AND DO NOT REFLECT A BOUNDARY SURVEY UNLESS SPECIFICALLY NOTED HEREON, AND THAT THIS MAP DOES NOT INCLUDE EASEMENTS EXCEPT THOSE SPECIFICALLY DELINEATED HEREON.

IF UNDERGROUND UTILITIES, ZONE, SETBACK AND STREET WIDENING DATA ARE SHOWN HEREON, IT IS FOR INFORMATION ONLY, HAVING BEEN OBTAINED FROM AVAILABLE SOURCES NOT CONNECTED WITH THIS CORPORATION THEREFORE, NO GUARANTEE IS MADE AS TO THE ACCURACY OR COMPLETENESS OF SAID INFORMATION.

ANDREW HOLMES L.S. 4428

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DATE	8/2/19
SCALE	1"=80'
DRAWN	TJP
JOB NO.	01.4260
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SHEET	1 OF 12

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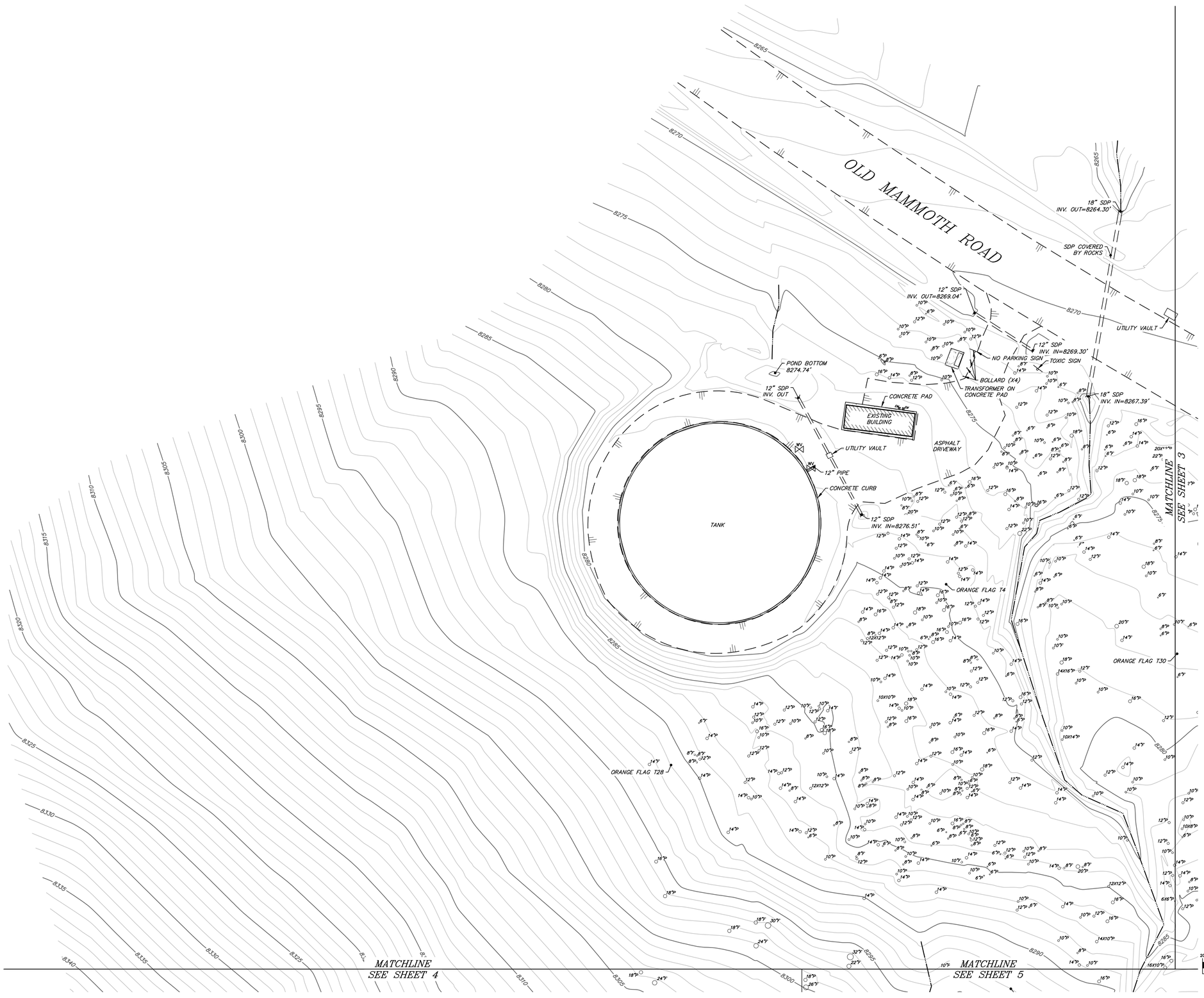

