100002484

ADDENDUM NO. 7 TO REMEDIAL INVESTIGATION WORK PLAN

SUPPLEMENTAL SOIL SAMPLING in OU2 and OU3

Former Frenchtown Mill
Missoula, County Montana

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NewFields Project 350.0065.003
October 2017

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TO THE REMEDIAL INVESTIGATION WORK PLAN

Supplemental Soil Sampling Work Plan
Former Frenchtown Mill, Missoula County, Montana

Version 3
Issued: October 3, 2017

11/27/17

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1.0 INTRODUCTION

This document, Addendum No. 7 to the Smurfit-Stone/Frenchtown Mill Remedial Investigation Work Plan (RIWP; NewFields 2015a) describes a plan to complete supplemental soil sampling in operable units 2 and 3 (OU2 and OU3) at the former Frenchtown Mill (hereafter referenced as the "Site"). The Site is located adjacent to the Clark Fork River (CFR), west of Mullan Road near Frenchtown, Missoula County, Montana (**Figures 1** and **2**). This Addendum is prepared in accordance with Section 46 of the Administrative Settlement Agreement and Order on Consent (AOC) for Remedial Investigation/Feasibility Study (RI/FS) between the potentially responsible parties (PRPs; M2Green Redevelopment LLC, WestRock CP, LLC, International Paper Company) and the U.S. Environmental Protection Agency (EPA), filed November 12, 2015.

1.1 Site Description

The Site is located within the northwestern portion of the Missoula Valley, approximately 11 miles northwest of Missoula, Montana and about three miles southeast of Frenchtown, Montana (**Figure 1**). The geographical coordinates of the industrial center of the Site are latitude 46°57'51.71" North and longitude -114°12'00.02" West.

The Missoula Valley elevation ranges from approximately 3,000 to 3,200 feet above mean sea level. Mountain ranges bordering the valley include the Rattlesnake Range to the north, Sapphire Range to the east, the Bitterroot Range to the south, and the Ninemile Divide to the west. The CFR and Bitterroot Rivers drain the valley. The CFR flows west through the valley and then north along the Site's western boundary (**Figure 2**). The Site project area (including all three Operable Units; OUs) encompasses about 3,150 acres.

Former mill operations spanned a large area in OU2 and OU3. A detailed description of the former uses of subareas within OU2 and OU3 is provided in the RIWP (NewFields 2015a). This sampling program is directed at surface and subsurface soil in OU2 and OU3. Part of the land in OU3 resides within the Special Flood Hazard Area (SFHA), the FEMA jurisdictional 100-year floodplain. For the purposes of this addendum, OU3 has been divided into two areas. The OU3 Upland area includes those lands within OU3 that reside outside the SFHA. The OU3 flood plain (FP) area includes those lands that reside within the SFHA.

1.2 Project Background

EPA has initiated a baseline human health risk assessment (BHHRA) and ecological risk assessment (BERA), starting with performance of screening evaluations and development of conceptual site models (CSMs) depicting potential exposure pathways (USEPA 2017a, USEPA 2017c, USEPA 2017e). As a result of these efforts, EPA has identified data gaps to be addressed by supplemental soil sampling. The results from supplemental soil sampling described in this addendum will complement results of earlier sampling efforts and support risk assessment at the Site.

1.3 Project Objectives

The objective of the supplemental soil sampling described in this addendum will be to complete sampling of surface and subsurface soils in OU2 and OU3 to address data gaps related to performance of the baseline HHRA and ERA for the Site.

1.4 Document Organization

A review of previous soil investigation work is summarized in Section 2. A detailed description of data quality objectives for collecting supplemental soil samples is presented in Section 3. Section 4 and the remainder of this addendum address field, laboratory, and data management procedures to be used in conformance with the approved Quality Assurance Project Plan (QAPP; NewFields 2015a).

2.0 SUMMARY OF PREVIOUS SITE INVESTIGATIONS

This section provides an overview of existing information that was used to inform the study design for supplemental soil sampling in OU2 and OU3. Detailed information supporting this section is available in the following documents:

- 2014 Site Investigation Report (NewFields 2014b)
- Remedial Investigation Work Plan (RIWP; NewFields 2015a)
- Preliminary Data Summary Report (PDSR; NewFields 2016b)
- Draft Memorandum: Strategy for Selecting Chemicals of Potential Concern (COPCs) for OU2, Smurfit Stone Frenchtown Mill, Missoula County, Montana. (USEPA 2017a)
- Draft Screening Level Ecological Risk Assessment for Operable Units 2 & 3 of the Smurfit Stone Frenchtown Mill Site Located in Missoula County, Montana. (USEPA 2017e)
- Draft Proposed Human Health Conceptual Site Model for Operable Unit 2 (OU2), Smurfit Stone Frenchtown Mill, Missoula County Montana. June 15, 2017 (USEPA 2017c)
- OU2 PCB Soils Investigation Report (NewFields 2017a)
- PCB Data Summary Memorandum (NewFields 2017c)

The 2014 Site Investigation report summarizes results of sampling and analysis completed in 2014 (before the RIWP was completed). The Site operational history described in the RIWP (NewFields 2015a) provides relevant context for past sampling efforts. The RIWP defines the remedial investigation approach for each OU based on conceptual site models (CSMs) that consider the historical uses within each OU. The PDSR summarizes RI results from sampling and analysis completed in 2015. The draft screening level ecological risk assessment (SLERA) for OU2 and OU3 (USEPA 2017e) compares 2014 and 2015 results to relevant screening criteria. The OU2 PCB Soils Investigation report summarizes PCB concentrations in soil from samples at two areas of OU2 where further investigation was pursued. The PCB Data Summary Memo summarizes all analytical results for PCBs collected between 2014 and 2017. Data from aforementioned sources has been validated according to the RIWP QAPP (NewFields 2015a) and stored in a Scribe project database. Historical sample quantities for these studies are presented by year and depth in **Table 1**. Historical sample locations are shown on **Figure 3**.

2.1 SOIL INVESTIGATIONS

In 2014, surface and subsurface soil samples were collected in OU2 and OU3 as part of a broader investigation of soil and groundwater at the site. Analytical results for this work are reported in NewFields (2014b) and the RIWP (NewFields 2015a).

- Samples were collected between April 1st and May 29th of 2014
- Data were collected by NewFields on behalf of M2Green Redevelopment to investigate the nature and extent of potential contamination at the site and provide information to support planning for site redevelopment.

- Site investigation was conducted in accordance with EPA site inspection guidance (USEPA 1992) and a sampling and analysis plan (NewFields 2014a).

- A biased sampling approach was used whereby discrete samples were collected from locations most likely to be contaminated from former operations. Surface soils were collected as localized 5-point composites over a 1 to 2-meter area. Subsurface soil samples were collected at discrete intervals from waste material within waste water treatment system (WWTS) basins and native soils below the base of the basins using hollow-stem auger (with split spoon) and test pitting techniques. Borings and test pits were extended to a depth of 2 feet below the contact of any apparent impacted soils or to groundwater, whichever was encountered first. Sample quantities and depths are summarized in **Table 1**. Subsurface samples with information on soil chemistry greater than 10 feet below ground surface (bgs) will not be used for risk assessment, and were not considered in planning the supplemental soil sampling described herein.

- Analyte groups included dioxins and furans, metals, and PCBs. All results of this investigation are stored in the project (Scribe) database and available to risk assessors.

- Samples were analyzed in accordance with a quality assurance project plan. Certified laboratory program (CLP) or equivalent laboratory methods were used.

- A data validation report for this dataset was submitted to EPA on March 15, 2015 (NewFields 2015d). All soils data were deemed sufficient to achieve project objectives and usability.

In 2015, surface and subsurface soil samples were collected in OU2 and OU3 as part of the RI at the site (NewFields 2015b). Analytical results for this work are reported in a preliminary data summary report (NewFields 2016b).

- Samples were collected during the months of November and December 2015

- Data were collected by NewFields on behalf of the Site PRPs to investigate the nature and extent of potential contamination.

- Site investigation was conducted in accordance with EPA Remedial Investigation guidance (USEPA 1988) and overseen by technical staff from Region 8 of the US EPA, and MDEQ.

- A biased sampling approach was used whereby discrete samples were collected from locations most likely to be contaminated from former operations. Surface soils were collected as localized 5-point composites over a 1 to 2-meter area. Subsurface soil samples were collected as 10 foot (or less) vertical composites from waste material within WWTS basins using hollow-stem auger (with split spoon) and test pitting for sample acquisition. Borings and test pits were extended to a depth of 2 feet below the contact of any apparent impacted soils or to groundwater, whichever was encountered first. In some circumstances, subsurface samples were collected as discrete samples from soils that appeared to be impacted (staining and odor). Sample quantities and depths are summarized in **Table 1**. Subsurface samples with information on soil chemistry greater than 10 feet bgs will not be used for risk assessment, and were not considered in planning the supplemental soil sampling described herein.

- Analyte groups included dioxins and furans, metals, PCBs, VOCs, and SVOCs including polycyclic aromatic hydrocarbons (PAHs). All results of this investigation are stored in the project (Scribe) database and available to risk assessors.

- Samples were analyzed in accordance with a quality assurance project plan (NewFields 2015c). Certified laboratory program (CLP) or equivalent laboratory methods were used.

- A data validation report for this dataset was submitted to EPA as part of the Preliminary Data Summary report (NewFields 2016b). All soils data were deemed sufficient to achieve project objectives and usability.

In 2016, surface and subsurface soil samples were collected in OU2 in accordance with Addendum 2 to the RIWP (NewFields 2016a). Analytical results for this work are reported in a data summary report (NewFields 2017a).

- Soil samples were collected on August 22nd and 23rd of 2016.

- Data were collected by NewFields on behalf of the Site PRPs to delineate PCBs which were observed at concentrations above soil screening levels in two locations within OU2 during the December 2015 RI sampling event.

- Site investigation was conducted in accordance with EPA Remedial Investigation guidance (USEPA 1988) and Remedial Investigation Work Plan Addendum 2 and the Quality Assurance Project Plan (NewFields 2016a, 2015c). Sample collection was overseen by technical staff from Region 8 of the US EPA, and MDEQ.

- August Soil samples were collected from several locations in the vicinity of the High Density Pulp Tank (HDPT) and Transformer Storage Building foundation area (TSB) proximal to locations sampled in December 2015 (NewFields 2016b). Samples were collected at depths ranging from 1 to 10 feet bgs to investigate the horizontal and vertical extent of PCBs from the two areas. Sample quantities and depths are summarized in **Table 1**.

- Results from the initial investigation of soil of OU2 completed in 2015 (NewFields, 2016b) indicated that additional soil characterization to address PCBs in a localized area of OU2 was needed. This investigation in 2016 (NewFields 2017a) identified PCBs in soils at elevated concentrations in the vicinity of the HDPT and the TSB. In the HDPT area, only Aroclor 1260 was detected. In the TSB area, Aroclors 1254 and 1260 were detected. In surface soil, which is defined by MDEQ as 0 to 2 feet bgs (MDEQ, 2012), PCB concentrations were above Residential Direct-Contact RSLs in samples SS18 and SS19 (HDPT area), boreholes 38 and 40 (HDPT area), surface soil sample SS30 (TSB area), and boreholes 46 and 47 (TSB area). The highest surface sample PCB concentration observed is 7.5 mg/kg (Aroclor 1260) from the TSB area. This concentration was observed in the December 2015 sampling event. The highest subsurface PCB concentration observed is 2.8 mg/kg (Aroclor 1260) from a sample about 4 feet bgs in the HDTP area. This concentration was observed in the August 2016 sampling event. A removal plan was submitted to EPA for review in September 2017 (NewFields 2017b). All results of this investigation are stored in the project (Scribe) database and available to risk assessors. All of the PCB data for soil and other media at the Site collected between 2014 and 2017 has been summarized in a memorandum (NewFields, 2017c).

- August 2016 Samples were analyzed in accordance with a quality assurance project plan (NewFields 2015c). Certified laboratory program (CLP) or equivalent laboratory methods were used.

- A data validation summary for the August 2016 dataset was submitted to EPA as part (Appendix C) of the report of findings (NewFields 2017a). All soils data were deemed sufficient to achieve project objectives and usability.

2.2 Screening Evaluations

EPA has completed risk screening and baseline human health and ecological risk assessments for OU1 (USEPA 2017b and 2017f). EPA concluded that chemicals in soils of OU1 are not present at concentrations of concern to human or ecological receptors.

EPA has initiated the risk screening process for OU2 and OU3 (USEPA 2017a), and development of conceptual site exposure models (USEPA 2017b, c) for relevant receptors.

- The human health screening for OU2 and OU3 have not been finalized because EPA and MDEQ have identified data gaps for soils that must be addressed to complete the human health risk assessments for these OUs.

- EPA's draft screening level ecological risk assessment for OU2 and OU3 is currently under review.

In the draft SLERA for OU2 and OU3, the maximum reported contaminant concentrations in soil exceeded screening levels for several metals and for 2,3,7,8 dibenzo-p-dioxin toxicity equivalents (TEQ) calculated using toxicity equivalency factors (TEFs) for mammals (TEQ_M). EPA's OU2 and OU3 SLERA did not include comparisons to background concentrations of metals in soils.

The CSMs developed by EPA as part of the initial steps of the risk assessments define human receptors for each OU. EPA has defined ecological receptors for these OUs in a presentation to the biological technical assistance group presented on June 21, 2017. These receptors are relevant to definition of data quality objectives for the supplemental soil sampling, and are discussed in the next section.

3.0 PROJECT DATA QUALITY OBJECTIVES

In the process of completing screening level risk assessments, EPA and MDEQ determined that the spatial coverage of existing soil samples is inadequate to complete human health and ecological risk assessments for OU2 and OU3. Consequently, this sampling program is designed to collect additional samples to improve the spatial representation of soils in OU2 and OU3. Data quality objectives (DQOs) for this sampling program are summarized below and detailed in separate tables for three areas of the site; **Table 4** (OU2), **Table 5** (OU3 Uplands) and **Table 6** (OU3 FP). DQOs for soil sampling, including soil analytes, sampling locations, sampling depths and anticipated use of the data were prepared in collaboration with EPA and MDEQ human health and ecological risk assessors.

3.1 Data Quality Objectives

This section addresses each of the seven steps of the DQO process for supplemental soil sampling in OU2 and OU3, focusing on details that do not fit into summary **Tables 4, 5, and 6**. It is organized to be consistent with USEPA (2006) guidance, and defines the problems to be addressed, study questions, and the means to resolve these with the present soil study. This DQO statement serves as a tool for organization of the SAP and for communication to multiple parties about the purpose and technical approach to resolve soil data gaps identified by EPA and MDEQ.

3.1.1 Statement of the Problem

USEPA's (2006) DQO guidance recognizes two types of problems: decision problems and estimation problems. For all of the supplemental soil sampling, additional data for selected chemicals in surface and subsurface soils are needed to address data gaps identified by EPA and MDEQ. Supplemental soil sampling addresses both decision problems and estimation problems. Such problems at the Site may include:

1. To complete the human health and ecological risk screening
2. To ensure that the baseline risk assessments will be prepared using data that provide sufficient spatial representation of the area that could be used by hypothetical human and ecological receptors (**Table 3**).
3. To describe the nature and extent of any observed contamination in soils, including the average concentration of chemicals within the perimeter of selected basins of OU3 uplands.
4. To support comparisons of concentrations of metals in soils of OU2 and OU3 with concentrations of metals in soils from background areas.

Data gaps to be resolved by supplemental soil sampling include additional information on dioxins, furans and metals in soils (USEPA 2017a, e) in both OU2 and OU3. All samples will be analyzed for these chemicals, grain size distribution and total organic carbon because this information is necessary to understanding the nature and extent of any observed contamination.

Soil samples in OU2 will also be analyzed for PCB congeners and PCB Aroclors. In samples collected in the past, Aroclor 1254 and Aroclor 1260 exceed their respective EPA regional screening levels (RSLs) for residential use in some of the surface soils previously sampled in OU2. The available PCB data for surface soil in OU2 is from a few discrete locations within the OU, including one location with multiple samples (**Figure 3**), and broader spatial representation is required to address potential exposure of human and ecological receptors within OU2; PCB congener data is required by EPA to evaluate the contribution of the dioxin-like PCB congeners[1] to total 2,3,7,8-TCDD toxicity equivalent concentrations in soil samples from OU2. In subsurface soils of OU2, information on PCBs is more widely distributed, but EPA has requested that additional information on subsurface PCBs be collected at the southern end of OU2, and along the outer edges of OU2.

Surface and subsurface samples in OU3 uplands and OU3 floodplain soils will not be analyzed for PCBs. Aroclors have not been detected in surface soils of OU3. Aroclors have rarely been detected OU3 subsurface soils: Aroclor 1254 and Aroclor 1260 were detected in five subsurface soil samples, including four collected in settling pond P3, and one at the location of monitoring well NFMW-10 in a solid waste basin (SWBCa). In the two soil samples collected in OU3 between 2 and 10 feet bgs in which Aroclors were detected, they were present at concentrations below their respective residential direct-contact RSLs. Aroclor 1254 slightly exceeded its residential RSL, at 0.167 mg/kg, from a sample between 10 and 14 ft. bgs.

Other chemicals analyzed in soil in prior studies throughout the Site (volatile organic compounds and semivolatile organic compounds) were either never detected or rarely detected in soils (NewFields 2016b). Existing data for these chemicals in OU2 and OU3 soil is sufficient for the evaluation of the nature and extent of contamination and there are no data gaps for these chemicals.

3.1.2 Goals of the Study

The goals of the study are to satisfy data gaps identified by EPA and MDEQ that must be addressed to perform baseline risk assessments for OU2 and OU3. All results of this study will be combined with information from soil sampling conducted between 2014 and the present and used to:

- Complete the human health and ecological risk screening process (including comparisons of concentrations of chemicals in soils within OUs to background),
- Calculate of receptor-specific exposures to chemicals of potential concern in soils as appropriate to the baseline risk assessments
- Describe the nature and extent of contamination in OU2 and OU3, including average concentrations within selected basins of OU3 uplands.

Through this process, EPA will make a determination as to which chemicals may present unacceptable risks to people or the environment. Any such chemicals will be addressed in the remedial alternatives analysis. Results of this study will also support determination of which chemicals do not pose an unacceptable risk.

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[1] Twelve of the 209 PCB congeners are considered to have dioxin-like toxicity because, like TCDD, they have a high affinity to bind to the aryl hydrocarbon receptor (AhR) in vertebrates. As a result, the toxicity of these twelve PCB congeners is considered to be additive with that of dioxins and furans expressed as TEQ (Safe 1990). The toxicological basis and rationale for the use of the TEF approach is described in Van den Berg et al. (1998; 2006), and in USEPA's Review Draft Dioxin Reassessment (USEPA 2003).

3.1.3 Information Inputs

As described in **Tables 4, 5 and 6**, the information necessary to answer the study questions includes:

- Laboratory analytical results for the supplemental soil samples to be collected as described in this SAP
- Analytical results for all Site media sampled from 2014 to the present
- Risk-based screening levels for soils identified by EPA in prior publications for this Site (USEPA 2017a, e)
- Concentrations of metals in soils from background areas
- Relevant EPA guidance for performing human health and ecological risk assessments
- Site-specific exposure factors
- Appropriate toxicity values to be used to interpret exposure estimates in the baseline risk assessments.

Other information inputs may be identified in the course of conducting the RI/FS.

3.1.4 Boundaries of the Study

Both the temporal and spatial boundaries of this study were determined by the specific needs of the risk assessments. Temporal boundaries of the study consist of the timing of sampling, and the time period that the results represent. Sampling and chemical analysis of samples will be conducted in the fourth quarter of 2017 to facilitate timely completion of the risk assessments. Samples collected will be considered representative of baseline conditions for the purposes of the RI/FS.

The spatial extent of sampling necessary to fill data gaps within the boundaries of OU2 and OU3 was evaluated by placing 20-acre grids onto maps of OU2 and OU3 uplands, and a 100-acre grid on a map of the OU3 floodplain. Gridded maps show the existing sample locations in which metals, dioxins and furans and PCBs had been analyzed.

EPA and MDEQ used the resulting maps to identify areas within each OU with inadequate representation for risk assessment purposes in the surface or subsurface soil data sets.

- Twenty-acre grids were used in OU2 and OU3 uplands because reasonably anticipated potential future human use of these areas includes residential and commercial uses, including construction of buildings. Twenty acres was the maximum spatial extent to be considered representative of the area within which a hypothetical future resident or commercial worker could be exposed.
- One hundred-acre grids were used in the floodplain of OU3 because potential future uses of this area do not include human activities that involve building construction, because new construction is generally not permitted within the 100-year floodplain in Missoula County (Griffin, S. Personal Communication: email from R. Moler on April 28, 2017). Therefore, potential future human uses within the floodplain include only recreation. One hundred acres was considered the maximum spatial extent to be considered representative of the area within which a hypothetical future recreational user could be exposed.

Spatial distribution of soil chemistry information and the area use by ecological receptors were considered in development of the supplemental soil sampling design. For example, within-basin sampling provides a means of estimating lifetime exposures to small home range receptors, i.e., those for which the home range may be no greater than the area of a basin. Additional spatial considerations for those ecological receptors with larger home ranges, such as the extent and spatial distribution of habitat types within each OU, have not yet been determined by EPA; they will be addressed in the BERA work plan.

Results of the spatial analysis and determination of the locations where new sampling is needed and the boundaries of sampling areas are illustrated in the following figures:

- **Figure 4** for OU2 surface soils
- **Figure 5** for OU2 subsurface soils
- **Figure 6** for surface soils in OU3 uplands
- **Figure 7** for subsurface soils in OU3 uplands
- **Figure 8** for surface soils in the OU3 floodplain
- **Figure 9** for subsurface soils in the OU3 floodplain
- **Figure 10** for surface soils in selected basins of the OU3 uplands.

The quantity of supplemental samples for each area is shown in **Table 2.** Individual samples are listed in **Table 8**. The other spatial consideration is the depth of samples. Surface soils will be collected at a depth of 0 to 6 inches bgs. This is an appropriate interval for calculating exposure to hypothetical future residents, commercial workers and ecological receptors.

- Each new surface sample collected within an area defined by a grid cell shown in **Figures 4 through 9** will be a composite of 20 subsamples; each of the 20 subsamples will be collected within a grid cell at 20 subsample locations, evenly spaced from one another in a grid pattern within the cell.
- Each new surface sample collected within the perimeter of a basin in the OU3 uplands shown in Figure 10 will be a composite of 30 subsamples; each of the 30 subsamples will be collected within a grid cell at 30 subsample locations, evenly spaced from one another in a grid pattern within the basin.

Details of the surface soil compositing protocol are provided in Section 4.

Subsurface soils will be collected at a single location within each grid cell identified for sampling on **Figures 5, 7 and 9**, at a depth interval of between 24 and 30 inches bgs. The only future human receptors to be evaluated in the human health risk assessment using these data are the hypothetical future construction worker. The only ecological receptor potentially exposed at this soil depth is a burrowing mammal.

Additional details on the scale of inference for risk screening and baseline risk assessment in each OU are presented in **Tables 4, 5 and 6**.

