DEPARTMENT OF ECOLOGY
State of Washington

CLEANUP ACTION PLAN
ALUMINUM RECYCLING TRENTWOOD SITE
SPOKANE, WA

Facility Site ID 628
Cleanup Site ID 1081

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Publication and Contact Information

This document is available on the Department of Ecology's website at: https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=1081.

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1.0 INTRODUCTION

This report presents the Washington State Department of Ecology's proposed cleanup action for the Aluminum Recycling Trentwood Site (Site) (Facility Site #628, Cleanup Site #1081), located at 2317 N. Sullivan Rd, Spokane Valley, in Spokane County, Washington (Figure 1). This draft Cleanup Action Plan (CAP) is required as part of the Site cleanup process under the Model Toxics Control Act (MTCA), Ch. 70A.305 RCW, implemented by the Washington State Department of Ecology (Ecology). The cleanup action decision is based on the Remedial Investigation/Feasibility Study (RI/FS) and other relevant documents in the administrative record. Union Pacific Railroad (UPRR) and Pentzer Venture Holdings II Inc. (Pentzer) have been named the potentially liable persons (PLPs) by Ecology. UPRR has completed investigation activities under Agreed Order 6968 with Ecology.

This CAP outlines the following:

- The history of operations, ownership, and activities at the Site;
- The nature and extent of contamination as presented in the RI;
- Cleanup levels for the Site that are protective of human health and the environment;
- The selected remedial action for the Site; and
- Any required compliance monitoring and institutional controls.

1.1 Declaration

Ecology has selected this remedy because it will be protective of human health and the environment. Furthermore, the selected remedy is consistent with the preference of the State of Washington as stated in RCW 70A.305.030(1)(b) for permanent solutions.

1.2 Applicability

Cleanup standards specified in this CAP are applicable only to the Aluminum Recycling Trentwood Site. They were developed as a part of an overall remediation process under Ecology oversight using the authority of MTCA, and should not be considered as setting precedents for other sites.

1.3 Administrative Record

The documents used to make the decisions discussed in this CAP are on file in the administrative record for the Site. Major documents are listed in the reference section. The entire administrative record for the Site is available for public review by appointment at Ecology's Eastern Regional Office, located at 4601 N. Monroe Street, Spokane, WA 99205-1295. Results from applicable studies and reports are summarized to provide background information pertinent to the CAP. These studies and reports include:

- RI/FS Work Plan for the Aluminum Recycling Trentwood Site, Pastor, Behling & Wheeler LLC, 2010

- Final Remedial Investigation/Feasibility Study, Pastor, Behling & Wheeler LLC, 2012
- Union Pacific Railroad Co. Feasibility Study (Revised), Aluminum Recycling Trentwood Site, Golder Associates Inc., 2021

1.4 Cleanup Process

Cleanup conducted under the MTCA process requires the preparation of specific documents either by the PLP or Ecology. These procedural tasks and resulting documents, along with the MTCA section requiring their completion, are listed below with a brief description of each task.

- Remedial Investigation and Feasibility Study — WAC 173-340-350
  The RI/FS documents Site investigations and evaluations from the discovery phase to the RI/FS document. The RI collects and presents information on the nature and extent of contamination, and the risks posed by the contamination. The FS presents and evaluates Site cleanup alternatives and proposes a preferred cleanup alternative. The document is prepared by the PLP, approved by Ecology, and undergoes public comment.
- Cleanup Action Plan — WAC 173-340-380
  The CAP sets cleanup standards for the Site, and selects the cleanup actions intended to achieve the cleanup standards. The document is prepared by Ecology, and undergoes public comment.
- Engineering Design Report, Construction Plans and Specifications — WAC 173-340-400
  The report outlines details of the selected cleanup action, including any engineered systems and design components from the CAP. These may include construction plans and specifications with technical drawings. The document is prepared by the PLP and approved by Ecology. Public comment is optional.
- Operation and Maintenance Plan(s) — WAC 173-340-400
  These plans summarize the requirements for inspection and maintenance of cleanup actions. They include any actions required to operate and maintain equipment, structures, or other remedial systems. The document is prepared by the PLP and approved by Ecology.
- Cleanup Action Report — WAC 173-340-400
  The Cleanup Action Report is completed following implementation of the cleanup action, and provides details on the cleanup activities along with documentation of adherence to or variance from the CAP. The document is prepared by the PLP and approved by Ecology.
- Compliance Monitoring Plan — WAC 173-340-410
  Compliance Monitoring Plans provide details on the completion of monitoring activities required to ensure the cleanup action is performing as intended. It is prepared by the PLP and approved by Ecology.