LEGEND

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- ADJACENT PROPERTY LINE
- CENTERLINE
- FLOWLINE
- EDGE OF PAVEMENT
- WOOD FENCE
- OHU — OVERHEAD UTILITIES
- 730 — EXISTING GROUND CONTOUR & ELEVATION
- LIGHT POST
- 12"P — TREE TYPE & SIZE P=PINE/J=JUNIPER
- SSCO — SEWER CLEANOUT
- SEWER MANHOLE
- GUY ANCHOR
- POWER POLE
- WV — WATER VALVE BOX
- EM — ELECTRIC METER
- GM — GAS METER
- WHB — WATER HOSE BIB
- FIRE HYDRANT

SCALE: 1"=20'
CONTOUR INTERVAL: 1'
GRAPHIC SCALE

20 0 10 20 40 80

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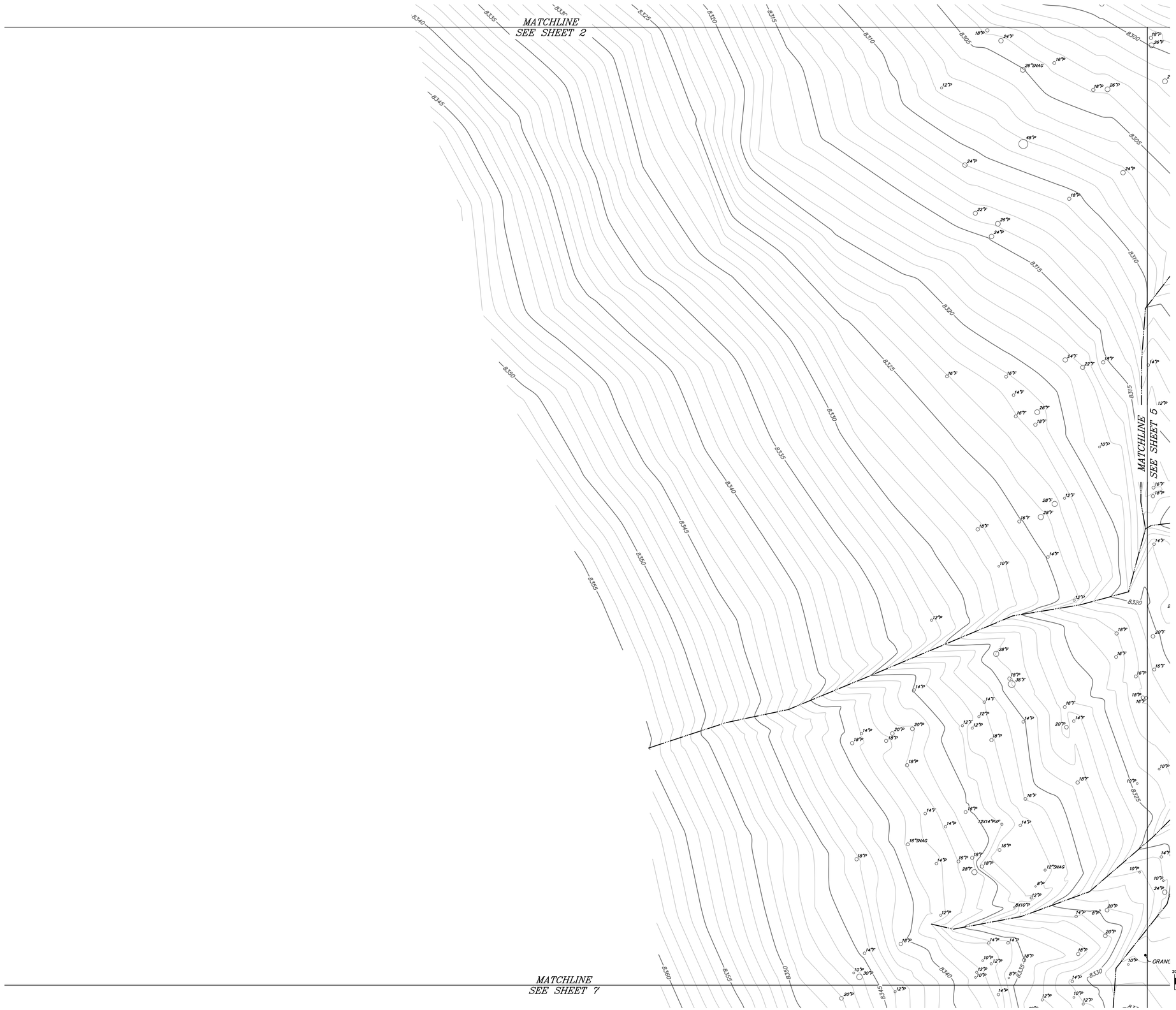