3.1.5 Develop the Analytical Approach

Concentrations of chemicals in soils resulting from the supplemental soil sampling will be used to perform baseline risk assessments. Results will also be used to describe the nature and extent of contamination within OU2 and OU3, and to compare concentrations of chemicals in soils from OU2 and OU3 to those of background. In all applications, 2017 soil chemistry data may be combined with data collected between 2014 and the present to address the study questions. Approaches for combining data will depend on the specific analytical need.

Methods for calculating exposure point concentrations from the information resulting from the supplemental soil sampling in combination with existing information will be presented by EPA in future publications.

Spatial representation of soil chemistry data resulting from this study will differ in important ways from that of past soil sampling efforts. To describe the spatial distribution of chemicals or other aspects of the nature and extent (e.g., spatial averages) in soils, it may not be appropriate to combine data sets generated using different sampling methods. Samples collected using 20- or 30-part composites do not represent the same level of precision as samples consisting of fewer parts collected across much smaller areas; the resulting differences limit the application of certain geostatistical methods to the combined (multi-year) soil chemistry data set for the Site. Such limitations will be identified in future applications of the final soil data set, e.g., to describe nature and extent of contamination.

For analyses requiring combinations of data sets in which variable precision among data points does not preclude their application (e.g., risk assessment), uncertainties will be minimized; those remaining will be evaluated and described thoroughly in the related report.

3.1.6 Performance and Acceptance Criteria for Resulting Data

Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015c), and in subsequent sections of this document. Analytical detection limits will be at or below the soil screening values identified by EPA for this project (USEPA 2017a, e). Detection limits are shown in **Table 7**.

Both human and ecological risk assessments will include discussion of qualitative uncertainty. Quantitative uncertainty analysis may include application of probabilistic risk assessment to determine a precise estimate of the probability of risk, or other statistical tools to provide quantitative uncertainty analysis.

3.1.7 Plan for Obtaining Data

The details of supplemental soil sampling are described in the remainder of this document. Sample locations selected to ensure a successful sampling program are shown on **Figures 4** through **8** and in **Tables 2 and 8**.

4.0 FIELD INVESTIGATION

The field investigation approach described below is designed to address data gaps related to the baseline risk assessments.

4.1 SITE ACCESS AND UTILITY CLEARANCE

Prior to the field investigation, NewFields will contact the Utilities Underground Location Center (UULC; 1-800-424-5555) to request all buried public utilities near proposed investigation locations be identified and marked. NewFields will work with the property owners to identify private utilities that may be present at the Site (including water, storm water, electric, natural gas lines, and/or underground irrigation lines). If NewFields determines the information provided by the property owners is insufficient to document the locations of underground utilities, a private utility locate contractor will be retained to confirm the locations of buried lines.

4.2 SAMPLING PROCEDURES

Procedures for sample collection, compositing where applicable, packaging, and shipment are described below for surface soil and subsurface soil sampling efforts, respectively.

4.2.1 Surface Soil Sampling

In accordance with the objectives discussed in **Section 3**, 20-point composite samples will be collected from square grid units to identify concentrations of contaminants in surface soil of OU2 and OU3. Samples will be collected from 20-acre grid units in OU2 (**Figure 4**), 20-acre grid units in OU3 Uplands (**Figure 6**), and 100-acre grid units in the OU3 Floodplain (**Figure 8**). Areas outside the OU boundaries will not be sampled. Where grid units are partially outside of the applicable OU, the sampled area will be smaller than the target grid size (i.e. 20 acres for OU2, 100 acres for OU3), however 20 subsamples will be collected. Per request from EPA, in the OU3 Uplands, in addition to the 20-point composite samples from square grid areas (**Figure 6**), 30-point composite surface soil samples will be collected from the basins depicted in **Figure 10**. All supplemental surface soil composite samples are listed in **Table 8**. Basin P3 is covered in two feet of wood chips to control dust, and sampling interval will begin immediately below the wood chips.

Field personnel will identify each subsampling location based on maps in a hand-held GPS device with sub-meter accuracy, and will place a pin flag at the subsampling location for the duration of sampling in the compositing unit (i.e. square grid unit or basin). When sampling in the unit has been completed, the pin flags will be removed. If an obstruction, such as a large boulder or concrete area prevents sampling at the designated location, field personnel will move the subsampling location to the nearest surface that can be sampled, and will record the direction and distance the subsampling location was moved on a table of field observations (see example in **Appendix B**).

At each subsampling location, field personnel will log surface soil conditions in general accordance with the Unified Soil Classification System (USCS) as described in ASTM D2488-00 (Visual-Manual Procedure). Soil descriptions will be tabulated in the field, and will include textural class/grain size, color, density/consistency, moisture content, and whether chemical odor or staining is present.

After recording soil conditions, soil sampling will be performed in accordance with SOP-13 (**Appendix A**). Soil sampling will be performed with decontaminated stainless steel tools. Decontamination will occur between each unit as described in **Section 4.5**. At each subsampling location, a laboratory-provided 2-ounce clean glass jar will be filled with soil from 0 to 6 inches bgs, and the sampled material will be placed in a decontaminated stainless steel or glass mixing receptacle (bowl, tray, or dish). This procedure will help to ensure that the same amount of sample is collected from each subsample location. After use in one grid unit, the 2-ounce subsampling jar will be disposed of, and will not be reused in other units; and the mixing receptacle will be decontaminated as described in **Section 4.5**.

When all subsamples from a unit have been collected and transferred to the mixing receptacle, the following procedures will be used to composite the material. The material will be mixed in alternating clockwise and counterclockwise directions with a decontaminated stainless steel trowel for at least 2 minutes. This mixing procedure assumes the material will generally be granular, and not clayey or otherwise highly cohesive. If the material is not granular, the kneading procedure from ASTM Standard D 6051-15 will be used to mix the sample.

After mixing, extraneous material greater than 0.5 inches wide will be removed by sieve from the composited sample. Containers for laboratory analysis will then be filled in general accordance with ASTM Standard D 6051-15, as follows. The mixed material will be arranged in a shallow rectangular pile within the compositing surface, and each container will be filled using multiple evenly-spaced swaths of a small decontaminated stainless steel scoop across the shallow pile. At least 30 seconds of re-mixing will occur between filling of each container.

Containerized samples will then be labelled in accordance with SOP-3 (**Appendix A**), then placed in a cooler with ice and shipped to the laboratory in accordance with SOP-4 (**Appendix A**). Laboratory analysis will be performed as described in **Section 4.3**.

4.2.2 Subsurface Soil Sampling

In accordance with the objectives discussed in **Section 3**, borehole soil samples from 24 to 30 inches bgs will be used to identify concentrations of contaminants in subsurface soil of OU2 and OU3. As with surface soil sampling, subsurface soil sampling will be used to fill data gaps based on grid units, and the grid unit size for OU2 and OU3 will be 20 acres. Grid units and proposed borehole locations in the center of each applicable grid unit are shown in **Figure 5** for OU2, **Figure 7** for OU3 Uplands, and **Figure 9** for OU3 Floodplain. All proposed supplemental subsurface soil samples are listed in **Table 8.**

Boreholes will be advanced using either direct-push technology or a hollow stem auger on a track-mounted drill rig. Decontamination of the drilling flights will be performed either by pressure washing after each borehole or by rinse with an environmentally benign detergent and tap water, and the tracks will be decontaminated by pressure washing between each OU. Field personnel will log borehole soil conditions in general accordance with USCS as described in ASTM D2488-00 (Visual-Manual Procedure). Soil descriptions will be recorded on borehole log forms (see example in **Appendix B**). Observations will include textural class/grain size, color, density/consistency, moisture content, and whether chemical odor or staining is present.

If drilling by direct-push methods, one core will be obtained from ground surface to at least 2.5 feet bgs. If drilling by hollow stem auger, material from ground surface to approximately 1.0 foot bgs will be logged by inspection of cuttings moved to the ground surface by the action of the auger. From 1.0 to at least 2.5 feet bgs, a soil sample will be obtained for logging and sampling purposes using a spit spoon sampler decontaminated in as described in **Section 4.5**.

After recording observations, laboratory-provided containers will be filled with sampled material from 2.0 to 2.5 feet bgs (24 to 30 inches bgs) in accordance with the procedures described in SOP-13 (**Appendix A**). Containerized samples will then be labelled in accordance with SOP-3 (**Appendix A**), then placed in a cooler with ice and shipped to the laboratory in accordance with SOP-4 (**Appendix A**). Laboratory analysis will be performed as described in **Section 4.3**.

4.3 Analytical Laboratory Testing

Contaminants of concern and laboratory analytical methods for this investigation are shown in **Table 9**. In summary, all soil samples will undergo laboratory analysis for dioxins and furans by EPA 8290 in High Resolution mode, metals by EPA Methods 6010, 6020, and 7471B, particle size analysis by ASTM Method D 422, and Total Organic Carbon (TOC) by EPA Method 9060 at all locations. The 17 dioxin/furan congeners to be reported are those with 4 to 8 chlorides (Cl4-Cl8). Metals to be reported will be the Target Analyte List (TAL) of the Superfund Contract Laboratory Program (CLP), which are Ag, Al, As, Ba, Be, Ca, Cd, Cr, Co, Cu, Fe, Hg, Pb, Mn, Mg, Na, Ni, K, Sb, Se, Tl, V, and Zn. Particle size analysis and TOC are included at the request of the PRPs. These two tests will provide preliminary information about the physical properties and type of material present where contaminants are detected.

In OU2 only, the surface and subsurface samples will also be analyzed for PCBs. Per EPA request, PCB analysis will be for Aroclors, 12 WHO congeners, and Total PCBs. Aroclors analysis will be by EPA Method 8082A. The laboratory will report Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Analysis for WHO congeners and Total PCBs will be by EPA Method 1668B.

Two laboratories will perform analysis. Analysis for dioxins and furans, PCB congeners, and Total PCBs will be performed by Frontier Analytical (Frontier) of El Dorado Hills, California. Analysis for metals, grains size distribution, TOC, and PCB Aroclors will be performed by Pace Analytical Services, Inc. (Pace) of Billings, Montana.

4.4 Quality Assurance and Quality Control (QA/QC)

QA/QC procedures specified in the RIWP QAPP will be followed. The QAPP is Appendix E of the RIWP (NewFields, 2015c) and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) QAPP guidance cited therein.

In accordance with the RIWP QAPP, QC samples will include equipment rinse blanks (one for every twenty (1/20) natural samples collected using non-disposable equipment, and blind field duplicates (one for every twenty (1/20) natural samples). An equipment rinse blank will be collected by pouring deionized water over decontaminated reusable sampling equipment and collecting the rinse water in sample containers. The field quality control sample will be collected in accordance with SOP-21 (**Appendix A**). Sufficient volume of soil will be provided to the laboratory to allow Matrix Spike (MS) testing specific to soil from the former Frenchtown Mill.

4.5 Decontamination Procedures and Disposal of Investigation-Derived Wastes

Decontamination of sampling equipment will be performed to ensure the quality of samples collected. A list of field equipment to be used during this investigation is provided in each relevant SOP. To prevent cross-contamination between soil samples, all non-disposable sampling equipment will be decontaminated on-site between sampling locations using distilled water, Alconox detergent, and a methanol and nitric acid rinse in accordance with SOP-2 (**Appendix A**). Decontamination procedures will be conducted at locations identified by NewFields prior to sampling and at an appropriate distance from sampling activities. Disposable equipment intended for one-time use will not be decontaminated, but will be disposed as described in SOP-2, which includes use of hexane to decontaminate prior to sampling for PCBs.

Heavy equipment (excavator, drill rig, and support vehicles) will be decontaminated in accordance with SOP-2. All equipment will be decontaminated prior to arriving on-site and before exiting a holding pond, basin, or other excavation/drilling location. Water for decontamination will be supplied from an on-site potable water source. Equipment will be positioned so that rinsate generated during decontamination drains back into the holding pond or basin being exited by the equipment. If excavations or drilling occurs outside a holding pond or basin, rinsate will be discharged to the ground in a prescribed location identified by NewFields. A proposed sequence of test pits excavations, borehole locations, and area entrance/exit points to reduce the potential for cross contamination will be discussed with subcontractors one week prior to field work. Investigation derived waste will be handled according to SOP-22 (**Appendix A**).

5.0 SAMPLE MANAGEMENT AND DOCUMENTATION

5.1 Field Documentation

NewFields personnel will document all activities in accordance with SOP-1 (**Appendix A**). Field records will include a chronology of activities and personnel on-site using a Daily Field Record form, tabulated observations of surface soil conditions, and a borehole log for each drilling location. If sampling locations need to be moved due to obstructions at designated subsampling location, adjusted locations will be noted on the table of surface soil observations, or on borehole logs for subsurface soil locations. Field forms examples are provided in **Appendix B**.

5.2 Field Data Collection and Transmission

Prior to initiating fieldwork, all field staff will review the SOPs (**Appendix A**) and this plan to understand the investigative approach and data requirements. Sample shipping arrangements will be made prior to mobilization, in order to ensure environmental samples are received by the laboratories within hold time. At the end of each day of sampling, field forms will be scanned by field personnel and electronic copies will be provided to the Project Coordinator.

5.3 Sample Labels and Chain-of-Custody Forms/Seals

All samples will be labeled in accordance with instructions provided in SOP-3 (**Appendix A**) to ensure samples can be correctly and consistently identified. Environmental samples will be placed in coolers with ice and chain-of-custody records, and each cooler will have a custody seal. **Appendix B** contains example chain of custody forms, which will specify the laboratory analyses for each sample. All samples submitted for laboratory analysis will be analyzed using standard turnaround times.

6.0 HEALTH AND SAFETY PROCEDURES

A site-specific Health and Safety Plan (HASP; NewFields, 2015a) has been prepared for field activities planned as part of remedial investigation. The HASP lists contaminants of concern and the range of concentrations that may be encountered at the Site and associated human health hazards. All fieldwork will be conducted in accordance with the HASP. NewFields has designated Mr. Richard Leferink as the corporate Health and Safety Officer overseeing the project. As indicated in the HASP, a competent person will be appointed to enforce health and safety considerations on-site during the investigation.

The HASP will be complemented by a Job Safety Analysis (JSA) worksheet to address safety concerns related specifically to drilling and collection of soil samples (**Appendix C**). At the beginning of each workday, field team leaders will conduct daily staff safety meetings guided by the HASP and JSA. A copy of the HASP and JSA will be kept on-site. The JSA will be modified during the investigation as needed, if changes occur in field conditions.

The Gatehouse is the designated muster area. Sign in/out sheets and daily tailgate meetings are mandatory for all field personnel.

7.0 DATA MANAGEMENT, VALIDATION AND REPORTING

7.1 Data Management and Validation

Environmental data will be entered into the EPA Scribe database. Data usability review and Tier II data validation will be conducted on all data collected by NewFields during this investigation. As outlined in the RIWP QAPP (Appendix E of the RIWP; NewFields, 2015a), data usability and validation will be completed in accordance with guidance for conducting remedial investigations and feasibility studies under CERCLA (EPA, 1988) and EPA Requirements for QAPPs (EPA, 2006, p. 5).

7.2 Reporting

Upon receipt of analytical laboratory results, NewFields will prepare a report describing the locations/depths of sampling, field observations, laboratory results, and any deviations from the field or analytical methods described in this plan.

Supporting documentation will be attached to the technical memorandum, including:

- A tabulated summary of soil sample analytical data;
- Figures depicting sample locations and concentrations of constituents of potential concern;
- A QA/QC summary, including Tier II data validation reports completed in accordance with EPA guidance; and,
- Appendices including Daily Field Records, tables of surface soil observations, borehole logs, laboratory analytical reports, and photographs.

8.0 REFERENCES

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TABLES

TABLE 1

SUMMARY OF SOIL SAMPLES COLLECTED FOR THE REMEDIAL INVESTIGATION

Supplemental Soil SAP

Former Frenchtown Mill, Missoula County, Montana

Media	Sample Type	Sample Location	Depth	Dioxins	Metals	PCBs	SVOCs/PAHs	VOCs
Samples Collected in OU2 in 2014								
Surface Soil	5-point composite	Landfarm	0-2 inches	1	1	1	---	---
Subsurface Soil	Subsurface samples not collected		> 24 inches	---	---	---	---	---
Samples Collected in OU2 in 2015								
Surface Soil	5-point composite	Throughout OU2	0-2 inches	17	17	---	17	---
Surface Soil	Discrete	Four sides of TSB, SB1-IN, SB2a,3a-IN	0-2 inches	---	2	5	1	1
Surface Soil	Discrete	Bleach plant and recovery boiler areas	12 and 24 inches	10	10	10	10	10
Boiler Ash	Discrete	Waste Fuel Boiler	0-6 inches	2	2	---	2	---
Subsurface Soil	Discrete	At potential source areas	2-10 feet, source dependent	1	15	13	6	6
Samples Collected in OU2 in 2016								
Surface Soil	Discrete	HDPT and TSB Areas	0 - 24 inches	---	---	11	---	---
Subsurface Soil	Discrete	HDPT and TSB Areas	24 - 120 inches	---	---	8	---	---
Total number of surface soil analytical results available for risk assessment in OU2				**30**	**32**	**27**	**30**	**11**
Total number of subsurface soil analytical results available for risk assessment in OU2				**1**	**15**	**21**	**6**	**6**

Media	Sample Type	Sample Location	Depth	Dioxins	Metals	PCBs	SVOCs/PAHs	VOCs
Samples Collected in OU3 in 2014								
Surface Soil	5-point composite	Throughout OU3	0-2 inches	8	8	8	---	---
	5-point composite	Throughout OU3	0-6 inches	14	13	13	---	---
	Discrete	Pond 13A, Pond 9	12-18 inches	2	2	2	---	---
Subsurface Soil/Waste	Discrete	Throughout OU3	>24 inches	14	12	12	---	---
Samples Collected in OU3 in 2015								
Surface Soil	5-point composite	Ponds HP-9, HP-13, HP-16, HP-18, Infiltration Basins IBK and IBJ	0-2 and 5-7 inches	16	16	---	---	---
On-site Floodplain Sediment	5-point composite	Floodplain of treated water holding ponds	0-2 inches	17	17	---	---	---
Subsurface Soil/Waste	Vertical Composite	Settling ponds, aeration basins, spoils basins, waste storage areas	up to 10 foot intervals based on depth of waste	26	24	6	---	---
Total number of surface soil analytical results available for risk assessment in OU3				**57**	**56**	**23**	**0**	**0**
Total number of subsurface soil analytical results available for risk assessment in OU3				**40**	**36**	**18**	**0**	**0**

Notes:

Samples with bottom of sampling interval at or less than 24 inches are listed as surface soil. Samples with a bottom interval greater than 24 inches are listed as subsurface soil.

Only samples relevant to risk assessment are enumerated. Subsurface samples collected below a depth of 10 feet are not applicable to risk assessment, and are not counted in this table.

QC samples, such as field duplicates, are not listed in the numbers of samples summarized above.

--- - not analyzed
na - not applicable
OU - operable unit
PAHs - Polynuclear Aromatic Hydrocarbons
PCBs - Polychlorinated Biphenyl
SVOC - semivolatile organic compounds
TOC - total organic carbon
TSB -Transformer Storage Building
VOC - volatile organic compounds

Metals: 2015 samples include: Arsenic, Antimony, Barium, Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Manganese, Mercury, Nickel, Selenium, Silver, Thallium, Vanadium, and Zinc. 2014 samples also include: antimony, calcium, magnesium, potassium, selenium, and sodium.

TABLE 2
SUMMARY OF SUPPLEMENTAL SOIL SAMPLES
Proposed September 2017
Former Frenchtown Mill Site, Missoula County, Montana

	Sample Type	Figure ID	Depth	Dioxins	Metals	PSA	TOC	PCBs
OU2								
Surface Soil	20-point composite	4	0-6 inches	9	9	9	9	9
Subsurface Soil	1 Discrete	5	24 - 30 inches	10	10	10	10	10
OU3 Uplands								
Surface Soil	20-point composite	6	0-6 inches	18	18	18	18	---
Subsurface Soil	1 Discrete	7	24 - 30 inches	8	8	8	8	---
OU3 Floodplain								
Surface Soil	20-point composite	8	0-6 inches	5	5	5	5	**---**
Subsurface Soil	1 Discrete	9	24 - 30 inches	6	6	6	6	---
OU3 Upland Basins								
Surface Soil	30-point composite	10	0-6 inches	6	6	6	6	**0**

Notes:

--- - not analyzed
na - Not Applicable
OU - Operable Unit
PCBs - Polychlorinated Biphenyl
PSA - Particle Size Analysis
TOC - Total Organic Carbon

TABLE 3
HUMAN AND ECOLOGICAL RECEPTORS, OPERABLE UNITS 2 AND 3
Former Frenchtown Mill, Missoula County, Montana

Human Receptors		Ecological Receptors[c]	
OU2[a]	OU3[b]	OU2	OU3
Resident	Resident	Montane vole	American mink
Commercial/Industrial Workers	Commercial/Industrial Workers	Deer mouse	River otter
Construction Workers	Construction Workers	Vagrant shrew	Montane vole
	Recreational Visitor	Mule deer	Deer mouse
		Bat	Vagrant shrew
		Tree swallow	Mule deer
		American robin	Belted kingfisher
		Gray catbird	Tree swallow
		Blue grouse	American robin
		American kestrel	Gray catbird
		Mallard	Mallard
		Northern flicker	American dipper
		Clark's Nutcracker	Blue grouse
		Terrestrial invertebrates	American kestrel
		Aquatic invertebrates	Northern flicker
		Plants	Clark's nutcracker
			Benthic macroinvertebrates
			Terrestrial invertebrates
			Plants

Notes:

a. DRAFT Proposed Human Health Conceptual Site Model for Operable Unit 2 (OU2), Smurfit-Stone Frenchtown Mill, Missoula County, Montana. 6/15/2017.

b. DRAFT Proposed Human Health Conceptual Site Model for Operable Unit 3 (OU3), Smurfit-Stone Frenchtown Mill, Missoula County, Montana. 6/13/2017.

c. Sanchez, B. 2017. Smurfit Stone Baseline Ecological Risk Assessment Work Plan. Slide Presentation. 6/21/2017.