2.0 SITE BACKGROUND

2.1 Site Description and History

The Site is comprised of three properties owned by UPRR, Pentzer, and the Washington State Department of Transportation (WSDOT) (Figure 2). It is bounded by Sullivan Road to the east, Washington Department of Parks and Recreation and City of Spokane Valley properties to the south, and a separate property owned by UPRR to the north and west. The Site is zoned heavy industrial. A large stockpile of mixed industrial process material is present over approximately 4 acres of the site; the volume is estimated at 57,000 cubic yards. The stockpile slopes have an approximate grade of 1:1 and show evidence of erosion onto neighboring properties with lower elevations.

The Site has been occupied by numerous lessees over the years. From 1979 to 1984, Aluminum Recycling Corporation performed aluminum recovery activities using aluminum cans and low-salt white aluminum dross as source material. These materials were mixed with salts and cryolite and heated in a rotary kiln, whereupon additional molten aluminum was extracted. The residue from this process is called black dross. Materials present on-site during this time included piles of white and black dross. Aluminum Recycling Corporation filed for bankruptcy in 1985, and UPRR removed all black dross from the Site by 1986.

From 1986 to 1995, Imperial West Chemical leased the Site to produce concrete additives. Low-salt aluminum dross was imported to produce aluminum sulfate. Residues from this process, including unreacted solids containing aluminum, magnesium, and silica oxides, were stockpiled on-site along with low-salt dross.

In 1998, Kemwater North America Inc. leased the site to produce water treatment chemicals. Other related companies producing similar products have leased the land and continue to operate on the property. None of these tenants appeared to use stockpiled waste materials, or produced any wastes present in the stockpile.

In October 1998, Pentzer Venture Holdings II Inc. acquired 7.5 acres of land immediately west of the UPRR property. Approximately one-third of the stockpile is on that land.

2.2 Site Investigations

Ecology completed a Preliminary Assessment in 1985, which indicated there wasn't evidence of hazardous waste at the site and made basic recommendations to protect air and water quality. In 1987, Ecology completed a Phase I Site Inspection to evaluate the nature of wastes, ascertain immediate risks, and recommend further actions. That report determined material in the stockpile was not a federally designated waste, and the site should not be evaluated by the Environmental Protection Agency. It also noted potential runoff to the Spokane River and leaching to groundwater were primary concerns.

In 2007, the Spokane Regional Health District, under contract by Ecology, completed a Site Hazard Assessment to assess the Site's risk to human health and the environment. The outcome of that assessment is a ranking of the Site relative to all other ranked sites in the State of Washington at that time. The ranking for the Aluminum Recycling Trentwood site was a two, with one representing the highest risk and five the lowest.

2.3 Physical Site Characteristics

2.3.1 Topography and Climate

The Site elevation is around 1,980 feet above mean sea level. The stockpile represents an additional 30 feet of height. The stockpile sits on a narrow but flat surface nearly level with the land to the north, east, and west but immediately abuts a steep slope which drops another 25 feet down to a former borrow pit and the Spokane River to the south. The region is semi-arid, receiving around 16–18 inches of precipitation annually. The majority of the precipitation occurs in late fall through early spring; winter precipitation is usually in the form of snow. Summers are typically warm and dry. The annual mean temperature is about 50˚F.

2.3.2 Regional Hydrogeology

The geology in the vicinity of the Site is primarily basalt flows of the Columbia Plateau overlain by Quaternary glacial flood deposits. The flood deposits are composed of thickly bedded, poorly sorted boulders, cobbles, gravel, and sand and are approximately 250–300 feet thick in the site vicinity. The coarse nature of the deposits results in very high permeabilities. Overlying the flood deposits are native surficial soils consisting of gravelly loam with thicknesses of up to five feet.