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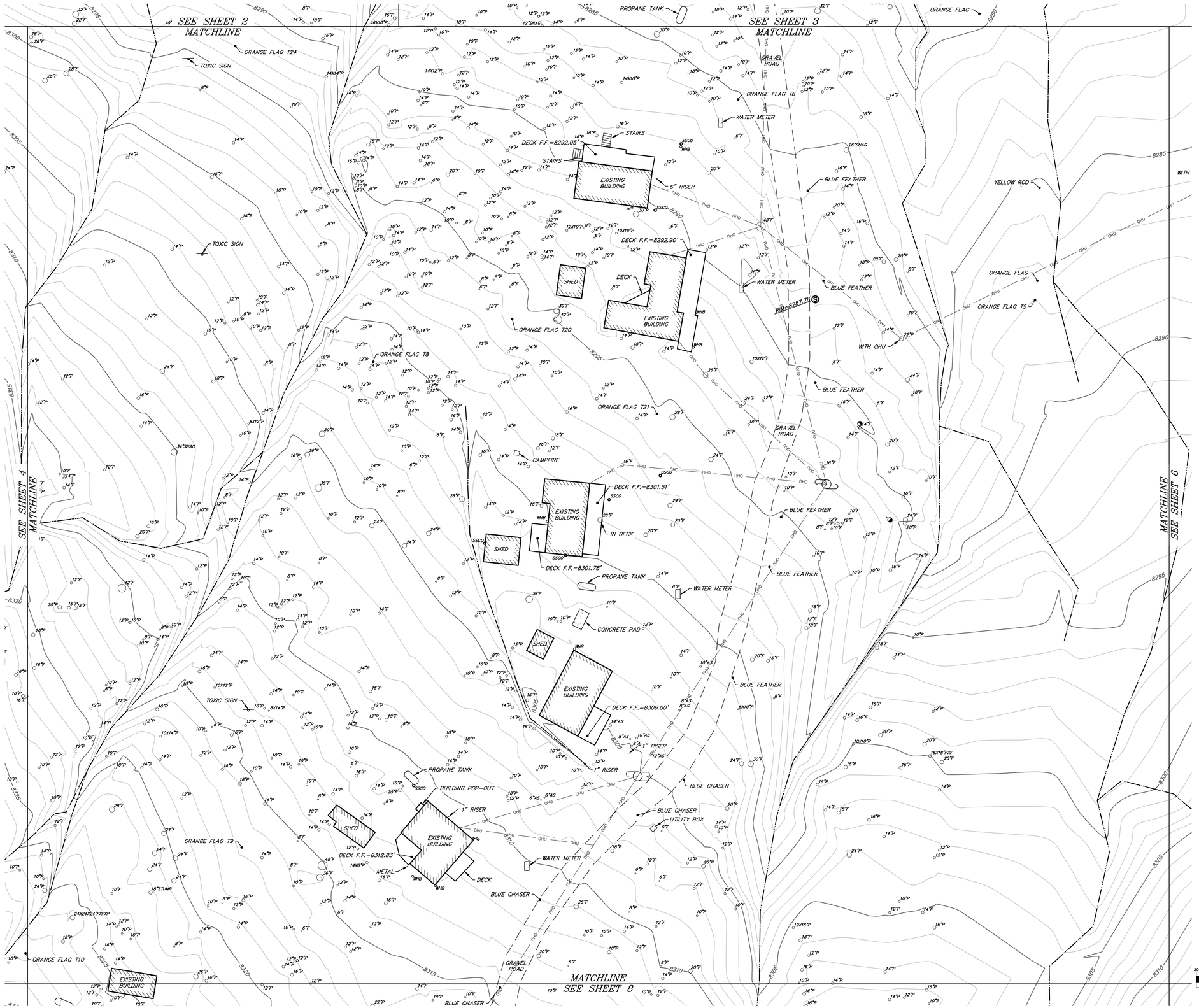