Table 4. Data quality objectives for supplemental soil sampling in Operable Unit 2 of the Former Frenchtown Mill site

Steps of the DQO Process (USEPA 2006)	Surface Soil OU2	Subsurface Soil OU2
1. State the Problem **Define the problem that necessitates the study, identify planning team and schedule**	Additional data for metals, PCB congeners and Aroclors, and dioxins and furans in surface soils of OU2 are needed to address decision problems and estimation problems: 1. To complete the human health and ecological risk screening. 2. To ensure that the baseline risk assessments will be prepared using data that provide sufficient spatial representation of the areas that could be used by hypothetical human and ecological receptors. 3. To describe the nature and extent of contamination in surface soils. 4. To determine whether concentrations of chemicals in surface soils of OU2 are statistically significantly different from concentrations of metals in soils from background areas. Planning Team: EPA, MDEQ, PRPs Schedule: Sampling to be conducted in the fourth quarter of 2017.	Additional data for metals, PCB congeners and Aroclors, and dioxins and furans in subsurface soils of OU2 are needed to address decision problems and estimation problems: 1. To complete the human health and ecological risk screening. 2. To ensure that the baseline risk assessments will be prepared using data that provide sufficient spatial representation of the areas that could be used by hypothetical human and ecological receptors. 3. To describe the nature and extent of contamination in subsurface soils. 4. To determine whether concentrations of chemicals in subsurface soils of OU2 are statistically significantly different from concentrations of metals in soils from background areas. Planning Team: EPA, MDEQ, PRPs Schedule: Sampling to be conducted in the fourth quarter of 2017.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU2	Subsurface Soil OU2
2. Identify the Goals of the Study **State how environmental data will be used in meeting the objectives and solving the problem, identify study questions, define alternative outcomes.**	The study resolves the problem identified in step 1 by satisfying data gaps identified by EPA for surface soils in OU2. The principal study questions to be addressed by the data are: 1. Do chemicals in surface soil exceed the screening levels selected by EPA for human and ecological receptors? 2. What is the magnitude of exposure of each receptor to each chemical present in at least one surface soil sample above relevant screening levels? 3. Do exposures of human and ecological receptors to chemicals of potential concern in surface soils of OU2 pose an unacceptable risk to these receptors? 4. What is the nature and extent of contamination in surface soils? 5. Is the concentration of each metal in surface soils of OU2 statistically significantly greater than the concentration in soils from background areas? Potential outcomes following evaluation of resulting data: identification of risk driving chemicals, or determination of no significant risk due to contamination in surface soils of OU2.	The study resolves the problem identified in step 1 by satisfying data gaps identified by EPA for subsurface soils in OU2. The principal study questions to be addressed by the data are: 1. Do chemicals in subsurface soil exceed the screening levels selected by EPA for human and ecological receptors? 2. What is the magnitude of exposure of a hypothetical construction worker and a burrowing mammal to each chemical present in at least one subsurface soil sample above screening levels for human receptors, and above soil screening levels for mammalian wildlife? 3. Do exposures of a hypothetical construction worker and a burrowing mammal to chemicals of potential concern in subsurface soils of OU2 pose an unacceptable risk to these receptors? 4. What is the nature and extent of contamination in subsurface soils? 5. Is the concentration of each metal in subsurface soils of OU2 statistically significantly greater than the concentration in soils from background areas? Potential outcomes following evaluation of resulting data: identification of chemicals that present unacceptable risk to hypothetical future construction workers and burrowing mammals, or determination of no significant risk to hypothetical future construction workers and burrowing mammal populations due to contamination in subsurface soils of OU2.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU2	Subsurface Soil OU2
3. Identify Information Inputs **Identify data and information needed to answer study questions.**	Data and information inputs needed to answer study questions: Results of the analysis of composite surface soil samples to be collected at locations shown in Figure 4. Surface soil samples will be analyzed for the 17 2,3,7,8-substituted dioxins and furans, PCB congeners and Aroclors, and metals (TAL metals and mercury) (target analytes). Results of surface soil sampling and chemical analysis performed by NewFields (in 2014 and 2015) and results of sampling and analysis of other exposure media performed from 2014 through 2017. EPA guidance for conducting human health risk assessments and ecological risk assessments. EPA's selected site-specific exposure factors for human and ecological receptors. EPA's hierarchy of toxicity factors for chemicals exceeding screening values. Peer reviewed or equivalent literature on the toxicity of chemicals that exceed screening values for ecological receptors. The human health and ecological screening values selected by EPA for the risk assessments for this site. Existing data regarding concentrations of metals in soils from background areas.	Data and information needed to answer study questions: Results of the analysis of subsurface soil samples to be collected at locations shown in Figure 5. Subsurface soil samples will be analyzed for the 17 2,3,7,8-substituted dioxins and furans, PCB congeners and Aroclors, and metals (TAL metals and mercury) (target analytes). In some cases, subsurface soil samples will only be analyzed for the 2,3,7,8-substituted dioxins and furans (see Figure 5). Results of subsurface soil sampling and chemical analysis performed by NewFields (in 2014 and 2015) and results of sampling and analysis of other exposure media performed from 2014 through 2017. EPA guidance for conducting human health risk assessments for construction workers and ecological risk assessments for burrowing mammals. EPA's selected site-specific exposure factors for human and ecological receptors. EPA's hierarchy of toxicity factors for chemicals exceeding screening values. Peer reviewed or equivalent literature on the toxicity of chemicals that exceed screening values for ecological receptors. The human health and ecological screening values selected by EPA for the risk assessments for this site. Existing data regarding concentrations of metals in soils from background areas.

<table>
<tr><th>Steps of the DQO Process (USEPA 2006)</th><th>Surface Soil OU2</th><th>Subsurface Soil OU2</th></tr>
<tr><td>Step 4. Define the Boundaries of the Study

Specify the target population and characteristics of interest, define spatial and temporal limits and the scale of inference.</td><td>Boundaries of the study:

Target population: OU2 surface soils in areas shown on Figure 4, and concentrations of target analytes in surface soils of those areas.

Spatial limits: OU2 perimeter. Soil depth of 0 to 6 inches.

Compositing: Composites will be prepared by subsampling within each area that is shaded on Figure 4 at 20 locations. Subsample locations will be evenly spaced in a grid within each cell.

Temporal limits: Sampling to be conducted in the fourth quarter of 2017.

Scale of inference: Risk screening is conducted using individual sample results.

Risk assessment for chemicals exceeding screening concentrations is conducted at spatial scales that vary according to the receptor being modeled, but reflect the assumed spatial extent of activities of a hypothetical individual of the modeled population for both human health and ecological risk assessment.

• Each 20-acre grid cell shown in Figure 4 is considered representative of the area within which a hypothetical future resident or commercial worker could be exposed, and the chemical concentrations reported for the composite will be used to estimate the exposure to each chemical contributed by soil.
• For each human and ecological receptor potentially exposed to chemicals in surface soils across larger areas, results for composite soil samples will be combined across receptor-specific areas to estimate exposure from soils.
• For some receptors (hypothetical resident, small mammal), a single sample may be used to represent the EPC for the baseline risk assessment.</td><td>Boundaries of the study:

Target population: OU2 subsurface soils in areas shown on Figure 5, and concentrations of target analytes in subsurface soils of those areas.

Spatial limits: OU2 perimeter. Soil depth of 24 to 30 inches. A single discrete sample will be collected from within the shaded areas shown on Figure 5.

Temporal limits: Sampling to be conducted in the fourth quarter of 2017.

Scale of inference: Risk screening is conducted using individual sample results.

Risk assessment for chemicals exceeding screening concentrations is conducted at spatial scales that vary according to the receptor being modeled, but grid sizes shown in Figure 5 reflect the minimum assumed spatial extent of activities of a hypothetical individual of the modeled population for both human health (construction worker) and ecological (burrowing mammal) risk assessment.

For some receptors (hypothetical construction worker, burrowing mammal), a single sample may be used to represent the EPC for the baseline risk assessment.</td></tr>
</table>

Steps of the DQO Process (USEPA 2006)	Surface Soil OU2	Subsurface Soil OU2
Step 5. Develop the Analytic Approach **Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.**	Parameter of interest: Baseline risk assessment: The parameter of interest is the EPC used in baseline exposure calculations to represent the amount of the chemical of potential concern derived from soil exposure. The EPC for soil is added to EPCs for other exposure media to calculate a cumulative dose to a hypothetical individual receptor from multiple media.	Parameter of interest: Baseline risk assessment: The parameter of interest is the EPC used in baseline exposure calculations to represent the amount of the chemical of potential concern derived from soil exposure. The EPC for soil is added to EPCs for other exposure media to calculate a cumulative dose to a hypothetical individual receptor from multiple media.
Step 6. Specify Performance or Acceptance Criteria **Specify probability limits for false rejection and false acceptance of decision errors.**	Probability limits do not apply to the proposed analytical approach for the risk assessment because calculation of EPCs is an estimation problem. Both human and ecological risk assessments will include discussion of qualitative uncertainty.	Probability limits do not apply to the proposed analytical approach for the risk assessment because calculation of EPCs is an estimation problem. Both human and ecological risk assessments will include discussion of qualitative uncertainty.
Develop performance criteria for new data being collected or acceptable criteria for existing data being considered for use.	Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015). Analytical detection limits will be at or below the soil screening values identified by EPA for this project (USEPA 2017a,b).	Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015). Analytical detection limits will be at or below the soil screening values identified by EPA for this project (USEPA 2017a, b).
Step 7. Develop the Plan for Obtaining Data **Select the resource-effective sampling and analysis plan that meets the performance criteria.**	Surface soil samples will be collected at locations shown in Figure 4 during the fourth quarter of 2017. Within each shaded cell in Figure 4, a composite surface soil sample representing a soil depth of 0 to 6 inches will be prepared by sampling at 20 locations within a grid cell, evenly spaced from one another, each at a depth of 0 to 6 inches. An equal volume of soil will be collected at each subsample location. The full volume of each subsample will be combined into a single composite in the field, as described in the standard operating procedure for the sampling and analysis plan. The homogenate of all 20 subsamples will be used to prepare aliquots for each of the required chemical analysis.	Subsurface soil samples will be collected at locations shown in Figure 5 during the fourth quarter of 2017. Within each shaded cell in Figure 5, a single subsurface soil sample representing a soil depth of 24 to 30 inches will be prepared by sampling at one location at the center of a grid cell and co-located with a surface subsample. Each subsurface sample will be collected at a depth of 24 to 30 inches.

Acronyms:

DQO = data quality objective

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

MDEQ = Montana Department of Environmental Quality

OU = operable unit

PCB = polychlorinated biphenyl

PRP = potentially responsible party

QAPP = quality assurance project plan

TAL = target analyte list

References

NewFields, 2015. Remedial Investigation Work Plan. Smurfit Stone/Frenchtown Mill. Missoula County, Montana. Prepared for M2Green Redevelopment, LLC; WestRock, International Paper Company. Prepared by NewFields. Missoula, MT. 85 pp.

USEPA, 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process. EPA QA/G-4. U.S. Environmental Protection Agency, Office of Environmental Information, Washington D.C. EPA/240/B-06/001.

USEPA, 2017a. Draft Memorandum: Strategy for Selecting Chemicals of Potential Concern (COPCs) for OU2, Smurfit Stone Frenchtown Mill, Missoula County, Montana. E-mail from Susan Griffin (EPA Region 8, Denver, CO), March 6, 2017.

USEPA, 2017b. Draft Screening Level Ecological Risk Assessment for Operable Units 2 & 3 of the Smurfit Stone Frenchtown Mill Site Located in Missoula County, Montana. E-mail from Brian Sanchez, (EPA Region 8, Denver, CO), July 28, 2017.

Table 5. Data quality objectives for supplemental soil sampling in Operable Unit 3 Uplands of the Former Frenchtown Mill site

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Uplands	Subsurface Soil OU3 Uplands
1. State the Problem **Define the problem that necessitates the study, identify planning team and schedule**	Additional data for metals and dioxins and furans in surface soils of OU3 Uplands are needed to address decision problems and estimation problems: 1. To complete the human health and ecological risk screening. 2. To ensure that the baseline risk assessments will be prepared using data that provide sufficient spatial representation of the areas that could be used by hypothetical human and ecological receptors. 3. To describe the nature and extent of contamination in surface soils. 4. To describe the average concentration of chemicals in surface soils occurring within the perimeter of five selected basins within the OU3 Uplands. 5. To determine whether concentrations of chemicals in surface soils of OU3 Uplands are statistically significantly different from concentrations of metals in soils from background areas. Planning Team: EPA, MDEQ, PRPs Schedule: Sampling to be conducted in the fourth quarter of 2017.	Additional data for metals, and dioxins and furans in subsurface soils of OU3 Uplands are needed to address decision problems and estimation problems: 1. To complete the human health and ecological risk screening. 2. To ensure that the baseline risk assessments will be prepared using data that provide sufficient spatial representation of the areas that could be used by hypothetical human and ecological receptors. 3. To describe the nature and extent of contamination in subsurface soils. 4. To determine whether concentrations of chemicals in subsurface soils of OU3 Uplands are statistically significantly different from concentrations of metals in soils from background areas. Planning Team: EPA, MDEQ, PRPs Schedule: Sampling to be conducted in the fourth quarter of 2017.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Uplands	Subsurface Soil OU3 Uplands
2. Identify the Goals of the Study **State how environmental data will be used in meeting the objectives and solving the problem, identify study questions, define alternative outcomes.**	The study resolves the problem identified in step 1 by satisfying data gaps identified by EPA for surface soils in OU3 Uplands. The principal study questions to be addressed by the data are: 1. Do chemicals in surface soil exceed the screening levels selected by EPA for human and ecological receptors? 2. What is the magnitude of exposure of each receptor to each chemical present in at least one surface soil sample above relevant screening levels? 3. Do exposures of human and ecological receptors to chemicals of potential concern in surface soils of OU3 Uplands pose an unacceptable risk to these receptors? 4. What is the nature and extent of contamination in surface soils? 5. What is the average concentration of target analytes within the perimeter of five selected basins within the OU3 Uplands? 6. Is the concentration of each metal in surface soils of OU3 Uplands statistically significantly greater than the concentration in soils from background areas? Outcomes following evaluation of resulting data: identification of risk driving chemicals, or determination of no significant risk due to contamination in surface soils of OU3 Uplands.	The study resolves the problem identified in step 1 by satisfying data gaps identified by EPA for subsurface soils in OU3 Uplands. The principal study questions to be addressed by the data are: 1. Do chemicals in subsurface soil exceed the screening levels selected by EPA for human and ecological receptors? 2. What is the magnitude of exposure of a hypothetical construction worker and a burrowing mammal to each chemical present in at least one subsurface soil sample above screening levels for human receptors, and above soil screening levels for mammalian wildlife? 3. Do exposures of a hypothetical construction worker and a burrowing mammal to chemicals of potential concern in subsurface soils of OU3 Uplands pose an unacceptable risk to these receptors? 4. What is the nature and extent of contamination in subsurface soils? 5. Is the concentration of each metal in subsurface soils of OU3 Uplands statistically significantly greater than the concentration in soils from background areas? Outcomes following evaluation of resulting data: identification of chemicals that present unacceptable risk to hypothetical future construction workers and burrowing mammals, or determination of no significant risk to hypothetical future construction workers and burrowing mammal populations due to contamination in subsurface soils of OU3 Uplands.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Uplands	Subsurface Soil OU3 Uplands
3. Identify Information Inputs **Identify data and information needed to answer study questions.**	Data and information inputs needed to answer study questions: Results of the analysis of composite surface soil samples to be collected at shaded grid locations shown in Figure 6, and in shaded basins shown in Figure 10: aeration basin (AB) II; settling pond 8 (P8); settling pond 8dc (P8dc); the south polishing pond (SPP), solid waste basin A (SWBA); Pond 3. Surface soil samples will be analyzed for the 17 2,3,7,8-substituted dioxins and furans and metals (TAL metals and mercury) (target analytes). Results of surface soil sampling and chemical analysis performed by NewFields (in 2014 and 2015) and results of sampling and analysis of other exposure media performed from 2014 through 2017. EPA guidance for conducting human health risk assessments and ecological risk assessments. EPA's selected site-specific exposure factors for human and ecological receptors. EPA's hierarchy of toxicity factors for chemicals exceeding screening values. Peer reviewed or equivalent literature on the toxicity of chemicals that exceed screening values for ecological receptors. The human health and ecological screening values selected by EPA for the risk assessments for this site. Existing data regarding concentrations of metals in soils from background areas.	Data and information needed to answer study questions: Results of the analysis of subsurface soil samples to be collected at locations shown in Figure 7. Subsurface soil samples will be analyzed for the 17 2,3,7,8-substituted dioxins and furans, and metals (TAL metals and mercury) (target analytes). In some cases, subsurface soil samples will only be analyzed for the 2,3,7,8-substituted dioxins and furans (see Figure 7). Results of subsurface soil sampling and chemical analysis performed by NewFields (in 2014 and 2015) and results of sampling and analysis of other exposure media performed from 2014 through 2017. EPA guidance for conducting human health risk assessments for construction workers and ecological risk assessments for burrowing mammals. EPA's selected site-specific exposure factors for human and ecological receptors. EPA's hierarchy of toxicity factors for chemicals exceeding screening values. Peer reviewed or equivalent literature on the toxicity of chemicals that exceed screening values for ecological receptors. The human health and ecological screening values selected by EPA for the risk assessments for this site. Existing data regarding concentrations of metals in soils from background areas.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Uplands	Subsurface Soil OU3 Uplands
Step 4. Define the Boundaries of the Study **Specify the target population and characteristics of interest, define spatial and temporal limits and the scale of inference.**	Boundaries of the study: Target population: OU3 Uplands surface soils in areas shown on Figure 6 and Figure 10, and concentrations of target analytes in surface soils of those areas. Spatial limits: OU3 Uplands perimeter. Soil depth of 0 to 6 inches. Compositing: Composites within grid cells will be prepared by subsampling within each area that is shaded on Figure 6 at 20 locations. Subsample locations will be evenly spaced in a grid within each cell. Composites within selected basins cells will be prepared by subsampling within each basin that is shaded on Figure 10 at 30 locations. Subsample locations will be evenly spaced in a grid within each basin. Temporal limits: Sampling to be conducted in the fourth quarter of 2017. Scale of inference: Risk screening is conducted using individual sample results, for composites within both grid cells and basins. Risk assessment for chemicals exceeding screening concentrations is conducted at spatial scales that vary according to the receptor being modeled, but reflect the assumed spatial extent of activities of a hypothetical individual of the modeled population for both human health and ecological risk assessment. • Each 20-acre grid cell shown in Figure 6 is considered representative of the area within which a hypothetical future resident or commercial worker could be exposed, and the chemical concentrations reported for the composite will be used to estimate the exposure to each chemical contributed by soil. • For each of the five selected basins shown in Figure 10, the composite is considered representative of the average concentration within the basin. The chemical concentrations reported for the basin-specific composite will be used to estimate the exposure to each chemical contributed by soil from that basin. • For each human and ecological receptor potentially exposed to chemicals in surface soils across larger areas (e.g., recreational visitor), results for composite soil samples will be combined across receptor-specific areas to estimate exposure from soils. • For some receptors (hypothetical resident, small mammal), a single sample may be used to represent the EPC for the baseline risk assessment	Boundaries of the study: Target population: OU3 Uplands subsurface soils in areas shown on Figure 7,and concentrations of target analytes in subsurface soils of those areas. Spatial limits: OU3 Uplands perimeter. Soil depth of 24 to 30 inches. A single discrete sample will be collected from within each shaded area shown on Figure 7. Temporal limits: Sampling to be conducted in the fourth quarter of 2017. Scale of inference: Risk screening is conducted using individual sample results. Risk assessment for chemicals exceeding screening concentrations is conducted at spatial scales that vary according to the receptor being modeled, but grid sizes shown in Figure 7 reflect the minimum assumed spatial extent of activities of a hypothetical individual of the modeled population for both human health (construction worker) and ecological (burrowing mammal) risk assessment. For some receptors (hypothetical construction worker, burrowing mammal), a single sample may be used to represent the EPC for the baseline risk assessment.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Uplands	Subsurface Soil OU3 Uplands
Step 5. Develop the Analytic Approach **Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.**	Parameter of interest: Baseline risk assessment: The parameter of interest is the EPC used in baseline exposure calculations to represent the amount of the chemical of potential concern derived from soil exposure. The EPC for soil is added to EPCs for other exposure media to calculate a cumulative dose to a hypothetical individual receptor from multiple media.	Parameter of interest: Baseline risk assessment: The parameter of interest is the EPC used in baseline exposure calculations to represent the amount of the chemical of potential concern derived from soil exposure. The EPC for soil is added to EPCs for other exposure media to calculate a cumulative dose to a hypothetical individual receptor from multiple media.
Step 6. Specify Performance or Acceptance Criteria **Specify probability limits for false rejection and false acceptance of decision errors.** **Develop performance criteria for new data being collected or acceptable criteria for existing data being considered for use.**	Probability limits do not apply to the proposed analytical approach for the risk assessment because calculation of EPCs is an estimation problem. Both human and ecological risk assessments will include discussion of qualitative uncertainty. Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015). Analytical detection limits will be at or below the soil screening values identified by EPA for this project (USEPA 2017a,b).	Probability limits do not apply to the proposed analytical approach for the risk assessment because calculation of EPCs is an estimation problem. Both human and ecological risk assessments will include discussion of qualitative uncertainty Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015). Analytical detection limits will be at or below the soil screening values identified by EPA for this project (USEPA 2017a,b).
Step 7. Develop the Plan for Obtaining Data **Select the resource-effective sampling and analysis plan that meets the performance criteria.**	Surface soil samples will be collected at locations shown in Figure 6 and Figure 10 during the fourth quarter of 2017. Within each shaded cell in Figure 6, a composite surface soil sample representing a soil depth of 0 to 6 inches will be prepared by sampling at 20 locations within a grid cell, evenly spaced from one another, each at a depth of 0 to 6 inches. Within each shaded basin in Figure 10, a composite surface soil sample representing a soil depth of 0 to 6 inches will be prepared by sampling at 20 locations within a grid cell, evenly spaced from one another, each at a depth of 0 to 6 inches. In both types of composites, an equal volume of soil will be collected at each subsample location. The full volume of each subsample will be combined into a single composite in the field, as described in the standard operating procedure for the sampling and analysis plan. The homogenate of all subsamples will be used to prepare aliquots for each of the required chemical analysis.	Subsurface soil samples will be collected at locations shown in Figure 7 during the fourth quarter of 2017. Within each shaded cell in Figure 7, a single subsurface soil sample representing a soil depth of 24 to 30 inches will be prepared by sampling at one location at the center of a grid cell and co-located with a surface subsample. Each subsurface sample will be collected at a depth of 24 to 30 inches.

Acronyms:

DQO = data quality objective

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

MDEQ = Montana Department of Environmental Quality

OU = operable unit

PCB = polychlorinated biphenyl

PRP = potentially responsible party

QAPP = quality assurance project plan

TAL = target analyte list

References

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USEPA, 2017b. Draft Screening Level Ecological Risk Assessment for Operable Units 2 & 3 of the Smurfit Stone Frenchtown Mill Site Located in Missoula County, Montana. E-mail from Brian Sanchez, (EPA Region 8, Denver, CO), July 28, 2017.