The primary aquifer underlying the Site is the Spokane-Valley Rathdrum-Prairie Aquifer, which is the sole source of drinking water for over 500,000 people in the greater Spokane area. It consists of unconsolidated glaciofluvial sediments and is largely unconfined. The aquifer flows from northern Idaho to the west and southwest down the Spokane Valley at rates of up to 80 feet per day. At the Site, depth to water is about 55 feet with a seasonal variation of 10 to 15 feet, and flows to the west-southwest at a rate of about 33 feet per day. Gradients at the Site are fairly flat, with a change of approximately 0.003 feet/foot. Near the site, the aquifer is also affected by the Spokane River, which can be gaining or losing depending on conditions. During most of the year, the river near the site is a gaining reach.

3.0 Remedial Investigations

An RI was performed to assess the nature and extent of contamination. Soil and groundwater were first investigated to determine whether they were impacted by site contaminants. The outcome of sampling would determine next steps. If groundwater was impacted, then surface water would be evaluated. If soils proximal to the river were impacted, then sediments would be evaluated.

3.1 Soil

Based on knowledge of prior site operations, assumptions were made about the stockpile composition. Suspected contaminants were metals and “conventional” contaminants such as chloride, fluoride, nitrate, sulfate, and ammonia. These contaminants are commonly associated with both white and black dross, and have been found at other dross sites in Spokane County.

Soil investigations were designed to evaluate soil, stockpile material, and soil/stockpile mixes. Two soil borings were completed into the stockpile to evaluate its composition, to determine the depth of the soil/stockpile interface, and assess whether contaminants leached into the soil and to what depth. Eight soil borings were completed outside of the stockpile to determine the horizontal and vertical extent of stockpile erosion, and determine the depth of any leached contamination (Figure 3). Soil samples were also collected during the installation of the two downgradient monitoring wells.

The stockpile evaluation showed different types of material may be present based on significant color variations; some material was gray, and some was tan. Samples of both were collected from the surface to depths of fifteen feet. Samples of gray material were high in aluminum and lower in metals such as copper and chromium than the tan material. Gray material was also lower in chloride and nitrate, but higher in sulfate. Depth profiles of stockpile samples also showed concentrations of metals and conventionals reduced significantly below the stockpile interface, indicating significant leaching was not occurring. None of the stockpile samples aligned with traditional dross composition, indicating the stockpile was likely not comprised of a high percentage of dross. The stockpile material is suspected to be a mixture of aluminum sulfate and its processing residues. Small amounts of residual dross material may be present, but can’t be confirmed.

Soil samples outside the stockpile area confirmed erosion has occurred to varying extents. In areas with steep slopes, such as the UPRR – WSDOT property border, significant erosion has occurred. In other areas with gentler slopes adjacent to the stockpile, erosion is less defined. Sampling was designed to coincide with visual evidence of erosion, since stockpile material color was much lighter than native soil. Samples showed much lower contaminant levels than stockpile material. The highest levels of contaminants occur at the surface and generally decrease rapidly with depth. Sampling was conducted at a level spot at the base of a slope nearest the Spokane River to evaluate the potential for contaminants to have reached the surface water. Results showed samples did not exceed conservative screening levels. Based on this and the results of the groundwater evaluation provided below, it was determined sediments would not be sampled. The RI/FS (Pastor, Behling & Wheeler 2012) summarizes all RI soil and stockpile sampling results.

3.2 Groundwater

Three groundwater monitoring wells were installed to evaluate potential groundwater contamination, one upgradient and two downgradient (Figure 3). As with soil, groundwater was evaluated for metals and conventionals related to suspected dross contamination. Groundwater elevations were also measured to determine flow direction and gradient.

Two monitoring events were conducted in late 2010. Groundwater was at a depth of between 50 and 65 feet below ground surface, and generally flowed from northeast to southwest towards the Spokane River. This is consistent with information on regional groundwater flow. This stretch of the river is a gaining reach, so any contamination in groundwater would be expected to impact the river. Sampling results showed concentrations of metals and conventionals did not exceed conservative screening levels. Downgradient concentrations generally matched with upgradient concentrations. Therefore, it was determined groundwater was not impacted by site-related contaminants, and surface water samples were not collected. The RI/FS (Pastor, Behling & Wheeler 2012) summarizes all groundwater sampling results.