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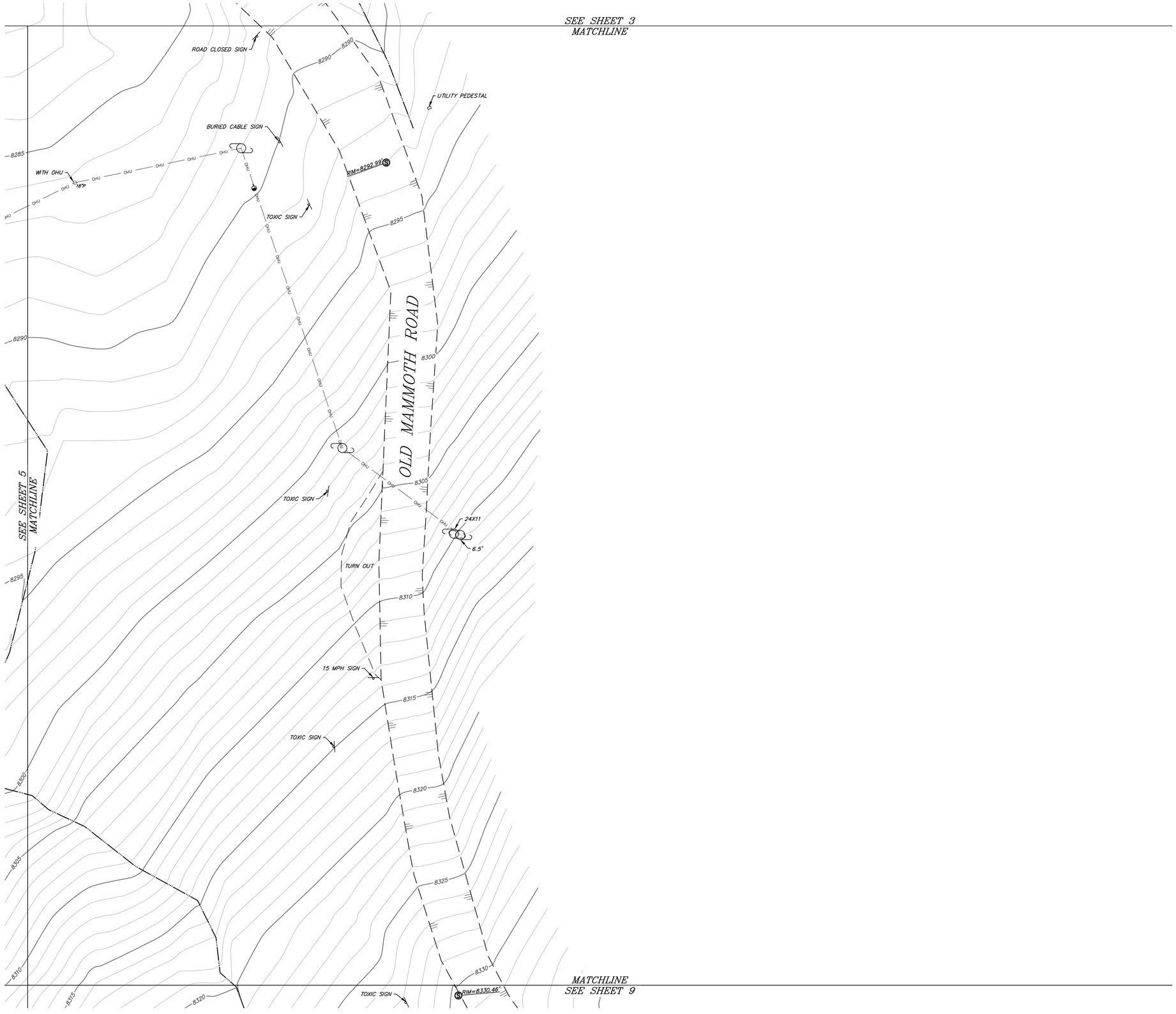

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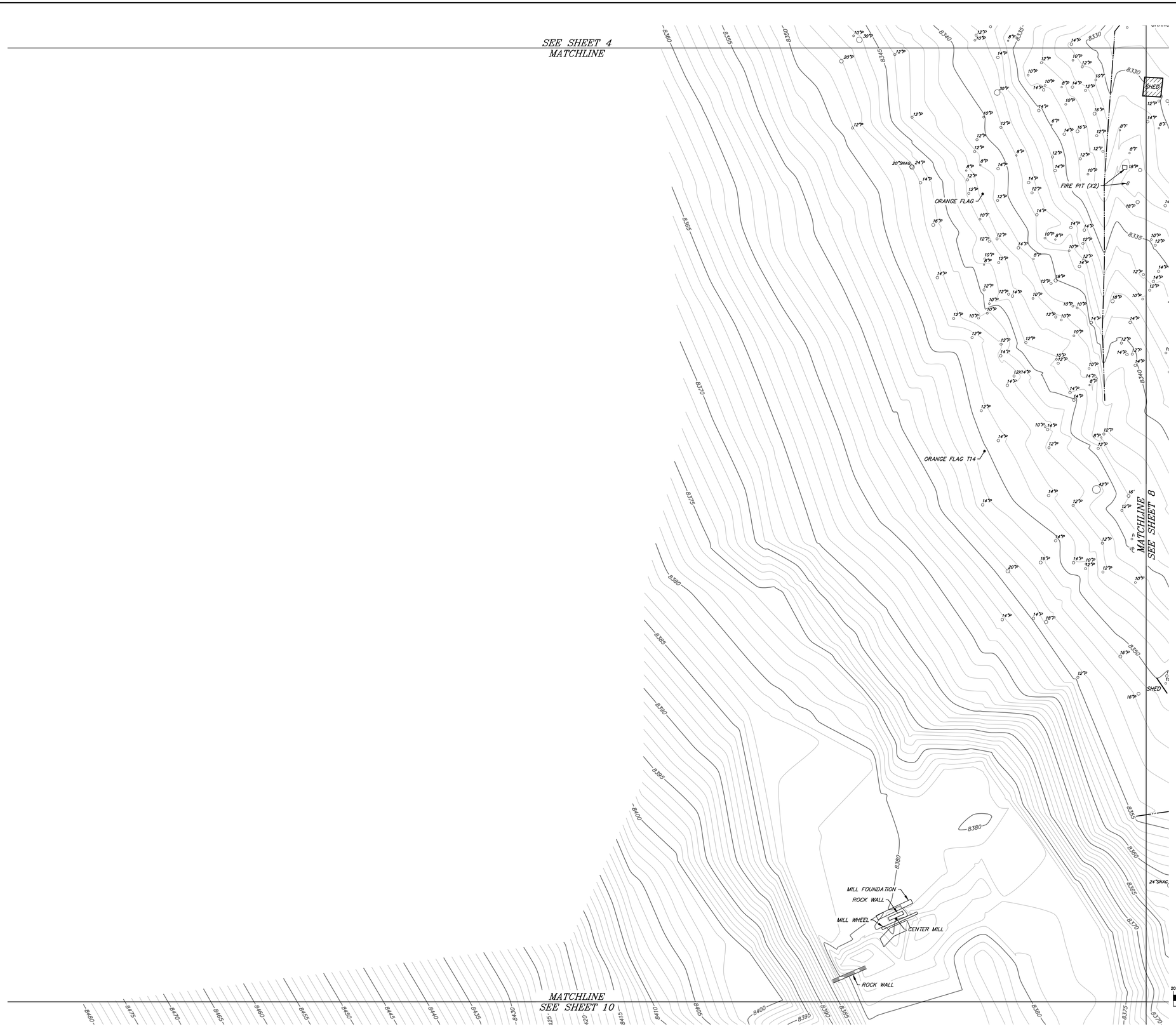