Table 6. Data quality objectives for supplemental soil sampling in Operable Unit 3 Floodplain of the Former Frenchtown Mill site

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Floodplain	Subsurface Soil OU3 Floodplain
1. State the Problem **Define the problem that necessitates the study, identify planning team and schedule**	Additional data for metals and dioxins and furans in surface soils of OU3 Floodplain are needed to address decision problems and estimation problems: 1. To complete the human health and ecological risk screening. 2. To ensure that the baseline risk assessments will be prepared using data that provide sufficient spatial representation of the areas that could be used by hypothetical human and ecological receptors. 3. To describe the nature and extent of contamination in surface soils. 4. To determine whether concentrations of chemicals in surface soils of OU3 Floodplain are statistically significantly different from concentrations of metals in soils from background areas. Planning Team: EPA, MDEQ, PRPs Schedule: Sampling to be conducted in the fourth quarter of 2017.	Additional data for metals and dioxins and furans in subsurface soils of OU3 Floodplain are needed to address decision problems and estimation problems: 1. To complete the ecological risk screening, and to ensure that the baseline ecological risk assessment for burrowing mammals will be prepared using data that provide sufficient spatial representation of the areas that could be used by burrowing mammals. 2. To describe the nature and extent of contamination in subsurface soils. 3. To determine whether concentrations of chemicals in subsurface soils of OU3 Floodplain are statistically significantly different from concentrations of metals in soils from background areas. Planning Team: EPA, MDEQ, PRPs Schedule: Sampling to be conducted in the fourth quarter of 2017.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Floodplain	Subsurface Soil OU3 Floodplain
2. Identify the Goals of the Study **State how environmental data will be used in meeting the objectives and solving the problem, identify study questions, define alternative outcomes.**	The study resolves the problem identified in step 1 by satisfying data gaps identified by EPA for surface soils in OU3 Floodplain. The principal study questions to be addressed by the data are: 1. Do chemicals in surface soil exceed the screening levels selected by EPA for human and ecological receptors? 2. What is the magnitude of exposure of each receptor to each chemical present in at least one surface soil sample above relevant screening levels? 3. Do exposures of human and ecological receptors to chemicals of potential concern in surface soils of OU3 Floodplain pose an unacceptable risk to these receptors? 4. What is the nature and extent of contamination in surface soils? 5. Is the concentration of each metal in surface soils of OU3 Floodplain statistically significantly greater than the concentration in soils from background areas? Outcomes following evaluation of resulting data: identification of risk driving chemicals, or determination of no significant risk due to contamination in surface soils of OU3 Floodplain.	The study resolves the problem identified in step 1 by satisfying data gaps identified by EPA for subsurface soils in OU3 Floodplain. The principal study questions to be addressed by the data are: 1. Do chemicals in subsurface soil exceed the screening levels selected by EPA for ecological receptors? 2. What is the magnitude of exposure of a burrowing mammal to each chemical present in at least one subsurface soil sample above soil screening levels for mammalian wildlife? 3. Do exposures of a burrowing mammal to chemicals of potential concern in subsurface soils of OU3 Floodplain pose an unacceptable risk to this receptor? 4. What is the nature and extent of contamination in subsurface soils? 5. Is the concentration of each metal in subsurface soils of OU3 Floodplain statistically significantly greater than the concentration in soils from background areas? Outcomes following evaluation of resulting data: identification of chemicals that present unacceptable risk to burrowing mammals, or determination of no significant risk to burrowing mammal populations due to contamination in subsurface soils of OU3 Floodplain.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Floodplain	Subsurface Soil OU3 Floodplain
3. Identify Information Inputs **Identify data and information needed to answer study questions.**	Data and information inputs needed to answer study questions: Results of the analysis of composite surface soil samples to be collected at locations shown in Figure 8. Surface soil samples will be analyzed for the 17 2,3,7,8-substituted dioxins and furans and metals (TAL metals and mercury) (target analytes). Results of surface soil sampling and chemical analysis performed by NewFields (in 2014 and 2015) and results of sampling and analysis of other exposure media performed from 2014 through 2017. EPA guidance for conducting human health risk assessments and ecological risk assessments. EPA's selected site-specific exposure factors for human and ecological receptors. EPA's hierarchy of toxicity factors for chemicals exceeding screening values. Peer reviewed or equivalent literature on the toxicity of chemicals that exceed screening values for ecological receptors. The ecological screening values selected by EPA for the risk assessments for this site. Existing data regarding concentrations of metals in soils from background areas.	Data and information needed to answer study questions: Results of the analysis of subsurface soil samples to be collected at locations shown in Figure 9. Subsurface soil samples will be analyzed for the 17 2,3,7,8-substituted dioxins and furans and metals (TAL metals and mercury) (target analytes). In some cases, subsurface soil samples will only be analyzed for the 2,3,7,8-substituted dioxins and furans (see Figure 9). Results of subsurface soil sampling and chemical analysis performed by NewFields (in 2014 and 2015) and results of sampling and analysis of other exposure media performed from 2014 through 2017. EPA guidance for conducting ecological risk assessments for burrowing mammals. EPA's selected site-specific exposure factors for ecological receptors. Peer reviewed or equivalent literature on the toxicity of chemicals that exceed screening values for ecological receptors. The ecological screening values selected by EPA for the risk assessment for this site. Existing data regarding concentrations of metals in soils from background areas.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Floodplain	Subsurface Soil OU3 Floodplain
Step 4. Define the Boundaries of the Study **Specify the target population and characteristics of interest, define spatial and temporal limits and the scale of inference.**	Boundaries of the study: Target population: OU3 Floodplain surface soils in areas shown on Figure 8, and concentrations of target analytes in surface soils of those areas. Spatial limits: OU3 Floodplain perimeter. Soil depth of 0 to 6 inches. Compositing: Composites will be prepared by subsampling within each area that is shaded on Figure 8 at 20 locations. Subsample locations will be evenly spaced in a grid within each cell. Temporal limits: Sampling to be conducted in the fourth quarter of 2017. Scale of inference: Risk screening is conducted using individual sample results. Risk assessment for chemicals exceeding screening concentrations is conducted at spatial scales that vary according to the receptor being modeled, but reflect the assumed spatial extent of activities of a hypothetical individual of the modeled population for both human health and ecological risk assessment. • Each 100-acre grid cell shown in Figure 8 is considered representative of the area within which a hypothetical current and future recreational visitor could be exposed, and the chemical concentrations reported for the composite will be used to estimate the exposure to each chemical contributed by soil. • For each human and ecological receptor potentially exposed to chemicals in surface soils across larger areas, results for composite soil samples will be combined across receptor-specific area to estimate exposure from soils. • For some receptors (hypothetical recreational visitor, small mammal), a single sample may be used to represent the EPC for the baseline risk assessment.	Boundaries of the study: Target population: OU3 Floodplain subsurface soils in areas shown on Figure 9, and concentrations of target analytes in subsurface soils of those areas. Spatial limits: OU3 Floodplain perimeter. Soil depth of 24 to 30 inches. A single discrete sample will be collected from within the shaded areas shown on Figure 9. Temporal limits: Sampling to be conducted in the fourth quarter of 2017. Scale of inference: Risk screening is conducted using individual sample results. Risk assessment for chemicals exceeding screening concentrations is conducted at spatial scales that vary according to the receptor being modeled, but grid sizes shown in Figure 9 reflect the minimum assumed spatial extent of activities of an individual of the modeled population for ecological (burrowing mammal) risk assessment. For a burrowing mammal, a single sample may be used to represent the EPC for the baseline risk assessment.

Steps of the DQO Process (USEPA 2006)	Surface Soil OU3 Floodplain	Subsurface Soil OU3 Floodplain
Step 5. Develop the Analytic Approach **Define the parameter of interest, specify the type of inference, and develop the logic for drawing conclusions from findings.**	Parameter of interest: Baseline risk assessment: The parameter of interest is the EPC used in baseline exposure calculations to represent the amount of the chemical of potential concern derived from soil exposure. The EPC for soil is added to EPCs for other exposure media to calculate a cumulative dose to a hypothetical individual receptor from multiple media.	Parameter of interest: Baseline risk assessment: The parameter of interest is the EPC used in baseline exposure calculations to represent the amount of the chemical of potential concern derived from soil exposure. The EPC for soil is added to EPCs for other exposure media to calculate a cumulative dose to a hypothetical individual receptor from multiple media.
Step 6. Specify Performance or Acceptance Criteria **Specify probability limits for false rejection and false acceptance of decision errors.** **Develop performance criteria for new data being collected or acceptable criteria for existing data being considered for use.**	Probability limits do not apply to the proposed analytical approach for the risk assessment because calculation of EPCs is an estimation problem. Both human and ecological risk assessments will include discussion of qualitative uncertainty. Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015). Analytical detection limits will be at or below the soil screening values identified by EPA for this project (USEPA 2017a, b).	Probability limits do not apply to the proposed analytical approach for the risk assessment because calculation of EPCs is an estimation problem. Performance criteria for all chemical data are as established in the approved QAPP (NewFields 2015). Analytical detection limits will be at or below the ecological soil screening values identified by EPA for this project (USEPA 2017a, b).
Step 7. Develop the Plan for Obtaining Data **Select the resource-effective sampling and analysis plan that meets the performance criteria.**	Surface soil samples will be collected at locations shown in Figure 8 during the fourth quarter of 2017. Within each shaded cell in Figure 8, a composite surface soil sample representing a soil depth of 0 to 6 inches will be prepared by sampling at 20 locations within a grid cell, evenly spaced from one another, each at a depth of 0 to 6 inches. An equal volume of soil will be collected at each subsample location. The full volume of each subsample will be combined into a single composite in the field, as described in the standard operating procedure for the sampling and analysis plan. The homogenate of all 20 subsamples will be used to prepare aliquots for each of the required chemical analysis.	Subsurface soil samples will be collected at locations shown in Figure 9 during the fourth quarter of 2017. Within each shaded cell in Figure 9, a single subsurface soil sample representing a soil depth of 24 to 30 inches will be prepared by sampling at one location at the center of a grid cell and co-located with a surface subsample.

Acronyms:

DQO = data quality objective

EPA = U.S. Environmental Protection Agency

EPC = exposure point concentration

MDEQ = Montana Department of Environmental Quality

OU = operable unit

PCB = polychlorinated biphenyl

PRP = potentially responsible party

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TABLE 7
Soil Analytes, Methods, Reporting Limits and Screening Levels
Former Frenchtown Mill Site, Missoula County, Montana

Analytical Method(s)	Target Analyte	CAS	CRQL		Lab Reporting Limit	Method Detection Limit	Units	Regional Soil Screening Levels[a]							Montana	Ecological SSLs [b]		
			SOM01.2[f]	SOM02.2[f]				Leach to GW Risk Based		Leach to GW MCL Based	Residential Direct Contact		Industrial Direct Contact		Background[c,d,e] or Action Level[f]	Lower Boundary	Receptor	Upper Boundary
Dioxins / Furans																		
EPA 8290 High Resolution	2,3,7,8-TCDD	1746-01-6	1	1	0.5	0.0315	ng/kg	0.059	c*	15	4.8	c**	22	c**	---	0.119	1	---
	1,2,3,7,8-PeCDD	40321-76-4	5	5	2.5	0.0468	ng/kg	---		---	---		---		---	---		---
	1,2,3,6,7,8-HxCDD	57653-85-7	5	5	2.5	0.049	ng/kg	---		---	---		---		---	---		---
	1,2,3,4,7,8-HxCDD	39227-28-6	5	5	2.5	0.0503	ng/kg	---		---	---		---		---	---		---
	1,2,3,7,8,9-HxCDD	19408-74-3	5	5	2.5	0.0488	ng/kg	---		---	---		---		---	---		---
	1,2,3,4,6,7,8-HpCDD	35822-46-9	5	5	2.5	0.0541	ng/kg	---		---	---		---		---	---		---
	OCDD	3268-87-9	10	10	5	0.0888	ng/kg	---		---	---		---		---	---		---
	2,3,7,8-TCDF	51207-31-9	1	1	0.5	0.0243	ng/kg	---		---	---		---		---	---		---
	1,2,3,7,8-PeCDF	57117-41-6	5	5	2.5	0.0285	ng/kg	---		---	---		---		---	---		---
	2,3,4,7,8-PeCDF	57117-31-4	5	5	2.5	0.0298	ng/kg	---		---	---		---		---	---		---
	1,2,3,6,7,8-HxCDF	57117-44-9	5	5	2.5	0.0253	ng/kg	---		---	---		---		---	---		---
	1,2,3,7,8,9-HxCDF	72918-21-9	5	5	2.5	0.0367	ng/kg	---		---	---		---		---	---		---
	1,2,3,4,7,8-HxCDF	70648-26-9	5	5	2.5	0.0255	ng/kg	---		---	---		---		---	---		---
	2,3,4,6,7,8-HxCDF	60851-34-5	5	5	2.5	0.0279	ng/kg	---		---	---		---		---	---		---
	1,2,3,4,6,7,8-HpCDF	67562-39-4	5	5	2.5	0.0321	ng/kg	---		---	---		---		---	---		---
	1,2,3,4,7,8,9-HpCDF	55673-89-7	5	5	2.5	0.0396	ng/kg	---		---	---		---		---	---		---
	OCDF	39001-02-0	10	10	5	0.0843	ng/kg	---		---	---		---		---	---		---
WHO 2005 TEF	TEQ	--	--	---	--		ng/kg	0.059	c*	15	4.8	c**	22	c**	3.7[d], 12.1[e]			
Target Analyte List Metals																		
EPA 6020 (ICP-MS) and EPA 6010 (ICP-AES)	Aluminum	7429-90-5	--	--	10	1.65	mg/kg	3000	n	--	7700	n	110000	n	25,941	50	p	--
	Antimony	7440-36-0	6	1	0.5	0.09		0.035	n	0.27	3.1	n	47	n	--	0.27	m, s	78.000
	Arsenic	7440-38-2	0.5	0.5	0.5	0.06	mg/kg	0.0015	c*	0.29	0.68	c**R	3	c*R	22.5[c]	18.0	p,m	46.0
	Barium	7440-39-3	5	5	0.3	0.04	mg/kg	16	n	82	1500	n	22000	n	429	330	i,m	2,000
	Beryllium	7440-41-7	0.5	0.5	0.2	0.04		1.9	n	3.2	16	n	230	n	---	10	p,s	40
	Cadmium	7440-43-9	0.5	0.5	0.08	0.01	mg/kg	0.069	n	0.38	7.1	n	98	n	0.700	0.360	m,i	140
	Chromium	7440-47-3	1	1	0.5	0.19	mg/kg	--		180000	--		--		41.7	26.0	a,m	130
	Cobalt	7440-48-4	0.5	0.5	0.5	0.08	mg/kg	0.027	n	--	2.3	n	35	n	10.0	13.0	p,m	230
	Copper	7440-50-8	1	1	1	0.29	mg/kg	2.8	n	46	310	n	4700	n	165	28.0	a,i	80.0
	Iron	7439-89-6	--	--	50	8.20	mg/kg	35	n	--	5500	n	82000	n	24,400	--	--	--
	Lead	7439-92-1	0.5	0.5	0.1	0.02	mg/kg	--	L	14	400		800	L	29.8	11.0	a,i	1,700
	Manganese	7439-96-5	0.5	0.5	0.5	0.11	mg/kg	2.8	n	--	180	n	2600	n	880	220	p,a	4,300
	Nickel	7440-02-0	0.5	0.5	0.5	0.09	mg/kg	2.6	n	--	150	n	2200	n	31.4	38.0	p,i	280
	Selenium	7782-49-2	3.5	2.5	0.5	0.08		0.052	n	0.26	39	n	580	n	0.7	0.5	p, s	70
	Silver	7440-22-4	0.5	0.5	0.5	0.01	mg/kg	0.08	n	--	39	n	580	n	0.300	4.20	a,p	560
	Thallium	7440-28-0	2.5	0.5	0.1	0.02		0.0014	n	0.14	0.078	n	1.2	n	---	1.00	9.000	--
	Vanadium	7440-62-2	2.5	2.5	1	0.15	mg/kg	8.6	n	--	39	n	580	n	52.6	7.80	a,m	280
	Zinc	7440-66-6	1	1	5	0.66	mg/kg	37	n	--	2300	n	35000	n	118	46.0	a,p	160
EPA 7470/7471 (CVAA)	Mercury	7439-97-6	0.1	0.1	0.02	0.01	mg/kg	0.0033	n	0.1	1.1	n	4	ns	0.068	0.100	i,p	0.300

TABLE 7
Soil Analytes, Methods, Reporting Limits and Screening Levels
Former Frenchtown Mill Site, Missoula County, Montana

Analytical Method(s)	Target Analyte	CAS	CRQL		Lab Reporting Limit	Method Detection Limit	Units	Regional Soil Screening Levels[a]							Montana	Ecological SSLs [b]		
			SOM01.2[f]	SOM02.2[f]				Leach to GW Risk Based		Leach to GW MCL Based	Residential Direct Contact		Industrial Direct Contact		Background[c,d,e] or Action Level[f]	Lower Boundary	Receptor	Upper Boundary
Polychlorinated Biphenyls (PCBs)																		
Aroclors by EPA SW-846 Method 8082A	Aroclor-1016	12674-11-2	0.033	0.033	0.033	0.0147	mg/kg	0.013	n	0.29	0.41	n	5.1	n	---	---	---	---
	Aroclor-1221	11104-28-2	0.033	0.033	0.033	0.013	mg/kg	0.00008	c	0.29	0.2	c	0.83	c	---	---	---	---
	Aroclor-1232	11141-16-5	0.033	0.033	0.033	0.016	mg/kg	0.00008	c	0.29	0.17	c	0.72	c	---	---	---	---
	Aroclor-1242	53469-21-9	0.033	0.033	0.033	0.01	mg/kg	0.0012	c	0.29	0.23	c	0.95	c	---	---	---	---
	Aroclor-1248	12672-29-6	0.033	0.033	0.033	0.00859	mg/kg	0.0012	c	0.29	0.23	c	0.95	c	---	---	---	---
	Aroclor-1254	11097-69-1	0.033	0.033	0.033	0.00892	mg/kg	0.002	c**	0.29	0.12	n	0.97	c**	---	0.000	m,p	40.000
	Aroclor-1260	11096-82-5	0.033	0.033	0.033	0.0073	mg/kg	0.0055	c	0.29	0.24	c	0.99	c	---	---	---	---
	Aroclor-1262	37324-23-5	0.033	0.033	0.033	0.00474	mg/kg	---			---	---	---	---	---	---	---	---
	Aroclor-1268	11100-14-4	0.033	0.033	0.033	0.00844	mg/kg	---			---	---	---	---	---	---	---	---
WHO Congeners by EPA 1668B	PCB-77	32598-13-3	2	2	2	0.184	ng/kg	0.00094	c**	0.29	0.038	c**	0.16	c**	---	---	---	---
	PCB-81	70362-50-4	2	2	2	0.168	ng/kg	0.000062	c*	0.29	0.012	c**	0.048	c**	---	---	---	---
	PCB-105	32598-14-4	2	2	2	0.234	ng/kg	0.001	c*	0.29	0.12	c**	0.49	c**	---	---	---	---
	PCB-114	74472-37-0	2	2	2	0.265	ng/kg	0.001	c*	0.29	0.12	c**	0.5	c**	---	---	---	---
	PCB-118	31508-00-6	2	2	2	0.251	ng/kg	0.001	c*	0.29	0.12	c**	0.49	c**	---	---	---	---
	PCB-123	65510-44-3	2	2	2	0.22	ng/kg	0.001	c*	0.29	0.12	c**	0.49	c**	---	---	---	---
	PCB-126	57465-28-8	2	2	2	0.283	ng/kg	0.0000003	c*	0.29	0.000036	c**	0.00015	c**	---	---	---	---
	PCB-156	38380-08-4	2	2	2	0.217	ng/kg	0.0017	c*	0.29	0.12	c**	0.5	c**	---	---	---	---
	PCB-157	69782-90-7	2	2	2	0.211	ng/kg	0.0017	c*	0.29	0.12	c**	0.5	c**	---	---	---	---
	PCB-167	52663-72-6	2	2	2	0.214	ng/kg	0.0017	c*	0.29	0.12	c**	0.51	c**	---	---	---	---
	PCB-169	32774-16-6	2	2	2	0.223	ng/kg	0.0000017	c*	0.29	0.00012	c**	0.00051	c**	---	---	---	---
	PCB-189	39635-31-9	2	2	2	0.186	ng/kg	0.0028	c*	0.29	0.13	c**	0.52	c**	---	---	---	---

TABLE 7
Soil Analytes, Methods, Reporting Limits and Screening Levels
Former Frenchtown Mill Site, Missoula County, Montana

Analytical Method(s)	Target Analyte	CAS	CRQL		Lab Reporting Limit	Method Detection Limit	Units	Regional Soil Screening Levels[a]				Montana	Ecological SSLs [b]		
			SOM01.2[f]	SOM02.2[f]				Leach to GW Risk Based	Leach to GW MCL Based	Residential Direct Contact	Industrial Direct Contact	Background[c,d,e] or Action Level[f]	Lower Boundary	Receptor	Upper Boundary

Notes:

[a] - Regional Screening Levels for Chemical Contaminants at Superfund Sites (June 2017, TR=1E-6, THQ=0.1) (EPA 2017); where two values are shown for leaching to groundwater, the first is risk-based, the second is MCL-based.