3.3 Risks to Human Health and the Environment

The Site is currently zoned as heavy industrial in the City of Spokane Valley. Properties to the east, west, and north of the Site are also zoned heavy industrial. Immediately to the south of the Site and adjacent to the Spokane River, property is zoned as parks/open spaces and contains a public use trail.

Exposures to human populations could occur through direct contact with contaminated surface or subsurface soil, dust entrained in air, or surface water runoff from the stockpile. Erosion off the stockpile also serves to spread the contaminant footprint and make incidental exposure more likely. Trespass is highly likely due to the Site's proximity to the rail line and the river trail, and to the lack of any fencing or signage. Potential exposed populations include workers at the neighboring Kemira Water Solutions plant, trespassers to the property, and recreational users of the trail.

Exposure to environmental receptors is likely given the presence of natural vegetation, open space, and the Spokane River. A terrestrial ecological evaluation (TEE) is in Section 4.3 that fully evaluates the exposure to ecological receptors.

3.4 Independent Actions Conducted Post-Remedial Investigation

In October 2019, UPRR submitted a work plan to Ecology for removal of aluminum dross material from the parcel owned by WSDOT and surface dross-containing soil from the Pentzer property. The work was conducted in March 2020 as an independent action. The area subject to the removal of dross material is shown on Figure 2 in green. Twenty confirmation samples

were collected and analyzed for metals after the removal was performed. Those locations are shown on Figures 4 and 5.

A Pre-Design Investigation (PDI) was performed as an independent action in 2020. The purpose was to further characterize the nature of dross-containing soil to refine the scale and cost of various alternatives. A work plan was prepared and submitted to Ecology in August 2020 for the PDI. Sixty-one samples were collected from 16 borings and an additional 12 surface soil samples were collected for chemical analysis under the PDI. Those locations are shown on Figure 6. The results provided additional data to refine the lateral and vertical delineation of contaminants of concern that exceed cleanup levels and reinforced the remedial alternative recommendation in the Revised FS.

Information on those independent actions can be found in the following reports:

- Completion Report: Dross Removal Project – WSDOT Property Union Pacific Railroad, Aluminum Recycling Trentwood Site, Golder Associates Inc., 2021
- Completion Report: Pre-Design Investigation Union Pacific Railroad, Aluminum Recycling Trentwood Site, Golder Associates Inc., 2021

4.0 CLEANUP STANDARDS

MTCA requires the establishment of cleanup standards for individual sites. The two primary components of cleanup standards are cleanup levels and points of compliance. Cleanup levels determine the concentration at which a substance does not threaten human health or the environment. All material exceeding a cleanup level is addressed through a remedy that prevents exposure to the material. Points of compliance represent the locations on the site where cleanup levels must be met.

4.1 Overview

The process for establishing cleanup levels involves the following:

- Determining which method to use;
- Developing cleanup levels for individual contaminants in each media;
- Determining which contaminants contribute the majority of the overall risk in each media (indicators); and
- Adjusting the cleanup levels downward based on total site risk.

MTCA provides three options for establishing cleanup levels: Methods A, B, and C.

- Method A may be used to establish cleanup levels at routine sites or sites with relatively few hazardous substances.
- Method B is the standard method for establishing cleanup levels and may be used to establish cleanup levels at any site.

- Method C is a conditional method used when a cleanup level under Method A or B is technically impossible to achieve or may cause significantly greater environmental harm. Method C also may be applied to qualifying industrial properties.

MTCA defines the factors used to determine whether a substance should be retained as an indicator for the Site. When defining cleanup levels at a site contaminated with several hazardous substances, Ecology may eliminate from consideration those contaminants contributing a small percentage of the overall threat to human health and the environment. WAC 173-340-703(2) provides a substance may be eliminated from further consideration based on:

- The toxicological characteristics of the hazardous substance that govern its ability to adversely affect human health or the environment relative to the concentration of the substance;
- The chemical and physical characteristics of the substance which govern its tendency to persist in the environment;
- The chemical and physical characteristics of the substance which govern its tendency to move into and through the environment;
- The natural background concentration of the substance;
- The thoroughness of testing for the substance;
- The frequency of detection; and
- The degradation by-products of the substance.