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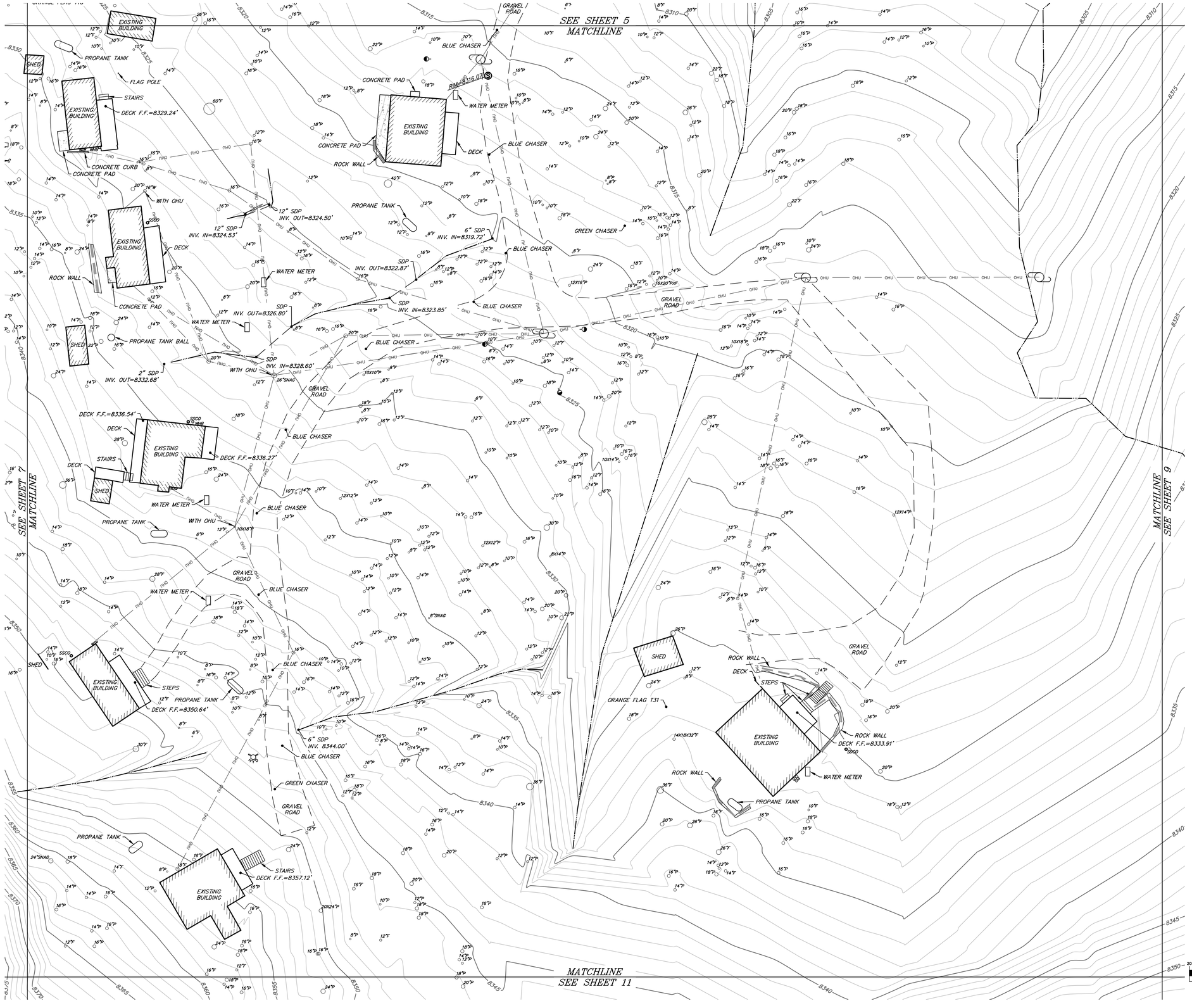