[b] - Ecological SSLs - Draft Screening Level Ecological Risk Assessment for OU2 and 3 (EPA, 2017)

[c] - Background Concentrations of Inorganic Constituents in Montana Surface Soils (2016)

[d] - Montana Dioxin Background Investigation Report (MDEQ 2011) Calculated UTL for Missoula County Surface Soils

[e] - Montana Dioxin Background Investigation Report (MDEQ 2011) Calculated UTL for the State of Montana Surface Soils

[f] Contract Laboratory Program (CLP) methods are DLM01.2 and DLM02.1

--- - not available or not applicable
CAS - Chemical Abstracts Service
CRQL - Contract Required Quantitation Limits
CVAA - Cold Vapor Atomic Absorption
EPA - United State Environmental Protection Agency
GW - groundwater
ICP-AES - Inductively Coupled Plasma Atomic Emission Spectrum
ICP-MS - Inductively Coupled Plasma Mass Spectrum
Ma - Massachusetts
MCL - Maximum Contaminant Level
mg/kg - milligrams per kilogram
MT - Montana
ng/kg - nanograms per kilogram
RBSL - Risk Based Screening Levels
SL - screening level
SSL - sediment screening level
TEF - Toxic Equivalency Factor
TEQ - Toxic Equivalency Quotient
UTL - Upper Tolerance Limit
WHO - World Health Organization

- indicates reporting limit exceed a standard

EPA Screening Level (SL) Abbreviations - http://www.epa.gov/region9/superfund/prg/

n - noncancer
L - refer to EPA user guidance on lead
m - concentration may exceed ceiling limit (i.e.: >10% by weight), see EPA SL guidance.
c - carcinogen
* - where n SL < 100 times the c SL
** - where n SL <10 times the c SL
R - Relative Bioavailability Factor (RBA) applied (see EPA SL guidance for Arsenic)
s - concentration may exceed soil saturation limits (Csat) (see EPA SL guidance)

Ecological Soil Screening Level (SSL) Abbreviations

m - mammals
i - invertebrates
p - plants
1 - Based on EPA Region 5 ESL for 2,3,7,8-Tetrachlorodibenzodioxin

TABLE 8
PROPOSED SOIL SAMPLES AND LABORATORY ANALYSIS
Former Frenchtown Mill, Missoula County, Montana

Sample ID	Location		Type		Analysis				
	Target Area	OU	Comp or Grab?	SS or SB?	Dioxins	Metals	PSA	TOC	PCBs
OU2 - Surface Soil		**(see locations on Figure 4)**							
Grid 1-SSComp-01	Grid 1	OU2	Comp	SS	x	x	x	x	x
Grid 2-SSComp-01	Grid 2	OU2	Comp	SS	x	x	x	x	x
Grids 4&7-SSComp-01	Grids 4&7	OU2	Comp	SS	x	x	x	x	x
Grid 8-SSComp-01	Grid 8	OU2	Comp	SS	x	x	x	x	x
Grid 9-SSComp-01	Grid 9	OU2	Comp	SS	x	x	x	x	x
Grid 13-SSComp-01	Grid 13	OU2	Comp	SS	x	x	x	x	x
Grid 14-SSComp-01	Grid 14	OU2	Comp	SS	x	x	x	x	x
Grid 22-SSComp-01	Grid 22	OU2	Comp	SS	x	x	x	x	x
Grid 23-SSComp-01	Grid 23	OU2	Comp	SS	x	x	x	x	x
Total NM OU2 - Surface Soil					9	9	9	9	9
OU2 - Subsurface Soil		**(see locations on Figure 5)**							
Grids 4&7-SB-(24-30 in)	Grids 4&7	OU2	Grab	SB	x	x	x	x	x
Grid 6-SB-(24-30 in)	Grid 6	OU2	Grab	SB	x	x	x	x	x
Grid 8-SB-(24-30 in)	Grid 8	OU2	Grab	SB	x	x	x	x	x
Grid 11-SB-(24-30 in)	Grid 11	OU2	Grab	SB	x	x	x	x	x
Grid 13-SB-(24-30 in)	Grid 13	OU2	Grab	SB	x	x	x	x	x
Grid 14-SB-(24-30 in)	Grid 14	OU2	Grab	SB	x	x	x	x	x
Grid 15-SB-(24-30 in)	Grid 15	OU2	Grab	SB	x	x	x	x	x
Grid 18-SB-(24-30 in)	Grid 18	OU2	Grab	SB	x	x	x	x	x
Grid 19-SB-(24-30 in)	Grid 19	OU2	Grab	SB	x	x	x	x	x
Grid 23-SB-(24-30 in)	Grid 23	OU2	Grab	SB	x	x	x	x	x
Total NM OU2 - Subsurface Soil					10	10	10	10	10
OU3 Uplands - Surface Soil		**(see locations on Figure 6)**							
Grid 27-SSComp-01	Grid 27	OU3	Comp	SS	x	x	x	x	---
Grid 28-SSComp-01	Grid 28	OU3	Comp	SS	x	x	x	x	---
Grid 29-SSComp-01	Grid 29	OU3	Comp	SS	x	x	x	x	---
Grid 30-SSComp-01	Grid 30	OU3	Comp	SS	x	x	x	x	---
Grid 33-SSComp-01	Grid 33	OU3	Comp	SS	x	x	x	x	---
Grid 34-SSComp-01	Grid 34	OU3	Comp	SS	x	x	x	x	---
Grid 37-SSComp-01	Grid 37	OU3	Comp	SS	x	x	x	x	---
Grid 39-SSComp-01	Grid 39	OU3	Comp	SS	x	x	x	x	---
Grid 43-SSComp-01	Grid 43	OU3	Comp	SS	x	x	x	x	---
Grid 44-SSComp-01	Grid 44	OU3	Comp	SS	x	x	x	x	---
Grid 47-SSComp-01	Grid 47	OU3	Comp	SS	x	x	x	x	---
Grid 53-SSComp-01	Grid 53	OU3	Comp	SS	x	x	x	x	---
Grid 60-SSComp-01	Grid 60	OU3	Comp	SS	x	x	x	x	---
Grid 61-SSComp-01	Grid 61	OU3	Comp	SS	x	x	x	x	---
Grid 64-SSComp-01	Grid 64	OU3	Comp	SS	x	x	x	x	---
Grid 74-SSComp-01	Grid 74	OU3	Comp	SS	x	x	x	x	---
Grids 75, 78-SSComp-01	Grids 75, 78	OU3	Comp	SS	x	x	x	x	---
Grids 76, 77, 79, 80-SSComp-01	Grids 76, 77, 79, 80	OU3	Comp	SS	x	x	x	x	---
Total NM OU3 Uplands - Surface Soil					18	18	18	18	0

TABLE 8
PROPOSED SOIL SAMPLES AND LABORATORY ANALYSIS
Former Frenchtown Mill, Missoula County, Montana

Sample ID	Location		Type		Analysis				
	Target Area	OU	Comp or Grab?	SS or SB?	Dioxins	Metals	PSA	TOC	PCBs
OU3 Uplands - Subsurface Soil	**(see locations on Figure 7)**								
Grid 26-SB-(24-30 in)	Grid 26	OU3	Grab	SB	x	x	x	x	---
Grid 29-SB-(24-30 in)	Grid 29	OU3	Grab	SB	x	x	x	x	---
Grid 33-SB-(24-30 in)	Grid 33	OU3	Grab	SB	x	x	x	x	---
Grid 38-SB-(24-30 in)	Grid 38	OU3	Grab	SB	x	x	x	x	---
Grid 45-SB-(24-30 in)	Grid 45	OU3	Grab	SB	x	x	x	x	---
Grid 53-SB-(24-30 in)	Grid 53	OU3	Grab	SB	x	x	x	x	---
Grids 75, 78-SB-(24-30 in)	Grids 75, 78	OU3	Grab	SB	x	x	x	x	---
Grids 76, 77, 79, 80-SB-(24-30 in)	Grids 76, 77, 79, 80	OU3	Grab	SB	x	x	x	x	---
Total NM OU3 Uplands - Subsurface Soil					8	8	8	8	0
OU3 Floodplain - Surface Soil	**(see locations on Figure 8)**								
Grid 81-SSComp-01	Grid 81	OU3	Comp	SS	x	x	x	x	---
Grid 82-SSComp-01	Grid 82	OU3	Comp	SS	x	x	x	x	---
Grid 84-SSComp-01	Grid 84	OU3	Comp	SS	x	x	x	x	---
Grid 89-SSComp-01	Grid 89	OU3	Comp	SS	x	x	x	x	---
Grid 94-SSComp-01	Grid 94	OU3	Comp	SS	x	x	x	x	---
Total NM OU3 Floodplain - Surface Soil					5	5	5	5	0
OU3 Floodplain - Subsurface Soil	**(see locations on Figure 9)**								
Grid 81-SB-(24-30 in)	Grid 81	OU3	Grab	SB	x	x	x	x	---
Grid 85-SB-(24-30 in)	Grid 85	OU3	Grab	SB	x	x	x	x	---
Grid 87-SB-(24-30 in)	Grid 87	OU3	Grab	SB	x	x	x	x	---
Grid 89-SB-(24-30 in)	Grid 89	OU3	Grab	SB	x	x	x	x	---
Grid 94-SB-(24-30 in)	Grid 94	OU3	Grab	SB	x	x	x	x	---
Grid 98-SB-(24-30 in)	Grid 98	OU3	Grab	SB	x	x	x	x	---
Total NM OU3 Floodplain - Subsurface Soil					6	6	6	6	0
OU3 Basins - Surface Soil	**(see locations on Figure 9)**								
P8-SSComp-01	P8	OU3	Comp	SS	x	x	x	x	---
AB II-SSComp-01	AB II	OU3	Comp	SS	x	x	x	x	---
P8dc-SSComp-01	P8dc	OU3	Comp	SS	x	x	x	x	---
SPP-SSComp-01	SPP	OU3	Comp	SS	x	x	x	x	---
P3-SSComp-01	SPP	OU3	Comp	SS	x	x	x	x	---
SWBA-SSComp-01	SWBA	OU3	Comp	SS	x	x	x	x	---
Total NM OU3 Basins - Surface Soil					6	6	6	6	0
Total Number of Samples									
Natural					**62**	**62**	**62**	**62**	**19**
Equipment Rinse Blank (QC)					4	4	4	4	1
Duplicate (QC)					4	4	4	4	1
Matrix Spike (QC)					4	4	4	4	1
Total					**74**	**74**	**74**	**74**	**22**

Notes:

x - sample will be analyzed for the respective analyte gro
--- - not sampled or not applicable
bgs - below ground surface
Blank - equipment rinse blank
Comp - multi-point composite sample
Dup - field duplicate (e.g., blind field replicate)
Grab - single point grab (discrete) sample
OU - operable unit
P - settling pond
PCBs - Polychlorinated Biphenyls (Aroclors by EPA Method 8082)
PSA - particle size analysis
QC - quality control sample (w - water, s - soil)
RB - rinse blank
SB - subsurface soil
SS - surface soil
TB - trip blank

[1] 20-point composite surface soil sample, 0 to 6 inches bgs from area of square grid unit within OU

[2] 30-point composite surface soil sample, 0 to 6 inches bgs from basin

[3] discrete subsurface soil sample, 24 to 30 inches bgs at center of square grid unit

TABLE 9
SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES BY ANALYTE
Former Frenchtown Mill, Missoula County, Montana

Parameter	Analytical Method & Analytes	Number of Containers	Container Type	Preservation	Holding Time	Laboratory
Dioxins / Furans	**EPA 8290A;** 17 Congeners PCDD/PCDF (Cl4-Cl8) 2005 WHO TEFs	1	4 ounce amber glass jar	Cool to <6^{o}C	Store at 6^{o}C or lower, in the dark. Extract within 30 days and analyze within 45 days of extraction. Analyze within 1 year if sample extracts stored in the dark at < -10^{o}C.	Frontier Analytical Laboratory, El Dorado Hills, CA
Polychlorinated Biphenyls (PCBs) - Total and WHO Congeners	**EPA 1668B;** Total PCBs and 12 WHO Congeners (PCBs 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, and 189) Note: All 209 PCB congeners will be reported in the Electronic Data Deliverable. Only Total PCBs and 12 WHO congeners will be reported in the pdf/printed laboratory report.	1	4 ounce amber glass jar	Cool to <6^{o}C	1 Year from sampling date. Store at 0-4^{o}C	
PCB Aroclors	**EPA 8082A;** Aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268	1	4-ounce amber glass jar	ol to within 0-6	Extract within 1 year of sample collection. Analyze within 40 days of extraction.	Pace Laboratories, Minneapolis, MN
Metals, Target Analyte List	**EPA 6020B;** Ag, Al, As, Ba, Be, Cd, Cr, Co, Cu, Fe, Pb, Mn, Ni, Sb, Se, Tl, V, Zn **7471B;** Hg **6010D;** Ca, Mg, Na, K	1	4-ounce HDPE or glass jar	Cool to <6^{o}C	6 months with the exception of mercury (28 days).	
Particle Size Analysis	**ASTM D422**	1	>500 grams gallon baggie	Cool to <6oC	6 months	
Total Organic Carbon	**EPA 9060;** TOC	1	4-ounce amber glass jar	Cool to <6^{o}C	14 days; 6 months if frozen (-18 ^{o}C)	

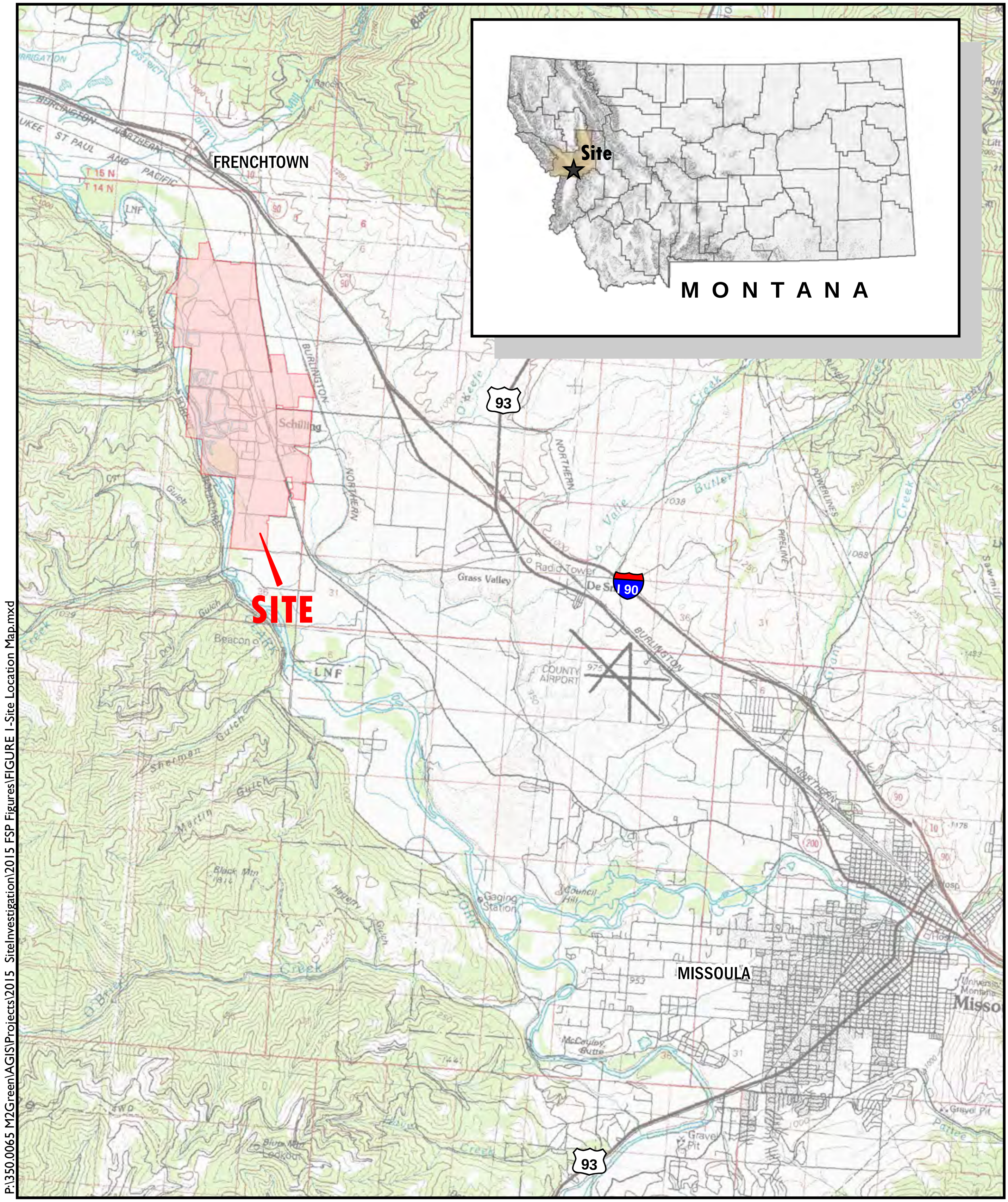
Notes:

^{o}C - degress celsius
HDPE - high density polyethylene
<, > - less than, greater than
TDS - total dissolved solids
PCDD - polychlorinated dibenzo-dioxin
PCDF - Polychlorinated dibenzo-furan
TOC - total organic carbon
WHO - world health organization
TEF - toxicity equivalence factor

Al - Aluminum
Sb - Antimony
As - Arsenic
Ba - Barium
Be - Beryllium
Cd - Cadmium
Ca - Calcium
Cr - Chromium
Co - Cobalt
Cu - Copper
Fe - Iron
Pb - Lead

Mg - Magnesium
Mn - Manganese
Ni - Nickel
K - Potassium
Se - Selenium
Ag - Silver
Na - Sodium
Tl - Thallium
V - Vanadium
Zn - Zinc
Hg - Mercury

FIGURES



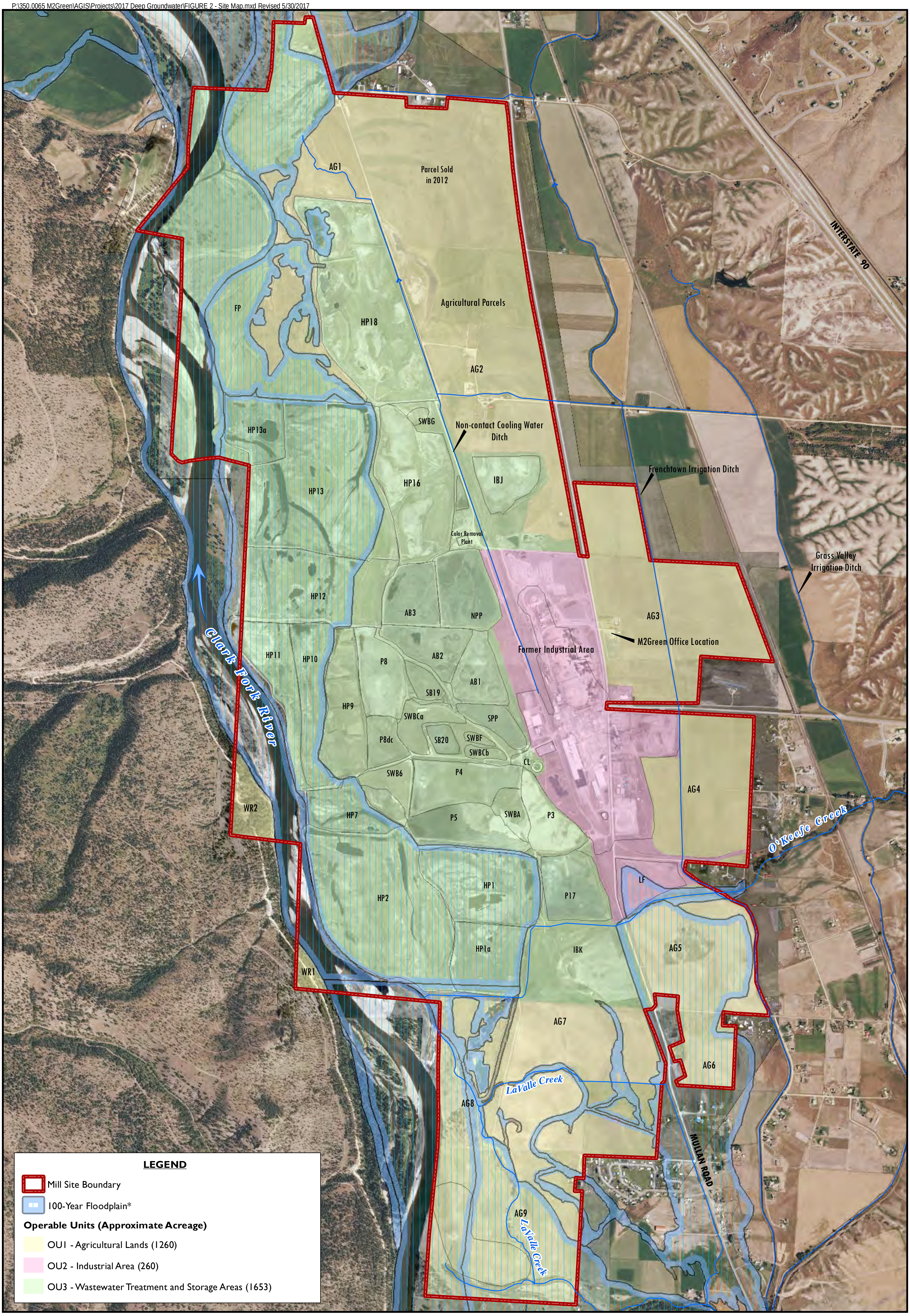
Source: Montana USGS 100K Topographic Map

0 Feet 10,000

NewFields

Site Location Map
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 1

P:\350.0065 M2Green\AGIS\Projects\2017 Deep Groundwater\FIGURE 2 - Site Map.mxd Revised 5/30/2017



Aerial Photo Source: NAIP 2011 and Newfields 2016 (Within Site Boundary)

*Floodplain Source:
As defined by the Federal Emergency Management Agency (FEMA) 2013 Digital Flood Insurance Rate Map (DFIRM). (NFIP 2013)

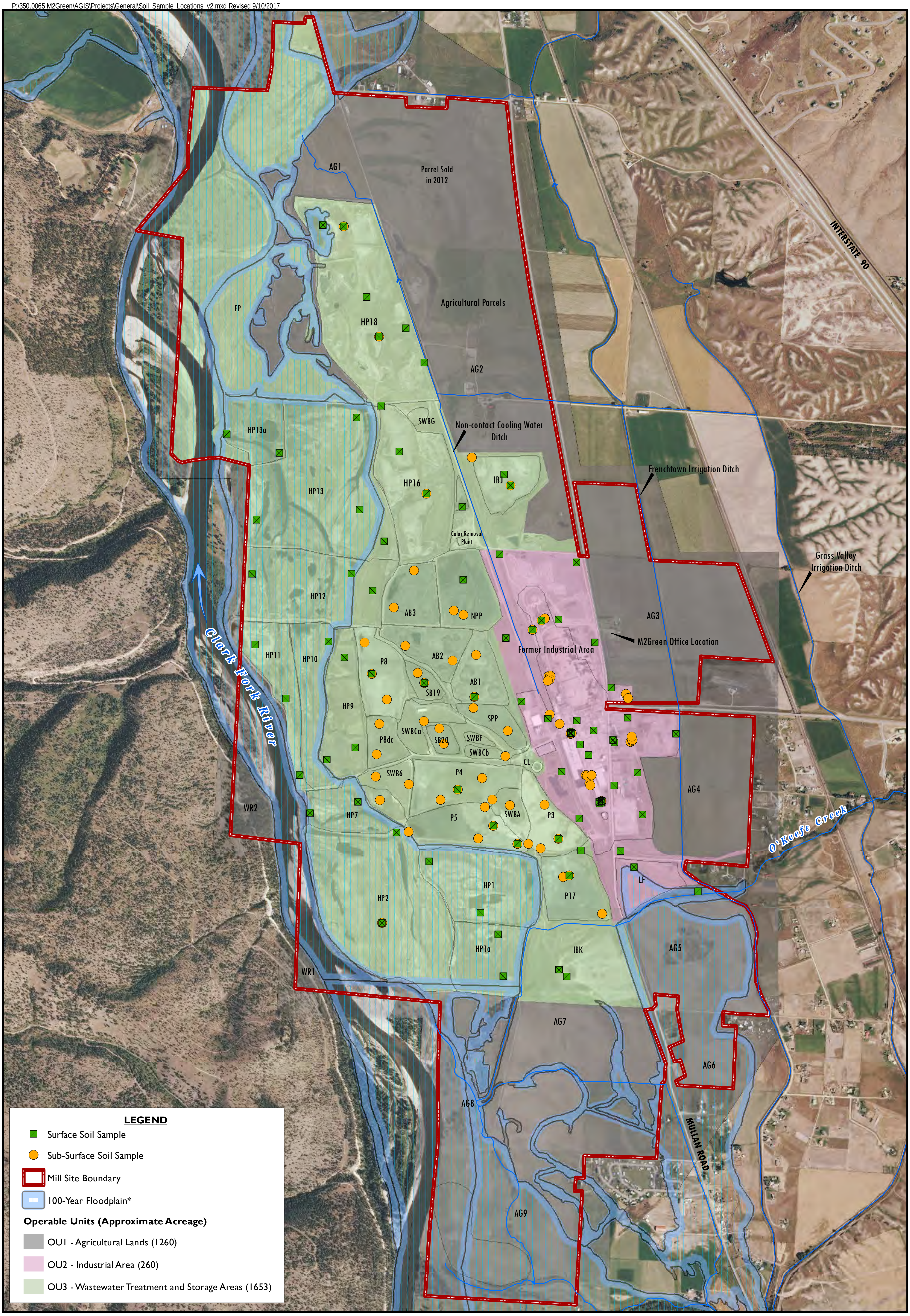
Notes

AG - Agricultural Land
AB - Aeration Stabilization Basin
CFR - Clark Fork River
CL - Clarifier
FP - Floodplain
HP - Holding or Storage Pond
IB - Rapid Infiltration Basin
NPP - North Polishing Pond
P - Settling Pond
SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin
WR - West of River