4.2 Site Use

The evaluation of cleanup levels and ecological exposures depends on the nature of the Site use. Options under MTCA are either an unrestricted property or an industrial property. Industrial properties are defined in WAC 173-340-200; the definition includes properties characterized by transportation areas and facilities zoned for industrial use. Industrial properties are further described in WAC 173-340-745(1) with the following factors:

- People don’t normally live on industrial property;
- Access by the general public is generally not allowed;
- Food is not grown/raised;
- Operations are characterized by chemical use/storage, noise, odors, and truck traffic;
- Ground surface is mostly covered by buildings, paved lots and roads, and storage areas; and
- Presence of support facilities serving the industrial facility employees and not the general public.

The Site is currently zoned industrial, and so potentially would qualify as an industrial site use. However, most of the ground surface on and around the site is not paved or covered by buildings, and the surrounding land is not developed and represents vacant land with quality habitat. Additionally, adjacent land has heavy recreational use due to the presence of parks and

trails. All neighboring parcels to the south and west are zoned as parks/open space. This makes human and ecological exposure to any residual contamination highly likely. Therefore, even though the UPRR property qualifies as industrial, Ecology will move this Site forward as unrestricted land use.

4.3 Terrestrial Ecological Evaluation

WAC 173-340-7490 requires that site managers perform a TEE to determine the potential effects of soil contamination on ecological receptors. A site may be excluded from a TEE if any of the following are met:

- All contaminated soil is or will be located below the point of compliance;
- All contaminated soil is or will be covered by physical barriers such as buildings or pavement;
- The site meets certain requirements related to the nature of on-site and surrounding undeveloped land; or
- Concentrations of hazardous substances in soil do not exceed natural background levels.

This Site does not meet any of the exclusionary criteria. Therefore, Ecology evaluated the Site to determine whether to conduct a simplified TEE or a site-specific TEE. As provided in WAC 173-340-7491, if any of the following criteria are true, then the Site is evaluated under a site-specific TEE:

- The site is located on or adjacent to an area where management or land use plans will maintain or restore native or semi-native vegetation;
- The site is used by a threatened or endangered species;
- The site is located on a property containing at least 10 acres of native vegetation within 500 feet of the site, not including vegetation beyond the property boundaries; or
- The department determines the site may pose a risk to significant wildlife populations.

The Site meets the first and third criteria based on its location near the riparian corridor of the Spokane River and the surrounding native vegetation, and must be evaluated under a site-specific TEE.

The first step of the evaluation is problem formulation. Problem formulation involves:

1. Determining the chemicals of ecological concern using Table 749-3 of MTCA.

   Table 749-3 of MTCA provides ecological indicator concentrations for contaminants with demonstrated ecological impacts. For unrestricted land use, the lowest value of the three receptors (wildlife, soil biota, and plants) is compared to maximum detected concentrations in soil. Table 1 shows that aluminum, arsenic, barium, copper, and mercury were all detected at levels of potential ecological concern.

2. Identifying complete exposure pathways for exposure of plants or animals to the chemicals of concern.

   Man-made barriers would eliminate exposure pathways with the use of institutional controls. Institutional controls would be required if a cap were used, but wouldn't if all materials were excavated (see Section 5.2). Excavation represents the most conservative scenario (all exposure pathways remain intact) and will be carried forward for this analysis.

3. Identifying current or potential future terrestrial species groups reasonably likely to live or feed at the Site.

   Identified terrestrial groups that are reasonably likely to live or feed at the Site include:

   - Plants (including trees, shrubs, grasses, flowering plants)
   - Soil-Dwelling Macroinvertebrates
   - Terrestrial Wildlife
     - Mammals
     - Avian Species
     - Reptiles

   Species within each identified group above that have been observed at/near the Site or are expected to live or feed near the Site are identified below.