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- WOOD FENCE
- OHU — OVERHEAD UTILITIES
- 730 — EXISTING GROUND CONTOUR & ELEVATION
- LIGHT POST
- 12"P — TREE TYPE & SIZE P=PINE/J=JUNIPER
- SSCO — SEWER CLEANOUT
- S — SEWER MANHOLE
- GUY ANCHOR
- POWER POLE
- WV — WATER VALVE BOX
- EM — ELECTRIC METER
- GM — GAS METER
- WHB — WATER HOSE BIB
- FIRE HYDRANT

SCALE: 1"=20'
CONTOUR INTERVAL: 1'
GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

triad/holmes assoc.
civil engineering
land surveying
MAMMOTH LAKES
BISHOP
REDWOOD CITY

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REVISIONS:	BY:

PREPARED FOR:
USDA FOREST SERVICE

MAMMOTH MILL
TOPOGRAPHIC SURVEY
TOWN OF MAMMOTH LAKES, MONO COUNTY, STATE OF CALIFORNIA

DATE	8/2/19
SCALE	1"=20'
DRAWN	TJP
JOB NO.	01.4260
DWG	8
SHEET	8 OF 12

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LEGEND

- PROPERTY LINE
- ADJACENT PROPERTY LINE
- CENTERLINE
- FLOWLINE
- EDGE OF PAVEMENT
- WOOD FENCE
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- 730 — EXISTING GROUND CONTOUR & ELEVATION
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DWG	9
SHEET	9 OF 12

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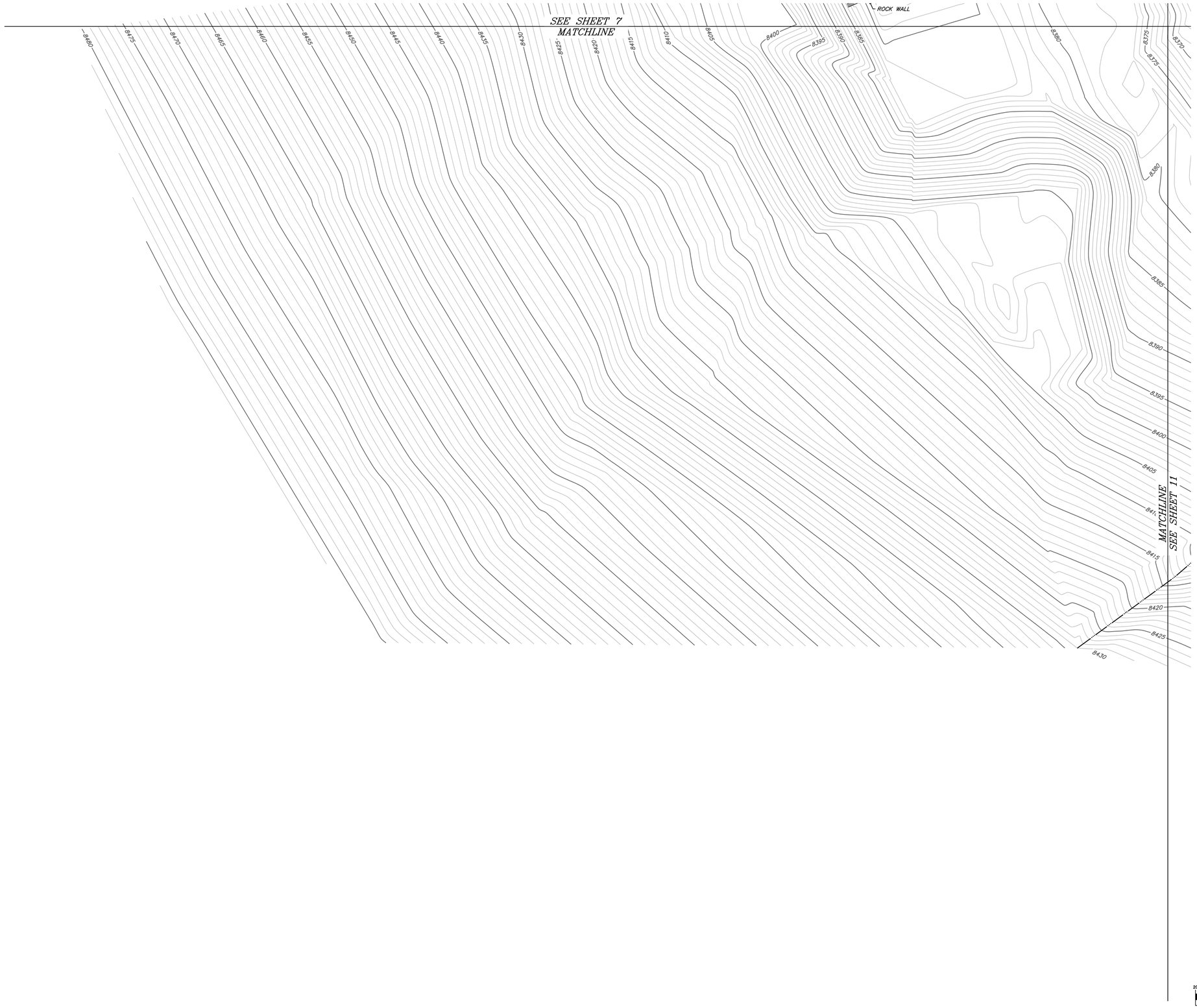