NewFields

Site Map
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 2

P:\350.0065 M2Green\AGIS\Projects\General\Soil_Sample_Locations_v2.mxd Revised 9/10/2017



LEGEND

- Surface Soil Sample
- Sub-Surface Soil Sample
- Mill Site Boundary
- 100-Year Floodplain*

Operable Units (Approximate Acreage)

- OU1 - Agricultural Lands (1260)
- OU2 - Industrial Area (260)
- OU3 - Wastewater Treatment and Storage Areas (1653)

Aerial Photo Source: NAIP 2011 and Newfields 2016 (Within Site Boundary)

0 Feet 1,500

*Floodplain Source:
As defined by the Federal Emergency Management Agency (FEMA) 2013 Digital Flood Insurance Rate Map (DFIRM). (NFIP 2013)

Notes

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AB - Aeration Stabilization Basin
CFR - Clark Fork River
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SB - Spoils Basin
SPP - South Polishing Pond
SWB - Solid Waste Basin
WR - West of River

NewFields

Locations of Surface and Subsurface Soil Samples Collected in 2014, 2015 and 2016
Former Frenchtown Mill Site
Missoula County, Montana
FIGURE 3

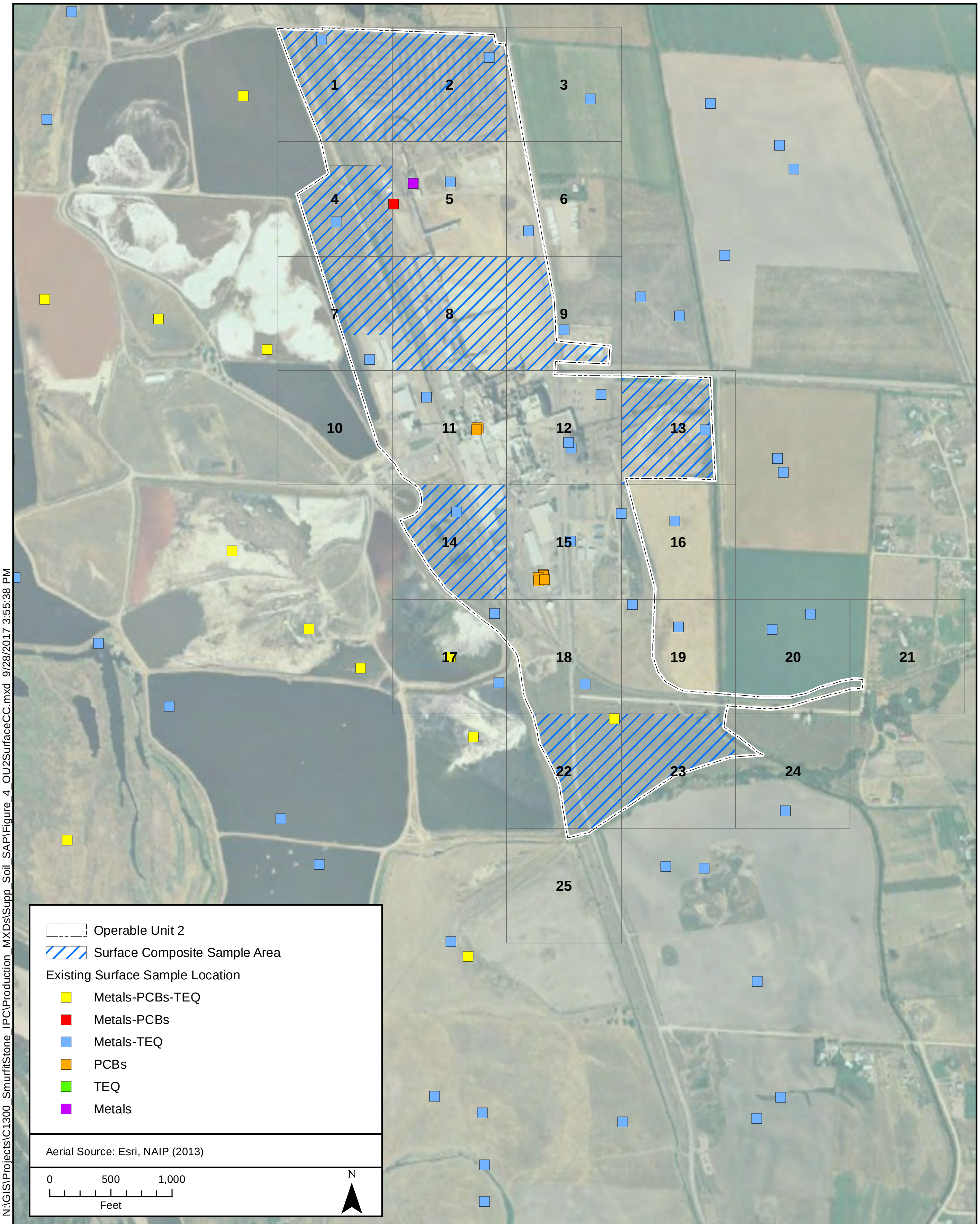

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Figure 4.
Locations of Existing and Supplemental Surface Soil Samples in OU2

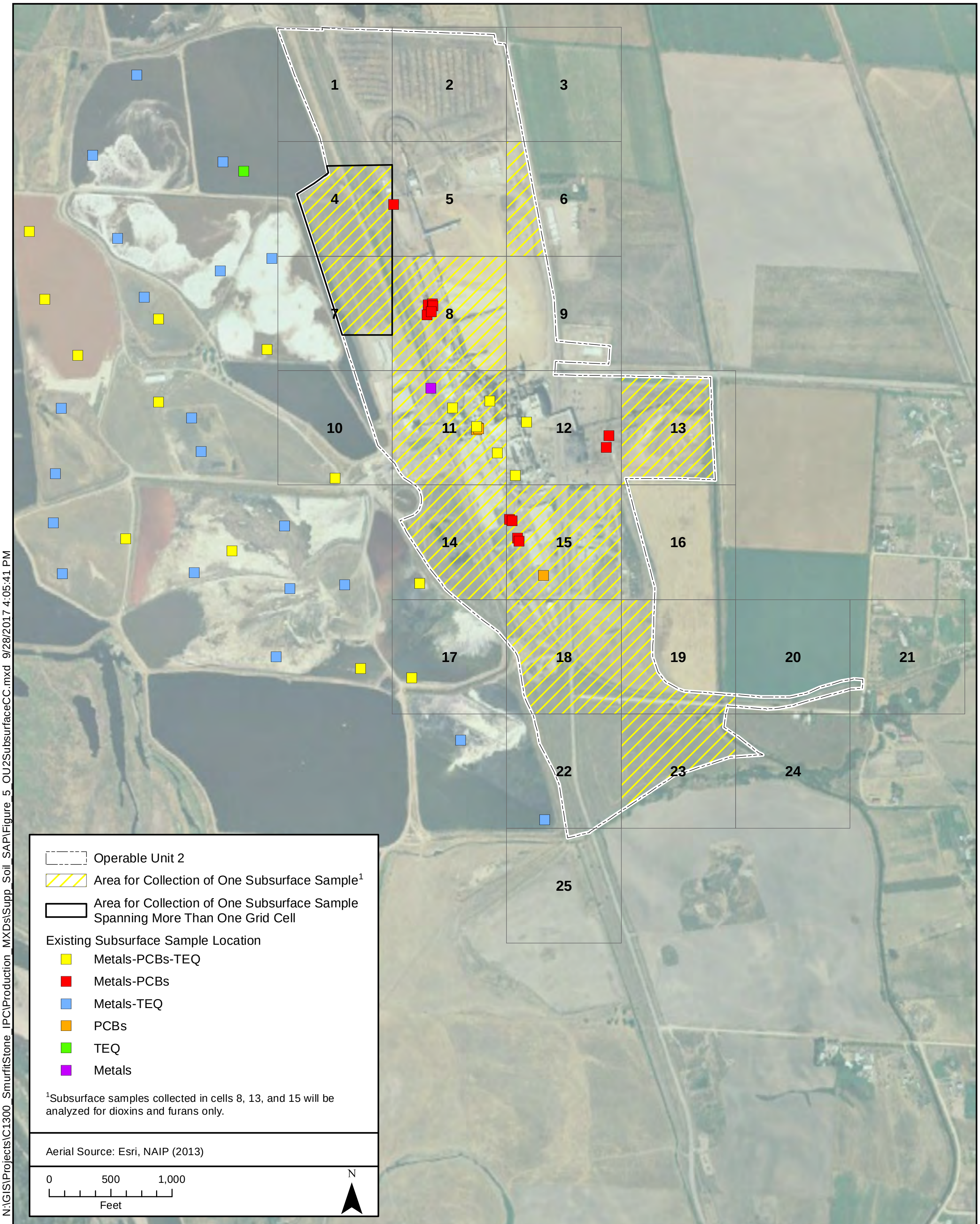

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Figure 5.
Locations of Existing and Supplemental Subsurface Soil Samples in OU2

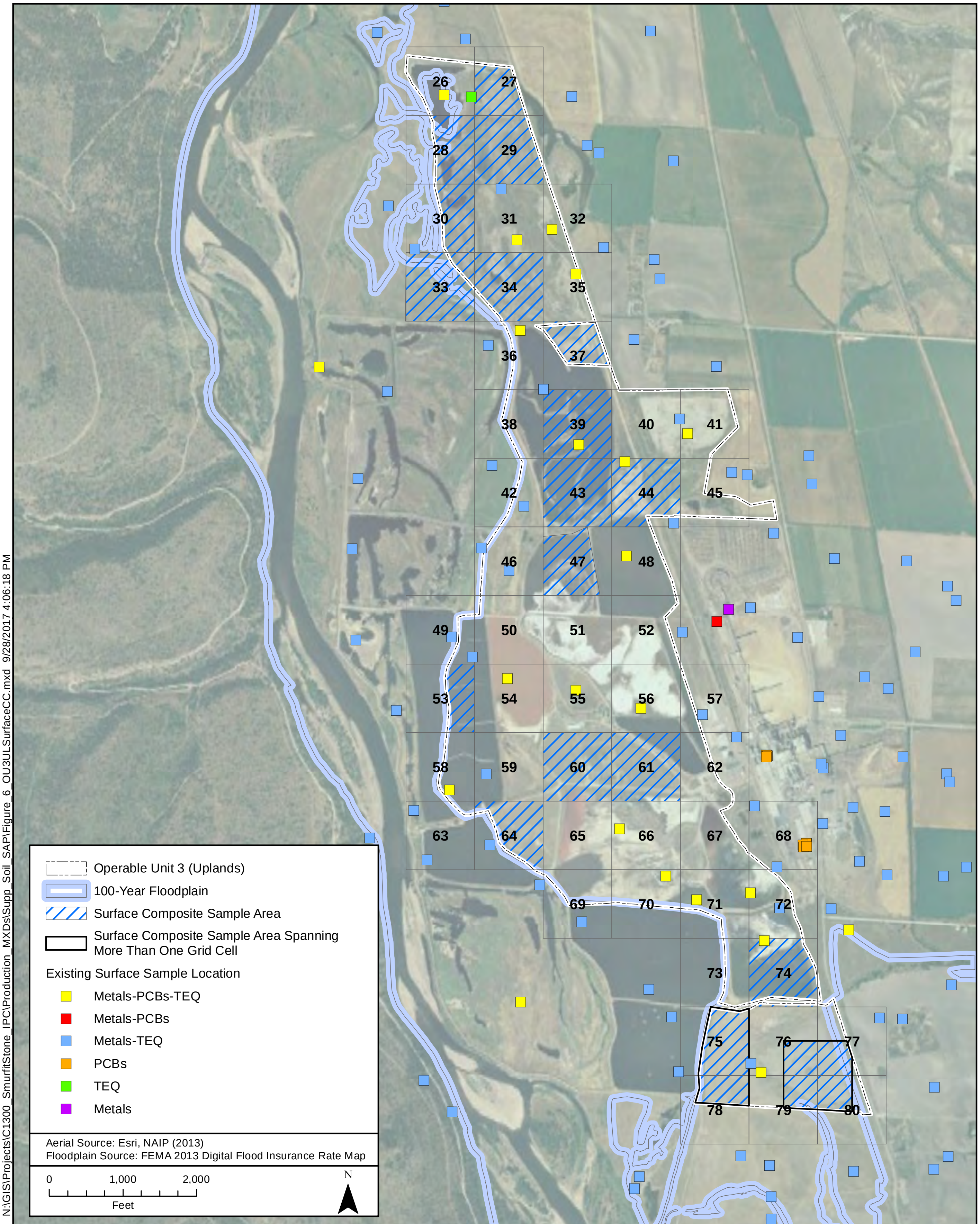

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Figure 6.
Locations of Existing and Supplemental Surface Soil Samples in OU3 Uplands

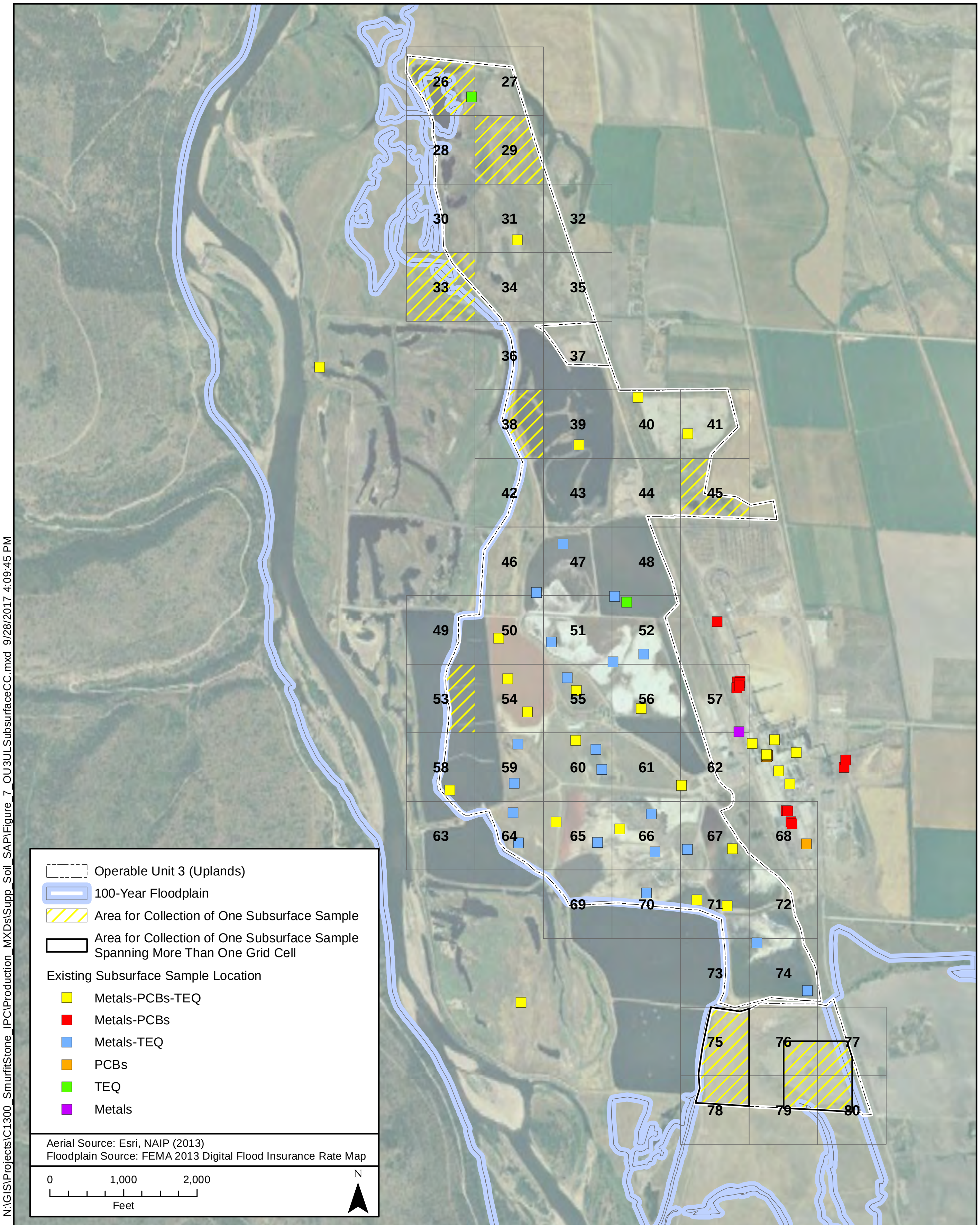

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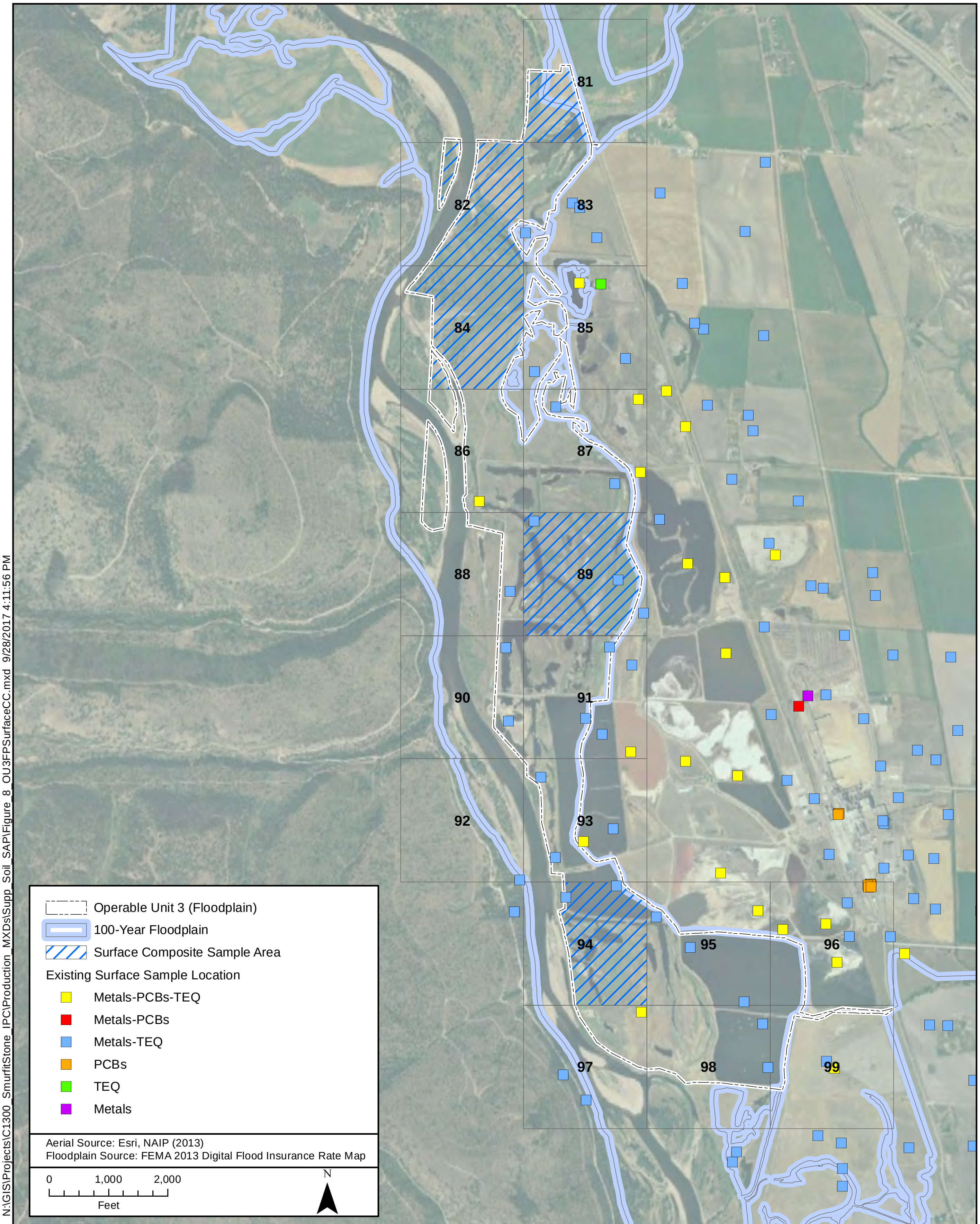
Figure 7.
Locations of Existing and Supplemental Subsurface Soil Samples in OU3 Uplands



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integral consulting inc. NewFields

Figure 8.
Locations of Existing and Supplemental Surface Soil Samples in OU3 Floodplain