   Plants

Common Name	Taxa
Shrubs	
Oregon Grape	*Mahonia aquifolium*
Sagebrush	*Artemisia tridentate*
Serviceberry	*Amelanchier alnifolia*
Nootka Rose	*Rosa nutkana*
Snowberry	*Symphoricarpos albus*
Syringa	*Philadephus lewisii*
Trees	
Ponderosa Pine	*Pinus Ponderosa*
Netleaf Hackberry	*Celtis reticulate*
Black Locust	*Robina pseudoacacia*
Grasses	
Bluebunch Wheatgrass	*Agropyron spicatum*
Cheatgrass	*Bromus tectorum*
Flowering Plants	
Arrowleaf Balsamroot	*Balsamorhiza sagittata*
Teasel	*Dipsacus sylvestris*

Soil-Dwelling Macroinvertebrates

Common Name	Taxa
Earthworms	*Oligocheata*
Ground Beetles	*Carabidae*
True Weevils	*Curculionidae*
Termites	*Iosptera*
Ants	*Fomicidae*
Woodlice/Pillbugs	*Isopoda*
Centipedes	*Chilopada*
Millipedes	*Diploda*
Snails	*Gastropoda*

Terrestrial Wildlife

Common Name	Taxa
Mammals	
Mammalian Herbivore	
Mule Deer	*Odocoileus hemionus*
Deer Mouse	*Peromyscus maniculatus*
Ground Squirrel	*Urocitellus washingtoni*
Cottontail Rabbit	*Sylvilagus* spp.
Blacktailed Jackrabbit	*Lepus californicus*
White-tailed Deer	*Odocoileus virgianus*
Shiras Moose	*Alces alces*
Voles (species)	*Microtus* spp.
Mammalian Omnivore	
Badger	*Taxidea taxus*
Yellow-Bellied Marmot	*Marmota flaviventris*
Raccoon	*Procyon lotor*
Chipmunk	*Tamias* spp.
Deer Mouse	*Peromyscus maniculatus*
Striped Skunk	*Mephitis*
Porcupine	*Erethizon dorsatum*
Bats (species)	*Chiroptera*
Mammalian Predator	
Coyote	*Canis latrans*
Vagrant Shrews	*Sorex vagrans*
Avian Species	
Avian Omnivore (Including Insectivorous)	
American Robin	*Turdus migratorius*
Nuthatch	*Sitta* spp
Red-Winged Blackbird	*Agelaius phoeniceus*

Common Name	Taxa
Wren	Troglodytida
Cedar Waxwing	*Bombycilla cedrorum*
Sparrow	Emberizidae
Warbler	Parulidae
Magpie	*Pica hudsonia*
Savannah Sparrow	*Passecrculus sandwichensis*
Western Bluebird	*Sialia mexicana*
Avian Herbivore	
Finch	*Fringillidae*
Canada Goose	*Branta Canadensis*
Mourning Dove	*Zenaida macroura*
Avian Predator	
Osprey	*Pandion haliaetus*
Red-Tailed Hawk	*Buteo jamaicensis*
Reptiles	
Fence Lizard	*Sceloporus occidentalis*
Western Skink	*Eumeces skiltonianus*
Gopher Snake	*Pituophis catenfe*
Western Terrestrial Garter Snake	*Thamnophis elegans*

Threatened and Endangered Species

A review of the Washington State Department of Natural Resources geographic information system data set[1,2] indicated that no threatened or endangered plant species occur within the area of the Site. In addition, no federally listed threatened or endangered terrestrial animal species[3] are expected to occur within the area of the Site while only the mountain quail (*Oreortyx pictus*), a State candidate species, may be found on or near the Site[4]. It is expected though that the representative receptor for ground-feeding avian species, the American robin, will be a qualified surrogate for evaluating any risks.

Surrogate Receptor Species of Concern

The site-specific TEE procedure of MTCA (WAC 173-340-7493) identifies default surrogate wildlife species for assessing risks of hazardous substances in soil to most sites found within Washington State. The identified species are American robin (*Turdus migratorius*), the shrew

[1] The Washington Natural Heritage Program Geographic Information System data set was obtained from the Washington State Department of Natural Resources on May 1, 2013.