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SCALE 1"=20'
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JOB NO. 01.4260
DWG 10
SHEET 10 OF 12

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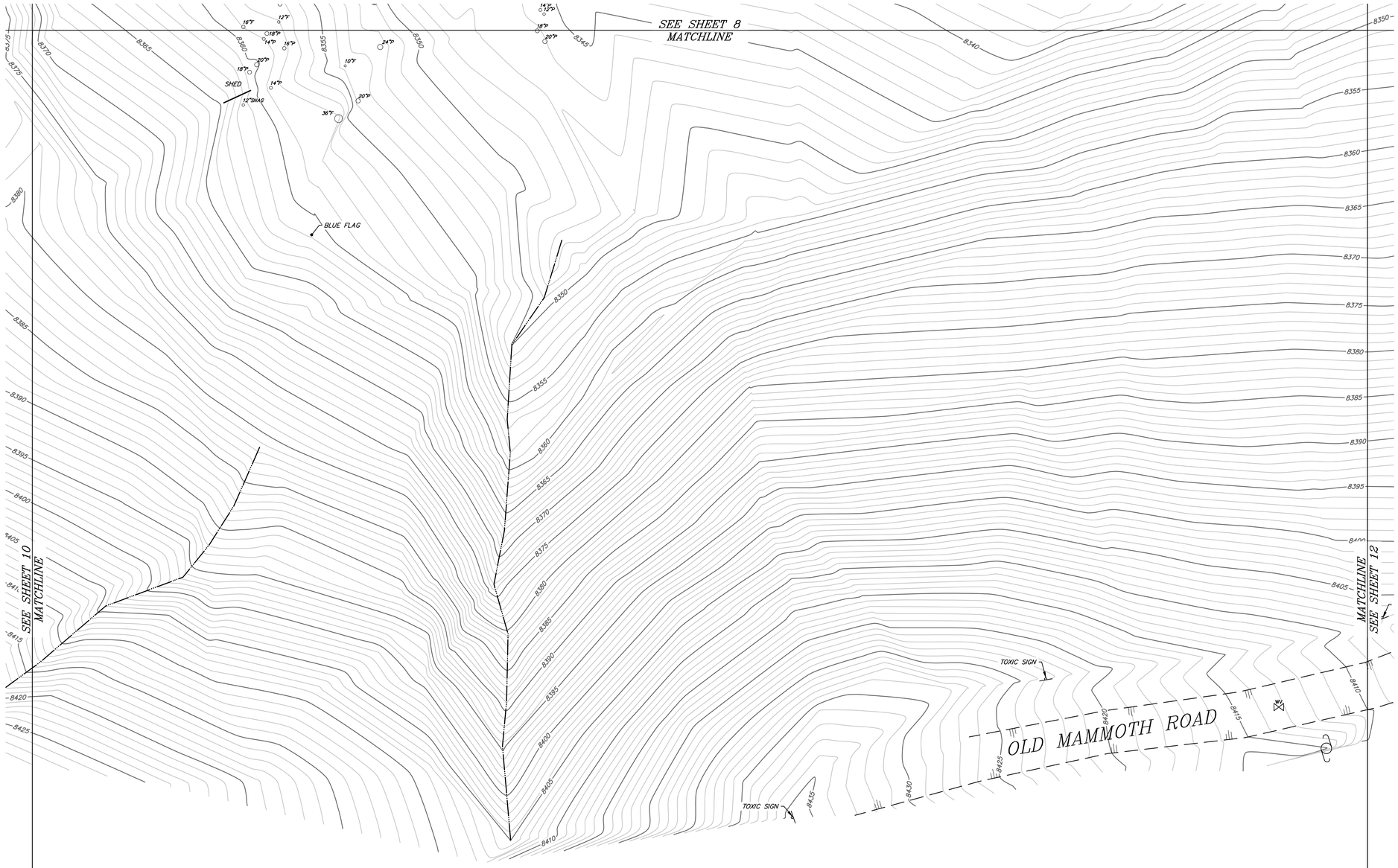