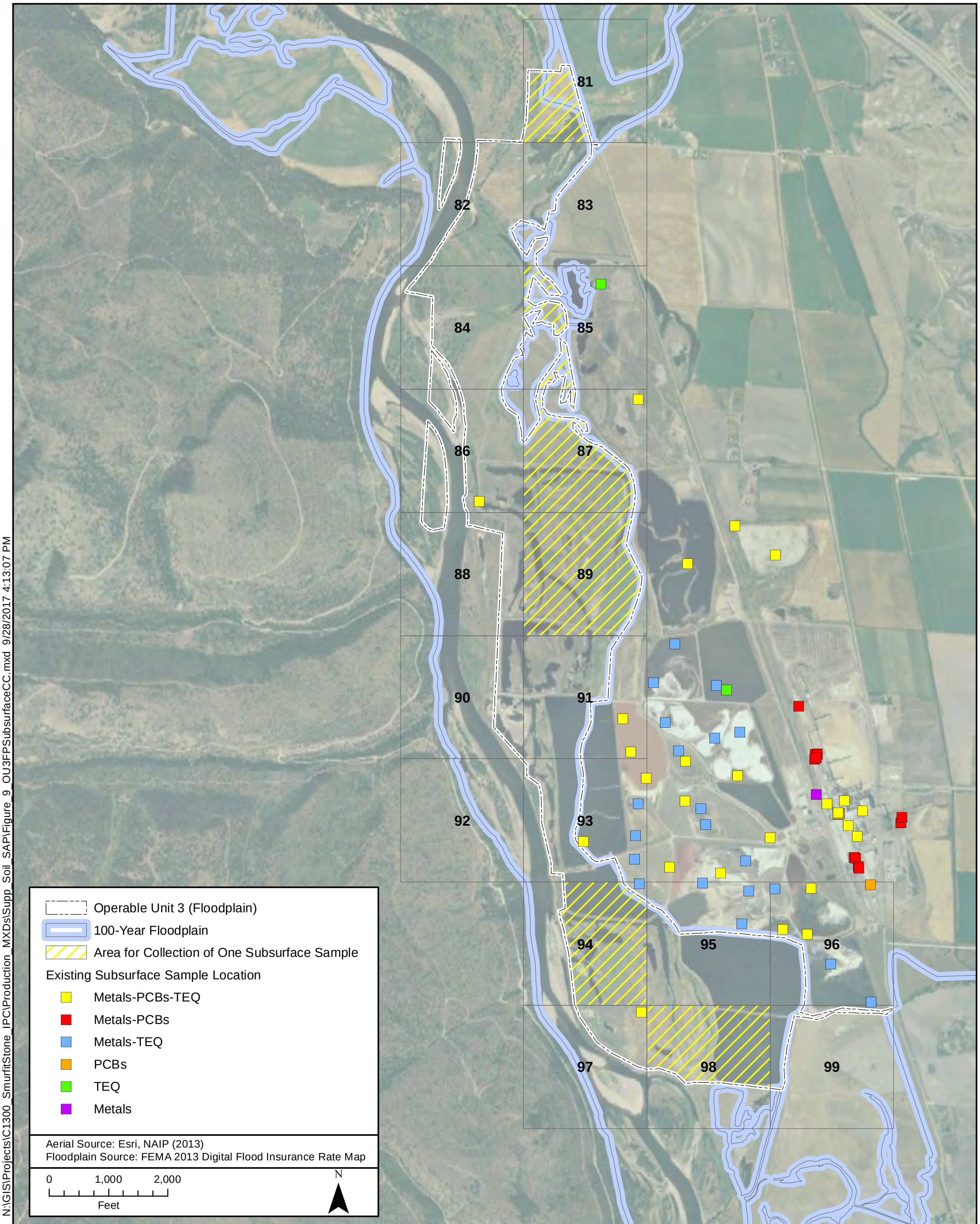

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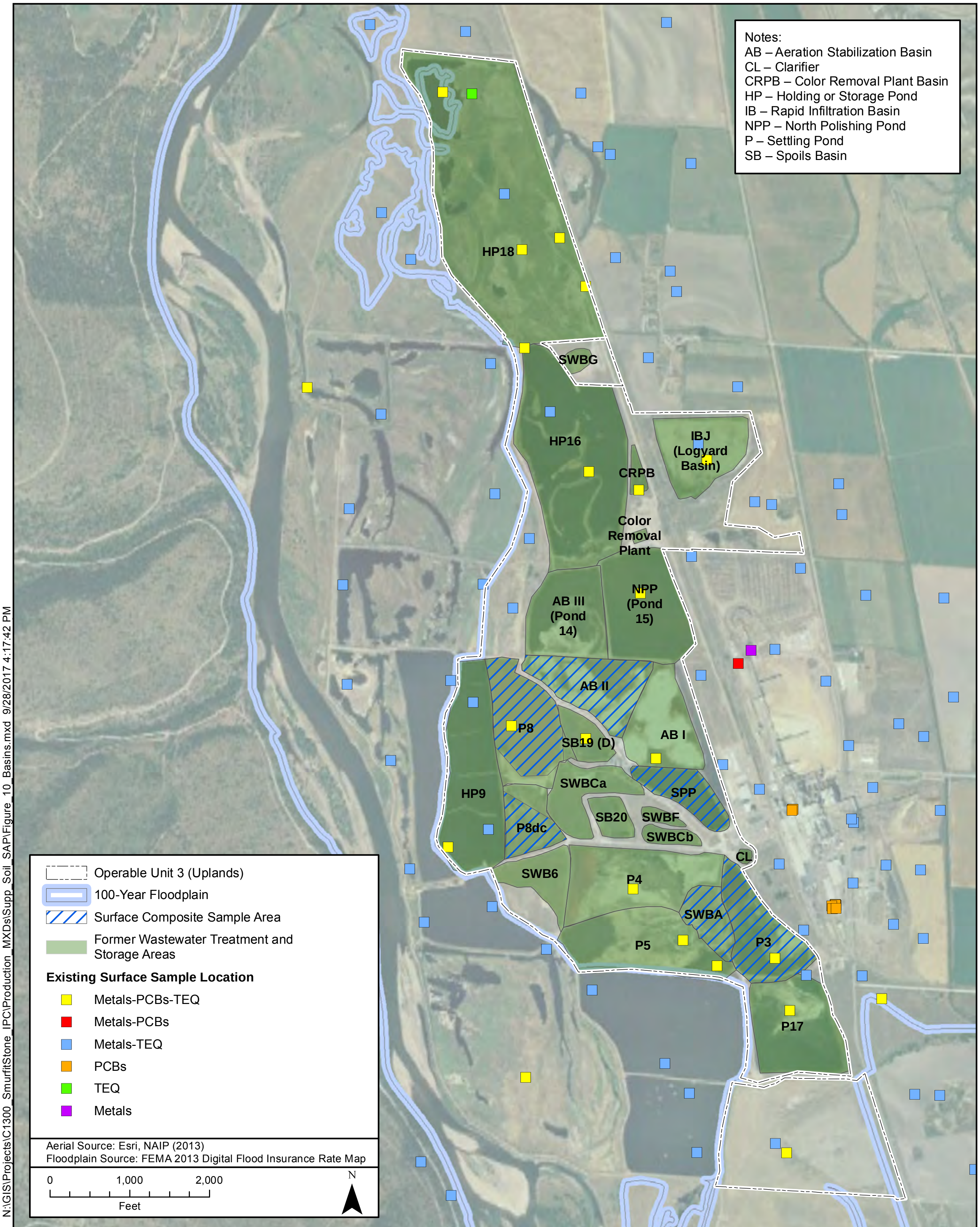
Figure 9.
Areas for Collection of Supplemental Subsurface Soils in OU3 Floodplain



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NewFields

Figure 10.
Areas for Collection of Supplemental Surface Soil Samples in Selected Basins of OU3 Uplands

APPENDIX A

STANDARD OPERATING PROCEDURES (SOPS)

STANDARD OPERATING PROCEDURES TABLE OF CONTENTS	
SOP	**TITLE**
1	Field Log Book and Field Sampling Forms
2	Equipment Decontamination
3	Sample Nomenclature, Documentation, and Chain-of-Custody Procedures
4	Sample Packaging and Shipping
13	Surface Soil Sampling
14	Subsurface Soil Sampling
21	Quality Control Sampling
22	Management of Investigative-Derived Waste

SOP-1

FIELD LOG BOOK AND FIELD SAMPLING FORMS

Pertinent field investigation and sampling information should be recorded on a daily field log book and appropriate sampling forms to provide a continual record of actions taken each day on the site. Each employee is responsible for completing a record of the day's activities in a log book and field forms of sufficient detail such that someone can reconstruct the field activities without relying on the memory of the field crew. Field Books will be bound, with consecutively numbered pages and all information must be recorded with permanent ink. If changes need to me made within the field book, a single strikethrough line will be used to mark out incorrect information. Initials of the employee making the corrections and the date of the correction must accompany the strikeout. At a minimum, daily entries on the field log book shall include, as appropriate:

- Project and client name
- Date, times and locations.
- Purpose of the field effort
- Names of field crew leader and team members present on the site, and other site visitors
- Description of site conditions and any unusual circumstances, including weather conditions
- Details of actual work performed, particularly any deviations from the field work plan or standard operating procedures
- Location of sample site, including map reference, if relevant
- Field observations including documentations of conditions and procedures used when collecting, handling or treating samples.
- Field measurements made (e.g., PID readings, pH, temperature) on appropriate forms.
- Date and time of initiation and cessation of work.

Purpose
To provide guidance on how to document activities completed in the field by NewFields employees

Goal and Objective
To provide a record of our project work and the decisions made in the field

Equipment Needs
Field Note Book
Field Sampling Forms
Permanent Writing Utensils
Camera

Specific details for each sample collected should be recorded using NewFields standardized field forms. These field forms contain blank queries to be filled in by field personnel. Items typically recorded on field sampling forms consist of the following:

- Sample name
- Time and date samples were collected
- Number and type (media; natural, duplicate, QA/QC) of samples collected
- Analysis requested
- Sample depth

- Sample preservative (if applicable) and volume
- Sampling method, particularly any deviations from standard operating procedures
- Additional field observations, including collection of field parameters
- Decontamination procedures (if applicable)
- Photo documentation; including a photo board in the photograph with details such as date, time and location or an accompanying photo log with descriptions, dates, and times.
- Signature of sampler

The field log book and field data sheet must be signed on a daily basis by the author of the entry. Upon completion of the field effort, the original field forms will be electronically scanned and both hard copies and electronic documents will be filed in their respective project file. Photocopies of the original field forms can be made and used as working documents.

SOP-2

EQUIPMENT DECONTAMINATION

Decontamination of field equipment is necessary to prevent cross contamination between sites to be investigated and sampling locations on a site. Decontamination should be performed on all non-dedicated and non-disposable sampling equipment that may contact potentially contaminated media.

The following should be done to decontaminate field sampling equipment:

- Set up a decontamination area, preferably upwind from your sampling area to reduce the potential for windborne contamination.
- Don disposal gloves while decontaminating equipment.
- Prior to initiating decontamination, visually inspect sampling equipment for evidence of contamination; use stiff brush to remove visible material.
- Once rough brushing is complete, decontaminate each piece of equipment following a sequential process of washing with Liquinox or an equivalent degreasing detergent; rinsing with distilled water; rinsing with 10% dilute nitric acid; and finally rinsing with distilled water three times. Best procedure is to set up wash tubs for each of the above processes.
- Rinse equipment with methanol instead of nitric acid if sampling for organic contamination.
- Decontaminated equipment that is used for sampling organics should be wrapped in aluminum foil or another inert material if not used immediately.

The following should be done for oversized equipment, such as drilling rigs and excavators:

- Determine whether rinsate generated during decontamination must be containerized. If so, establish a lined decontamination area and move equipment into this area prior to decontamination. If not, decontamination should be done far enough away from the area of sampling so that rinsate generated does not affect future anticipated samples as part of the investigation. The area should also allow for the infiltration of the rinsate into the soil.

Purpose

The purpose of this SOP is to describe general decontamination procedures for field equipment

Goal and Objective

To sufficiently clean field equipment to prevent cross contamination between sites and sample locations

Equipment Needs

5-gallon plastic tubs/buckets

Distilled water

10% Nitric Acid rinse (if metals are COC)

10% Methanol (if organic COC are present)

Hexane (if PCBs are COC)

Liquinox Soap

Hard Bristle Brush

Garbage Bags

Disposable Gloves

Paper Towels

55-gallon drums (optional depending on need to containerize wash water)

Steam cleaning equipment/water truck

- Decontaminate tracks, auger flights, wheels and excavator buckets using a high pressure washer, preferably using hot water.

All disposable items (e.g., paper towels, latex gloves) should be deposited into a garbage bag and disposed of as Class II common refuse, unless you are investigating a site known to contain hazardous wastes. Check with the project manager before initiating investigation to confirm proper handling of disposable items. Handling and disposal procedures for the rinse and wash water will depend on the likely presence and type of contaminant in the wash water. The project Field Sampling Plan should be reviewed to determine the process for handling wash water.

If equipment rinse blank samples are to be collected as part of quality control procedures, they should be collected from decontaminated sampling equipment in accordance with the project-specific Field Sampling and documented in accordance with SOP # 1.

A list of equipment for decontamination is provided above (text box). The amount of dissolved water and rinse solutions needed on site will depend on the number of samples to be collected and the sampling methods. For this reason, equipment needs should be evaluated prior to going in the field.

SOP-3

SAMPLE NOMENCLATURE, DOCUMENTATION, AND CHAIN-OF CUSTODY PROCEDURES

When completing sampling it is critical that the process used to label and transport samples to the laboratory for analysis is sufficient to demonstrate with confidence that the samples were collected from the location indicated, and that during transport to the lab no actions were taken to potentially alter the integrity of the samples. Without following strict sample labeling and chain-of-custody procedures, analytical data collected at a site has little to no value.

SAMPLE NOMENCLATURE

Samples should be labeled in such a way to allow a person unfamiliar with the site to understand where the samples were collected. Samples should be labeled sequentially as follows:

> General location designation - sampling method and site number – sample media type – sequential sample number and composite designation (if needed).

For example, the soil sample P3-TP1-SB-01, indicates the sample was collected in Pond 3 (P3), test pit number 1 (TP1), it was a sub-surface soil sample (SB), and it's the first sample collected (01). Discrete samples are assumed. If the sample is a composite (C), Additional designation should be added after the sequential sample number ie: P3-TP1-SB-01C.

Sediment samples are labeled similar to soils. CFR indicates the sample was collected along the Clark Fork River, these samples will be collected in either the Flood Fringe (FF) of the 100-year floodplain or subaqueous (SA) within the river channel and will be designated as sediment samples (SE). An example of the first location Flood Fringe sample in the CFR would be named CFR-FF1-SE-01. The first subaqueous sample would be named CFR-SA1-SE-01. Similarly, surface water samples would use the designation (SW) ie: (CFR-SA1-SW-01).

Purpose

To identify the specific requirements for labeling and documenting sample collection

Goal and Objective

To increase the confidence in sample locations and to submit samples to the laboratory without risk of integrity loss

Equipment Needs

Indelible ink pen

Chain-of-custody forms

Field Log Book

Field Sampling Form

Newly installed groundwater monitoring wells will be named by the field oversight person, and include NF for NewFields, followed by a designation of the well type (MW) for monitoring well, and a well number. An example groundwater sample name would be: NFMW1. If multiple groundwater samples were to be collected from NFMW1 then they should be named sequentially NFMW1-01, NFMW1-02…. .

Prior to initiating sampling, field personnel should familiarize themselves with the Field Sampling Plan and the nomenclature to be used for the site. The character prefixes in the table below are recommended for sample types.

SAMPLE DOCUMENTATION

In addition to the chain-of-custody forms discussed below, field person must keep a list of samples collected in the field in the field log book and on appropriate field sampling forms. This allows you to go back and verify sample locations and numbers should there be any confusion at a later time. Upon returning to the office, the field log book and forms should be kept in the project file and subsequent copies sent to the laboratory, or other designated parties, as needed.

Each person in the field is responsible for putting entries into the field log and sampling forms. Designating an individual from the sampling team for record keeping is fine, provided all field personnel come to an agreement as to who this will be, and the field crew leader is certain field personnel are familiar with the record keeping requirements. All entries on the log book and field sampling forms must be made in indelible ink.

Sampling Acronym	Label
EB	Equipment Blank
TB	Trip Blank
FB	Field Blank
MW	Monitoring Well
DW	Domestic Well
IW	Injection Well
OB	Observation Well
UST	Underground Storage Tank
VE	Vapor Extraction
AA	Ambient Air
SUMP	Sump (Water sample)
P	Pond
SPR	Spring
SE	Sediments
SW	Surface Water, Stream or River
SR	Surface Runoff
SA	Subaqueous
FF	Flood Fringe (Floodplain)
FW	Flood Way (Floodplain)
GR	Grab Sample
TP	Excavated Test Pit
BH	Borehole
SS	Surface Soil Sample
SB	Subsurface Soil Sample
GW	Groundwater Sample

CHAIN OF CUSTODY PROCEDURES

A chain-of-custody form must be generated for all samples collected in the field for laboratory analysis. Samples from more than one project should not be included on the same chain of custody; however, multiple samples from a specific project can be included on the same custody form.

Copies of the chain-of-custody form should be maintained in the project file. The sampler may use a NewFields' chain-of-custody form or a chain- of-custody form provided by the laboratory. Sample custody records must be maintained from the time of sample collection until the time of sample delivery to the analytical laboratory and should accompany the sample through analysis and final disposition. The information to be included on the chain-of-custody form will include, but is not limited to:

- Project number/site name
- Sampler's name and signature
- Date and time of sample collection
- Unique sample identification number or name
- Number of containers
- Sample media (e.g., soil, water, vapor, etc.)
- Sample preservative (if applicable)
- Requested analysis
- Comments or special instructions to the laboratory

Each sample must be assigned a unique sample identification number as described above. The information on the chain-of-custody form, including the sample identification number, must correspond to the information recorded by the sampler on the field forms and field log book and the label on the sample container.

A sample is considered under a person's control when it is in their possession. When custody of a sample is relinquished by the sampler, the sampler will sign and date the chain-of-custody form and note the time that custody was relinquished. The person receiving custody of the sample will also sign and date the form and note the time that the sample was accepted into custody. The goal is to provide a complete record of control of the samples. Should the chain be broken (signed by the relinquished but not receiver or vice versa), the integrity of the sample is lost and the resulting analytical data suspect. Samples must be shipped to the analytical laboratory following the procedures described in in SOP-4. If an overnight shipping service is used to transport the samples to the laboratory, custody of the samples must be relinquished to the shipping service. If possible, have the shipping service sign the chain-of-custody form prior to placing the chain of custody in the sample cooler. If this is not possible (i.e. form placed in the sealed cooler), a note should be included on the chain of custody that the shipping company has received the samples with the chain of custody inside the cooler.

SOP-4

SAMPLE PACKAGING AND SHIPPING

SAMPLE PACKAGING

Samples must be packaged to preclude breakage or damage to sample containers, and shipped under chain of custody, complying with shipper, U.S. EPA, and U.S. DOT regulations. When packaging samples:

- Chain of custody procedures must be strictly adhered to. This applies to sample collection, transportation, shipment and laboratory handling. The COC will provide documentation from collection to analysis.

- Use sample labels from the laboratory whenever possible. Place the sample label on the side of the sample container and use indelible ink when completing the label. Sample containers should be new and stored in an environment free from dust, dirt and fumes.
- Sample should never stand in the sun. After collection and preservation, place labeled sample bottles in a high quality cooler. Place the samples in an upright position inside the cooler and wrap the samples with cushioning material for protection during transport. The cooler should be able to withstand tough handling during shipment without sample breakage.
- Make sure the cooler has an adequate amount of "wet" or "blue" ice (inside sealed Ziploc bags) at all times containers or in them and make sure ice volume is sufficient and appropriate for the season in order to maintain a temperature of 4°C or less inside the cooler from the time the samples are placed in the cooler until they are received by the laboratory. When in doubt put in more ice. Ensure the cooler drain plug is taped shut.
- Fill out the appropriate chain-of-custody forms and place them in a Ziploc bag and tape it to the inside lid of the shipping container. If more than one cooler is used per chain of custody, put a photocopy in the other coolers and mark them as a copy. Commercial carriers are not required to sign the COC, but the tracking number and name of the carrier should be documented on the original cahin-of-custody.
- Close and thoroughly secure the cooler with packing tape.

Purpose

To ensure samples are properly packaged for shipment to the analytical laboratory

Goal and Objective

To have samples received by the analytical laboratory in good condition and within EPA temperature thresholds

Equipment Needs

Indelible ink pen

Chain-of-custody forms

Custody Seals

Sample Labels from Lab

Coolers and Ice

Field Sampling Form

Packing Tape

Bubble wrap/absorbent pads

- Place completed sample custody seals on the outside of the cooler such that the seals will be broken when the cooler is opened. Secure the custody seals on the cooler with clear strapping tape.
- Secure a shipping label with address, phone number, and return address on the outside of the cooler where it is clearly visible. Shipping samples should be coordinated and scheduled to prevent exceeding of hold times or temperature requirements of analytical tests. Check with the lab if there are questions regarding holding times. If Saturday delivery is necessary, confirm with the lab that they will be able to receive the sample delivery before it is shipped.

SHIPPING HAZARDOUS MATERIALS/WASTE

Transportation regulations for shipping of hazardous substances and dangerous goods are defined by the U.S. DOT in 49 CFR, Subchapter C, Part 171 (October 1, 1988); IATA and ICAO. These regulations are accepted by Federal Express and other ground and air carriers.

According to DOT regulations, environmental samples are classified as Other Regulated Substances (ORS). ORS are articles, samples, or materials that are suspected or known to contain contaminants and/or are capable of posing a risk to health, safety, or property when transported by ground or air. Samples, substances, or materials from sources other than material drums, leachate streams, or sludge, should be considered as ORS or environmental samples. Materials shipped under the classification of ORS must not meet any of the following definitions:

Class 1: Explosives; Class 2: Gases- compressed, liquefied, dissolved under pressure, or deeply refrigerated; Class 3 Flammable Liquids; Class 4: Substances susceptible to spontaneous combustion; Class 5: Oxidizing substances; Class 6: Poisonous (toxic and infectious); Class 7: Radioactive materials; Class 8: Corrosives.

If your samples might meet any of the above definitions, contact the project manager to obtain instructions on sample shipment.

SOP-13

SURFACE SOIL SAMPLING

This SOP describes the field equipment and sampling methods for sampling of surface soil. Be sure to review the project specific Field Sampling Plan (FSP) in addition to this SOP.

All sampling equipment must be decontaminated before arriving on site in accordance with SOP-2. All sampling equipment should be decontaminated between collection of samples.

Purpose

Provide guidelines for sampling of surface soil.

Goal and Objective

To employ a method of collecting surface soil samples representative of field conditions.

Equipment Needs

Stainless steel mixing bowl and sampling trowel

Sample Containers

Hand lens (10) power

pH and electrical conductivity meters for soil (if required)

Munsel color book (if required)

Latex or Nitrile gloves

Locating Flags

Coolers and Ice

GPS Unit

Field forms, field book COC

Camera/photo board

SURFACE SOIL SAMPLING

Commonly, there are two different methods of surface soil sampling completed on a site: Discreet or Grab Samples, and Composite Samples. The methods for each of these are described below.

For both methods, surface soil samples should be collected from the surface to a depth of six inches unless otherwise specified in the project specific FSP. The FSP will outline the appropriate sampling approach for collection of composite vs. discrete samples.

Soils should be described according to the procedures outlined in the United Soil Classification System (USCS; method ASTM D2487) or the Soil Conservation Service (SCS) classification system. Soil texture should be classified by either the USCS or the U.S. Department of Agriculture (USDA) classification. Descriptions shall be recorded in the field books.

Discrete or Grab Soil Samples

- Locate the site as directed in the appropriate FSP. If location is not staked, confirm location with GPS unit.
- Prep sample containers by labelling in accordance with naming conventions outlined in the FSP, and SOP-3.
- Wearing disposable latex or nitrile gloves collect a sample by scraping the 0-6 inch interval of soil with a decontaminated stainless steel spoon or trowel.
- Place the soil in a stainless steel bowl, unless testing of the soil for volatile organic compounds is required. If VOC analysis is required, place representative soil sample directing into sample container.
- If sample is place in a bowl (no VOC analysis), remove all coarse fragments greater than 0.5 inches from the bowl. Remove leaves, grass, and debris from sample.
-

- Transfer the soil sample directly from the bowl into a glass sample jar with Teflon cap (4 or 8 ounce, depending on number of analyses required) and store in a cooler at 4 degrees Celsius or less. Retain approximately 30 grams of the sample in a plastic bag for field measurement of pH or PID screening, if required.
- Push a marking flag into the ground at the sample location, which will allow for obtaining the coordinates of the sample location later with a GPS Unit, or take a coordinate reading using the GPS unit prior to moving to another sample location.
- Record information about the sample collection on the appropriate forms in accordance with SOP-1 . Document sample collection and location with photographs.

Composite Samples

Review the FSP to determine the location and spacing of sampling area grids for the collection of composite samples. When reviewing, determine the grid to be cordoned off in the field and the number of composite samples to be collected within the each grid. Follow the process below to collect the composite samples. **Composite soil samples should never be collected for analysis of volatile organic compounds.**

- Prior to collecting composite samples, mark off the sampling grid or detail as described in the FSP. This may include collection of a sub-set of samples within a grid, or subset of samples a set radial distance from a sampling point.
- If sampling within a grid, divide the grid into five to eight (as indicated in the FSP) smaller grids and collect a surface soil sample randomly from within the smaller grid. Sample from each smaller grid should be of equal volume and collected using a decontaminated trowel. Place each composite sample into a mixing bowl. If a sod or duff layer is present, this layer should be peeled back to the top of the mineral soil. Remove all coarse fragments greater than 0.5 inches from the bowl. Mix the composite samples in the mixing bowl and then a fill a laboratory supplied sample container with the mixed soil.
- Push a marking flag into the ground at each of the composite sample locations to allow for obtaining the coordinates of the sample location later with a GPS Unit, or take a coordinate reading using the GPS unit prior to moving to another composite sample location.
- Complete appropriate field sampling forms and the chain of custody in accordance with SOP-1 and SOP-3. Store all samples in a cooler with ice and ship samples in accordance with SOP-4.