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DRAWN	TJP
JOB NO.	01.4260
DWG	11
SHEET	11 OF 12

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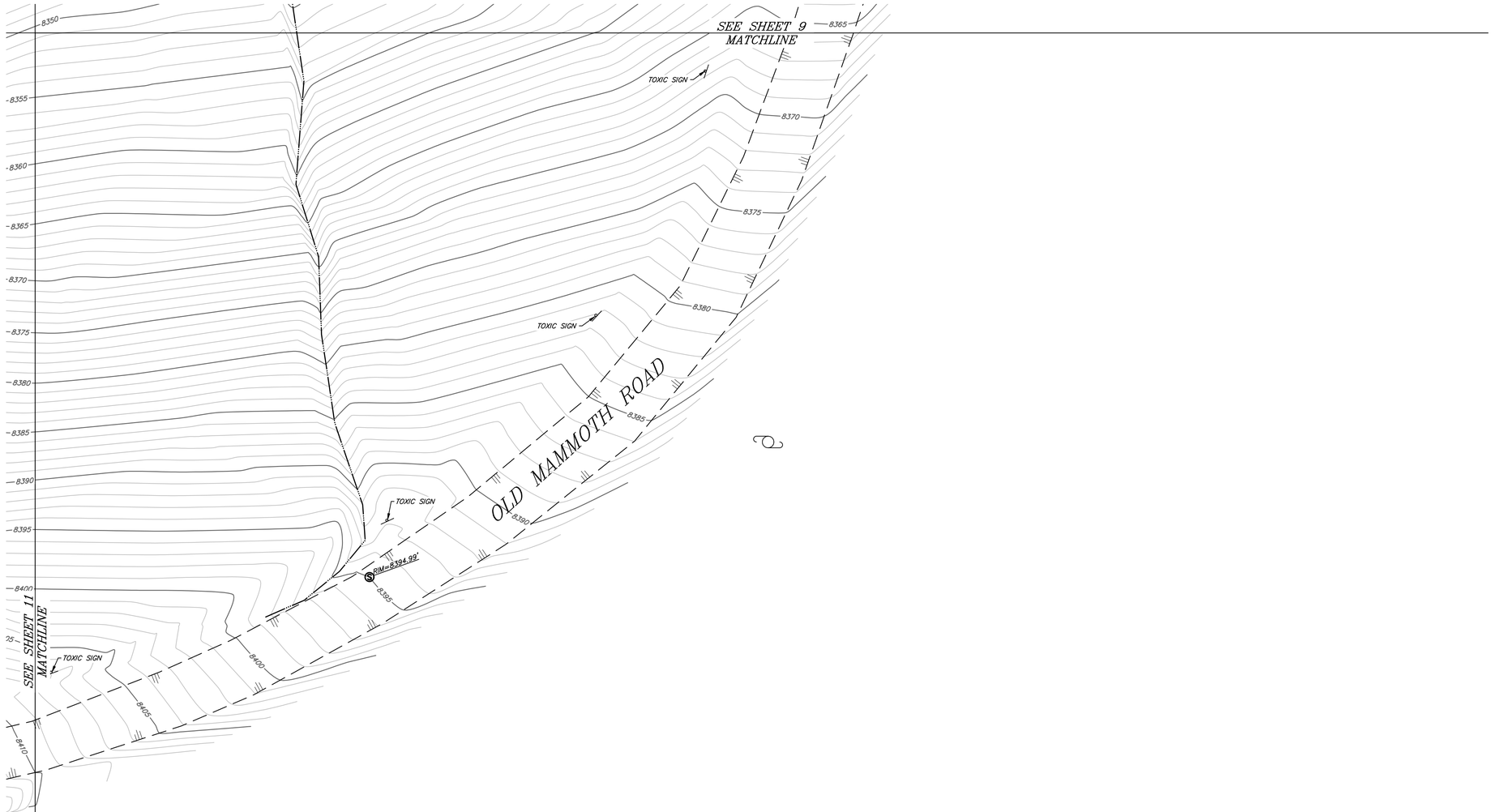

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DWG	12
SHEET	12 OF 12

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