SOP-14

SUBSURFACE SOIL SAMPLING

SUBSURFACE SOIL SAMPLING

Subsurface soil sampling is commonly completed using a hand auger, split spoon sampler and drill rig, direct push drilling equipment, or backhoe or excavator. Sampling procedures for each type of equipment is described below. Be sure to review the project specific Field Sampling Plan (FSP) in addition to this SOP. For any subsurface soil sampling event, locate the site to be sampled and ensure that drilling equipment can safely access the site. Minimize off road travel to prevent off site damage to surrounding vegetation. One call utility locate will be called and ticket number recorded prior to initiating any subsurface work below two feet.

Purpose

Provide guidelines for sampling of subsurface soil.

Goal and Objective

To employ a method of collecting subsurface soil samples representative of field conditions.

Equipment Needs

Will depend on sampling method

Stainless steel mixing bowl and sampling trowel

Hand lens (10) power

Munsel color book (if required)

Latex or Nitrile gloves

Locating Flags

GPS Unit

Sample containers

Coolers and Ice

Field forms and field book

Decontamination supplies

Hand Auger

- Arrive on-site equipped with a decontaminated stainless steel auger rod and hand auger. If you intend to collect samples from different intervals below grade, bring several sizes of stainless steel augers (e.g. 2-inch, 4-inch, 6-inch, etc.).
- Hand auger holes can be drilled as one size or in a telescoping manner if you wish to collect discreet samples at intervals below grade and prevent risk of cross contamination between intervals. If a single depth sample is required, advance the auger bucket to the top of the desired sampling interval depth and empty the contents of the auger and remove all cutting from borehole. Decontaminate the auger and advance it to the bottom of the hole and collect a sample. Place the sample in a stainless steel mixing bowl. Mix and place soil into appropriate sample containers.

  For the telescoping method, advance the largest auger first to the desired depth. Collect sample at that depth. Install temporary decontaminated PVC casing with a diameter slightly smaller than the borehole to keep the hole open and reduce possible cross-contamination between depth intervals. Using the next size smaller auger, auger down to the next desired depth and repeat collected of sample at the desired depth.
- Record lithology of soil encountered according to USCS classification system on a boring log.
- Fill out appropriate sample labels, field forms and chain-of-custody paperwork in accordance with SOP-1 and SOP-3.
- Place samples for lab analysis in a cooler with ice and ship according to SOP-4.

- Decontaminate all sampling equipment between sampling sites in accordance with SOP-2.

Split Spoon Sampling using a Hollow-Stem Auger Drill Rig

This SOP does not include procedures for operating drilling equipment. Equipment operation will be subcontracted to a qualified third party that is properly trained.

- Driller should arrive on-site equipped with at least two standard 1.4 inch inside diameter decontaminated split spoon samplers and decontaminated auger flights.
- To collect a sample at depth, driller should advance hollow-stem auger to the desired depth. Driller should remove rod and bit and install split-spoon sampler on end of rod. Driller should then lower rod to desired sampling depth with the hollow-stem auger. Using a 140 pound drop hammer, driller should pound the sampler into the underlying soil, recording the number of blow counts necessary to drive it over the entire length of the sampler (18 inches). Blow counts should be counted for each driven 6-inch interval.
- Retrieve sampler and place on work table. Using the other sampler, repeat this sequence again when driller has reached desired depth of sampling, decontaminating the split spoon in accordance with SOP-2 after every sample.
- Record lithology of soil within the sampler according to USCS classification system on standard boring log. In addition, record the blow counts and percent recovery from cores retrieved from split spoon sampler on the field boring log.
- If required by the field sampling plan, composite like core intervals by mixing soil the soil in stainless steel bowl. When sampling for volatile organic compounds, the sample should never be composited.
- Containerize samples, and follow standard procedures for recording field information, sample labeling, and sample shipment and packaging in accordance with SOP-1, SOP-3 and SOP-4, respectively.
- Decontaminate all sampling equipment between sampling sites in accordance with SOP-2.

Direct Push Drilling Equipment

This SOP does not include procedures for operating drilling equipment. Equipment operation will be subcontracted to a qualified third party that is properly trained.

- Advance sampling rods lined with acetate sleeves to the prescribed depth. Retrieve the rods, remove the sample sleeves, and secure on the work table.
- Record lithology in accordance with USCS standard practices and percent recovery from the retrieved sample sleeve on standard field forms.
- If required by the project work plan or sampling and analysis plan, composite like core intervals by mixing in stainless steel bowl in a similar manner as described for surface sampling (SOP-13). When sampling for volatile organic compounds, the sample should not be mixed.
- Containerize samples, and follow standard procedures for recording field information, sample labeling, and sample shipment and packaging in accordance with SOP-1, SOP-3 and SOP-4, respectively or as outlined in the FSP.

- Decontaminate sampling equipment between each interval sampled in accordance with SOP-2 as required by the FSP. Decontaminate sampling equipment between sampling sites.

Backhoe or Hand Dug Excavations

This SOP does not include procedures for operating heavy equipment. Equipment operation will be subcontracted to a qualified third party that is properly trained. Additional information regarding goals and objectives of test pitting can be found in the SAP.

- Orient excavation to maximize use of the angle of the sun to illuminate the pit for photographs.
- Excavate to the prescribed depth. Place excavated material a sufficient distance from the excavation. Sampling personnel should never enter a pit excavated greater than three feet deep to collect samples, unless the pit is adequately shored and sloped in accordance with OSHA standards. Failure to follow this directive shall be grounds for dismissal from NewFields.
- Soil profile descriptions shall be made for ground surface and of the pit sidewall on standard field forms or in the test pit field log.
- Complete profile descriptions in accordance with USCS standard practices and take photographs before pit is sampled.
- Soil samples shall be collected from depth intervals specified in the SAP. Soil samples should be collected using the excavator bucket. When a depth interval is sampled, soil should be collected from the entire interval exposed on the pit wall by the excavating bucket. When the bucket is brought to the surface, soil samples should be collected from the bucket with a stainless steel trowel, collecting a representative sampling and using extra caution to avoid collecting soil that has touched any portion of the excavator bucket.
- Place soil in a stainless steel bowl and mix thoroughly (this should not be done when analyzing for volatile organics). Containerize mixed soil in appropriate sample containers samples, and follow standard procedures for recording field information, sample labeling, and sample shipment and packaging in accordance with SOP-1, SOP-3 and SOP-4, respectively.
- After sampling is completed, the pit should be backfilled with excavated material in the reverse order that it was excavated so that topsoil material is returned to the top of the pit. When backfilling is complete the area should be cleaned up to its original condition. No test pit should be left open overnight unless temporary fencing and appropriate signs and flagging tape is used to prevent access to the pit.
- Decontaminate the excavator bucket and all sampling equipment between sampling sites in accordance with SOP-2. Excavation equipment should be steam cleaned between sites with hot water after visible dirt and mud has been physically removed.

SOP-21

QUALITY CONTROL SAMPLING

Quality Control (QC) samples must be submitted along with natural samples to provide supporting laboratory data to validate laboratory results. In general, field equipment and field replicate samples should be collected for every sampling event. Always check the SAP before going to the field to understand what QC samples are required for the sampling event, and at what frequency samples should be collected.

With the exception of trip blank, QC samples will be collected in the field following sample collection procedures (SOP-3, SOP-4). Trip blanks are supplied by the laboratory and will accompany each sample cooler containing samples for analysis of volatile organic compounds. Trip blanks provide data to evaluate whether the samples were affected by organic compounds during transport to the lab.

The most common QC samples are shown in the table below.

Purpose

To outline the quality control samples to be collected in the field

Goal and Objective

To ensure quality control samples are collected along with natural samples to validate laboratory results

Equipment Needs

Field Forms and field book

Chain-of-custody

Most Common QC Samples		
SP	Split Sample	A portion of a natural sample collected for independent analysis; used in calculating laboratory precision
R	Replicate Sample	Two samples taken from the same media under similar conditions; used to evaluate precision
FB	Field Blank	Deionized water collected in sample bottle; used to detect contamination introduced during the sampling process.
ERB	Equipment Rinsate Blank	Deionized water run through or over decontaminated equipment; used to verify the effectiveness of equipment decontamination procedures
MS/MSD	Matrix Spike/ Matrix Spike Duplicate	Certified materials of known concentration; used to assess laboratory precision and accuracy
TB	Trip Blank	Inert material (deionized water or diatomaceous earth) included in sample cooler; sent by the lab, the sample is used to detect any contamination or cross-contamination during handling and transportation.

Typical QC sample collection frequencies are presented in the table below. Consult the FSP for variations based on site specific objectives. Each field crew leader will be responsible for all QC samples prepared by that crew.

QC Sample	Purpose	Collection Frequency
Field Replicate Samples	Measure analytical precision.	1 per every 20 samples
Matrix Spike/Matrix Spike Duplicate	Measure analytical accuracy.	1 per every 20 samples
Equipment rinse blanks	Evaluate effectiveness of equipment decontamination and sample handling procedures.	1 per sampling event per media
Field Blank	Assess possible cross-contamination of samples due to ambient conditions during sample collection.	1 per sampling event
Trip Blanks	Evaluate sample preservation, packing, shipping, and storage.	1 per sampling event with volatile constituents

SOP-22

MANAGEMENT OF INVESTIGATIVE-DERIVED WASTE

Prior to the field sampling event, review the Sampling and Analysis Plan to understand how wastes generated during the investigation should be handled. This standard operating procedure is applicable to non-hazardous wastes. If hazardous wastes may be generated, please consult with the project manager and the Field Sampling Plan (FSP).

SOIL

Whenever possible, soils excavated from test pits should be placed back in the test pit in the reverse order that it was excavated.

To determine appropriate methods for handing of drill cuttings from soil borings or monitoring well installation, soils exhumed from the borehole should be monitored for staining and field screened for VOCs using a PID in accordance with standard operating procedures. Based on the PID screening, cuttings with organic vapor concentrations greater than 100 ppm should be containerized in labeled 55-gallon drums (or roll-off containers if large volumes of cuttings are anticipated) pending further characterization. Alternatively, project personnel may elect to containerize all drill cuttings based on the presence of known contamination and anticipated contaminant concentrations. Containerized soil must be properly labeled, documented and disposed of in accordance with state and federal regulations based on of soil analytical results.

Soil that does not appear to be contaminated based on observations by field personnel and PID screening may be spread on the ground near the point of origin.

Purpose

To outline the procedure for handling wastes generated during site investigation

Goal and Objective

To employ a method for appropriate handling investigative-derived wastes that limits contamination of the environment

Equipment Needs

PID

Field Forms and field book

DOT approved 55-gallon drums

Drum wrench

GROUNDWATER

Groundwater purged from a well during development or sampling that has a sheen or contains free product must be containerized in an appropriately labeled 55-gallon drums or tank pending receipt of analytical results. A drum should be dedicated to each well sampled so that the analytical results of the groundwater sample from the well can be used to characterize the water in the drum. If groundwater from several wells is placed in a drum, the water in the drum should be sampled for adequate characterization. The containerized water must be disposed of in accordance with state and federal regulations based on the analytical results. Groundwater that does not have a sheen or contain free product or other know contamination may be discharged to the ground surface in the vicinity of the well location for evaporation and infiltration. All surface discharge areas should not allow for migration of discharge water to a surface water body.

RINSEATE WATER ORIGINATING FROM DECONTAMINATION

All source water for sampling equipment decontamination purposes will be distilled water. For larger equipment when power washing procedures are used for decontamination, potable water will be used. Decontamination will be conducted in a specified area that limits the spread of decontamination water. Decontamination water will be discharged to the ground in the vicinity of the source of dirt and mud to evaporate and infiltrate.

APPENDIX B
FIELD FORMS

FIELD FORMS	
#	Description
1	Daily Field Record
2	Soil Boring Log
3	Surface Soil Observations Table
4	Photo Log
5	Incident Report
6	Pace Analytical – Chain of Custody
7	Field Investigation Summary

DAILY FIELD RECORD

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Page______ of ______

Project and Task Number:	Date:
Project Name:	Field Activity:
Location:	Weather:

Personnel: Name	Company	Time in	Time Out

PERSONAL SAFETY CHECKLIST					
	Steel-toed boots		Hard Hat		Traffic Vest
	Gloves		Safety Goggles		Ear Protection

TIME	DESCRIPTION OF WORK PERFORMED

DAILY FIELD RECORD

Page______ of ______

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Date:_______________________

TIME	DESCRIPTION OF WORK PERFORMED

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PROJECT:	**PROJECT NO:**	**BORING NO:**
LOCATION OF BORING	DRILLING METHOD:	DRILLING CONTRACTOR:
	SAMPLE METHOD:	DRILLER:
	SAMPLER(S)/LOGGER(S):	
	START DATE/TIME:	RIG/EQUIPMENT:
	TOTAL BOREHOLE DEPTH:	FINISH DATE/TIME:
	WATER LEVEL/TIME/DATE:	CASING DEPTH:

SAMPLE						DEPTH IN FEET	LITHOLOGY	SOIL DESCRIPTION	COMMENTS
SAMPLE TYPE	INCHES DRIVEN	INCHES RECOVERED	SAMPLE NO.	SAMPLE DEPTH	PID READING			SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	OBSERVATIONS (ODOR, STAINING, DRILLING RATE, DRILLING ISSUES, ETC.)
						1			
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						0			
						1			
						2			
						3			
						4			
						5			
						6			
						7			
						8			
						9			
						0			

Surface Soil Observations
Former Frenchtown Mill
Missoula County, Montana

Location ID	Time	Depth (inches)	EC (and depth)	Color Code*	Color	Density/ Consistency	Texture/ Grain Size	Chemical impacts?		Photo ID**
								Odor?	Staining?	

Notes:
*From Munsell Soil Color Chart
**Photos are available from project files of NewFields Companies, LLC located in Missoula, Montana.
EC = Electrical Conductivity with field probe (moisture content not standardized)
in = inches below ground surface

PHOTOGRAPH LOG

Page______ of ______

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Project and Task Number:	Date:
Project Name:	Field Activity:
Location:	

ID#	Time	Direction of View	Subject of Photograph
1			

INCIDENT REPORT
Occupational Accident, Injury, or Illness

1. *Employee Name:* ____

2. *Employee No.:*   *3. Office location:* ______________________________

4. *Job title:* ____

5. *Home address:* ____

6. *Phone number:* ____

7. *Sex:* ☐ *M* ☐ *F*   *8. Date of birth:* ______________________________

9. *Type of incident:* ☐ *Exposure* ☐ *Physical injury*

10. *Address where incident occurred (include county):*______________________________

____

11. *Date and time of incident:* ____

12. *Date incident was reported:* __________ *To whom:* ______________________________

13. *What were you doing when injured? (Be specific identify tools, equipment, or materials you were using.)*

____

____

14 *How did the accident or exposure occur? (Describe events fully. Tell what happened and how it happened. Use additional sheets if needed.)*

____

____

15. *Object or substance that directly injured you:*

____

16. *Describe the injury or illness (e.g., cut, strain, fracture, skin rash):*

____

17. *Part of body affected:* ______________________________

18. *Did you receive medical care?* ☐ *Yes* ☐ *No* *If so, when?* ____________
By whom? (Name and address of physician/paramedic/hospital.)

____

____

If hospitalized, name and address of hospital:

____

____

19. *Did you lose time from work?* ☐ *Yes* ☐ *No* *If so, how much?* ____________

20. *Have you returned to work?* ☐ *Yes* ☐ *No* *If so, date returned:* ____________

21 *List anyone else affected by this incident.*

____

____

22 *List any witnesses to this incident.*

____

____

______________________________ ______________________________

Signature *Date*

CHAIN-OF-CUSTODY / Analytical Request Document

The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

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Page: of

Section A **Required** Client Information:		Section B **Required** Project Information:	Section C Invoice Information:
Company:		Report To:	Attention:
Address:		Copy To:	Company Name:
			Address:
Email To:		Purchase Order No.:	Pace Quote Reference:
Phone:	Fax:	Project Name:	Pace Project Manager:
Requested Due Date/TAT:		Project Number:	Pace Profile #:

REGULATORY AGENCY

☐ NPDES ☐ GROUND WATER ☐ DRINKING WATER

☐ UST ☐ RCRA ☐ OTHER________

SITE LOCATION ☐ GA ☐ IL ☐ IN ☐ MI ☐ NC ☐ OH ☐ SC ☐ WI ☐ OTHER____

Filtered (Y/N)

Requested Analysis:

Residual Chlorine (Y/N)

Section D **Required** Client Information

Valid Matrix Codes

MATRIX	CODE
DRINKING WATER	DW
WATER	WT
WASTE WATER	WW
PRODUCT	P
SOIL/SOLID	SL
OIL	OL
WIPE	WP
AIR	AR
OTHER	OT
TISSUE	TS

ITEM #	**SAMPLE ID** One Character per box. (A-Z, 0-9 / ,-) Sample IDs MUST BE UNIQUE	MATRIX CODE	SAMPLE TYPE G=GRAB C=COMP	COLLECTED COMPOSITE START DATE	COMPOSITE START TIME	COMPOSITE END/GRAB DATE	COMPOSITE END/GRAB TIME	SAMPLE TEMP AT COLLECTION	# OF CONTAINERS	Preservatives: Unpreserved	H_2SO_4	HNO_3	HCl	NaOH	$Na_2S_2O_3$	Methanol	Other	Requested Analysis	Residual Chlorine (Y/N)	**Pace Project No. Lab I.D.**
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				

Additional Comments:

RELINQUISHED BY / AFFILIATION	DATE	TIME	ACCEPTED BY / AFFILIATION	DATE	TIME	SAMPLE CONDITIONS Temp in °C	Received on Ice	Custody Sealed Cooler	Samples Intact
							Y/N	Y/N	Y/N
							Y/N	Y/N	Y/N
							Y/N	Y/N	Y/N
							Y/N	Y/N	Y/N

SAMPLER NAME AND SIGNATURE

PRINT Name of SAMPLER:

SIGNATURE of SAMPLER: DATE Signed (MM / DD / YY)

Field Investigation Form

Project Name:

Project Number:

Project Address:

Project City:

Date:

Investigation Date(s):

Site Contact:

Client Contact:

EPA/DEQ Manager:

Required Check Offs	**Yes**	**No**
DEQ/EPA Approved SAP		
SAP Reviewed		
Utility Locate Number		
Owner Notified		
Health & Safety Plan		
Sample Location Map		
Holding times work		

Overall Reason For Investigation

Number of Hours Approved for Sampling Effort (include all that apply)

Task	Hours	Notes
ACM/LBP Inspection		
Soils Investigation		
Groundwater Sampling		
Other		

Sampling Methods

# of Samples	Analytical Parameters	Media	Natural or QC Sample?	Method #	Containers	Preservative	Hold Time	Sample Locations

Lab Pack

Laboratory

Shipping by:

Standard Operating Procedure	SOP #

Other Instructions

Project Manager:

Site Investigator:

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APPENDIX C

JOB SAFETY ANALYSIS (JSA) FORM

JOB SAFETY ANALYSIS (JSA) FORM

Job Title: Supplemental Soil Sampling Per RIWP Addendum 7	**Location:** Former Frenchtown Mill Missoula County, Montana	**Page 1 of 2**
Equipment: PPE, decontamination and sampling tools/supplies, sample containers	**Supervisors:** Wilhelm Welzenbach (Certified Soil Scientist) David Tooke (Assistant Project Manager) Chris Cerquone (Project Manager)	**Analysis By:** W. Welzenbach

Required Personal Protective Equipment:

Emergency Communications (cell phones)

Level D Protection:

- Eye protection (safety glasses)
- Foot protection (steel toed boots)
- Head protection (hard hat)
- Hearing protection (ear plugs and/or muffs)

Sequence of Basic Job Steps	Potential Hazards	Recommended Mitigation Actions
Work Site Access / Equipment Transport / Set-Up	Vehicle accident during transport – poor road conditions (wet roads, muddy roads, low visibility) and other traffic on and off site	➢ Inspect and select a vehicle fit for purpose (4WD) and well maintained. ➢ Driver is to be licensed, trained and medically fit. ➢ Driver is to be rested and alert. ➢ Driver is to have driven the route to location previously or will plan the route to location ahead of time (on- and off-site planning). ➢ Driver must not be under the influence of alcohol, drugs or medications that may impair the ability to drive and safety operate the vehicle. ➢ Practice defensive driving. ➢ Wear seatbelts whenever vehicle is moving. ➢ Do not use cell phones while vehicle is in motion.
Work Site Access / Equipment Transport / Set-Up	Injury resulting from slips, trip or falls – slippery footing due to wet, uneven or unstable ground	➢ Stay aware of footing and ground conditions. Visually examine site prior to commencing work. Walk carefully and avoid steep slopes or uneven terrain. Wear appropriate Personal Protective Equipment (PPE) including non-slip rubber boots as appropriate if working on wet surfaces.
	Muscle strain injury	➢ Do not lift or move heavy equipment without assistance. Use proper bending / lifting techniques by lifting with arms and legs and not with back. Keep back straight while lifting.
Borehole Oversight	Injury resulting from inclement weather – Heat/Cold Stress Suspended loads (drill rod, etc.) Physical hazards from heavy equipment (struck by vehicle, pinch points, entanglement) Hearing damage from high noise levels Potential exposure to contaminated soil	➢ Match attire to weather conditions, and bring additional clothing to prepare for changes in weather. Consume adequate food and beverages. ➢ Use PPE including chemical resistant gloves, safety glasses, steel toe boots, and hard hat. Also use hearing protection (ear muffs or ear plugs) if noise levels are greater than or may exceed 85 decibels (db). ➢ Do not walk under suspended loads. ➢ When possible remain at least one mast length horizontally from the drilling rig. ➢ Maintain positive communication with drill operator prior to approaching the rig. ➢ Wear nitrile or latex gloves when handling soil. ➢ Wash hands prior to eating or drinking.

JOB SAFETY ANALYSIS (JSA) FORM

Surface Soil Sampling	Injury resulting from inclement weather – Heat/Cold Stress Hand injury from sharp tools Potential exposure to contaminated soil	➢ Match attire to weather conditions, and bring additional clothing to prepare for changes in weather. Consume adequate food and beverages. ➢ Use PPE including chemical resistant gloves, safety glasses, and steel toe boots. ➢ Do not walk under suspended loads. ➢ Communication with Project Manager at start and end of each day to confirm safe entry and exit of the site. ➢ Wear nitrile or latex gloves when handling soil. ➢ Wash hands prior to eating or drinking.
COMMENTS:		

NewFields Site Personnel Job Safety Analysis (JSA) Form Review

NewFields personnel involved with review and execution of this site specific JSA must indicate their understanding and agreement with the requirements of the JSA by signing below. I have reviewed this site / task specific JSA and I will comply with all of the provisions of the site-specific Health Safety and Analysis Plan (HSAP) and this JSA.

Name (Print)	Signature	Date