[2] A list of known occurrences of rare plants in Spokane County can be found at: https://www.dnr.wa.gov/NHPlists

[3] Lists of federally listed threatened or endangered species are available for Washington at: https://ecos.fws.gov/ecp/report/species-listings-by-state?stateAbbrev=WA&stateName=Washington&statusCategory=Listed

[4] List of Species of Concern in Washington State can be found at: https://wdfw.wa.gov/species-habitats/at-risk/listed

(*Sorex* spp.), and the vole (*Microtus* spp.). The American robin is representative of the omnivorous bird feeding guild, eating both invertebrates (insects and soil-dwelling) and seeds and berries. Shrews are representative of the predatory mammal feeding guild, eating both other mammals as well as invertebrates. The vole is representative of the herbivorous mammal feeding guild. All of these species have relatively-small home ranges (robins have small home ranges during the spring and summer reproduction period, which also represents the period for highest exposure to contaminated soil), are known to be found at/near the Site, and their diets lead to a higher exposure to potentially contaminated soil. These factors, and because these receptors have been heavily studied in the literature, make them qualified candidate surrogate receptors to evaluate potential risks to terrestrial wildlife at this Site.

MTCA does not identify a surrogate receptor for plants. Plants also have varying degrees of toxicity to individual contaminants, thus identifying an appropriate surrogate for a site with multiple contaminants is difficult.

MTCA identifies the earthworm (*Oligocheata*) as the surrogate receptor for soil-dwelling biota. Earthworms spend their entire lives in soil, thus they have a potentially high exposure to any contaminants found in the soil. They are also the diet of numerous other organisms including the robin and the shrew. In addition, earthworms have been heavily studied in their response to soil contamination.

4. Determining significant adverse effects to receptors that may result from exposure to chemicals of concern.

   The ecological indicator hazardous substances for the Site include aluminum, arsenic, barium, chromium, copper, and mercury. Detailed reviews of the ecotoxicity of these constituents to the respective receptor surrogates are provided by:

   - Oak Ridge National Laboratory
     - Terrestrial Plants[5]
     - Soil and Litter Invertebrates and Heterotrophic process[6]
     - Wildlife[7]
   - Environmental Protection Agency[8]
   - U.S. Geological Survey[9]
   - National Park Service[10]

After completing the problem-formulation step, the next step is selecting a method to address issues arising during problem formulation. Before completing the second step, Ecology has the opportunity to determine whether it needs to be completed. If the cleanup action plans

[5] Available online at: https://rais.ornl.gov/documents/tm85r3.pdf
[6] Available online at: https://rais.ornl.gov/documents/tm126r21.pdf
[7] Available online at: https://rais.ornl.gov/documents/tm86r3.pdf
[8] Available online at: https://www.epa.gov/chemical-research/ecological-soil-screening-level
[9] Available online at: https://www.usgs.gov/centers/pwrc
[10] Available online at: http://www.nps.gov

developed for the protection of human health will eliminate the exposure pathways of concern to all the soil contamination, then the TEE can be ended. In all active cleanup scenarios (Section 5.2, excavation or capping), all exposure pathways will be eliminated for ecological receptors concurrently with humans. Therefore, the TEE was ended.

4.4 Site Cleanup Levels

The RI/FS and previous investigations have documented the presence of contamination in soil at the Site. Even though groundwater sampling results were below conservative screening levels, cleanup levels will be fully developed to ensure groundwater is not impacted. Therefore, cleanup levels will be developed for both soil and groundwater.

Since it was determined the Site will move forward as a property with unrestricted site use (Section 4.2), Method B cleanup levels will apply to soil. Since groundwater is an established drinking water source, Method B is appropriate for groundwater.

Tables 2 and 3 show screening of indicators based on detection frequencies for groundwater and soil. If contaminants are detected at a low frequency (generally 5 percent or less), they are not carried forward to cleanup level development. Tables 4 and 5 show the cleanup level screening for groundwater and soil. Since no groundwater concentrations exceed cleanup levels, groundwater is not contaminated, and soil cleanup levels do not have to consider protection of groundwater. Since soil contaminant cleanup levels based on background are not included in calculations for total carcinogenic site risk or hazard quotients, no adjustments are necessary for overall Site risk. There may be a high degree of variability in the composition of the stockpile and contaminated soils, so Table 5 may be used for non-indicators should higher concentrations be discovered during remedy implementation.

This site consists of three separately-owned parcels. Two are currently unused (Pentzer and WSDOT), and one is used for industrial activities (UPRR). Given the UPRR property's planned continued use as an industrial property, it may not be appropriate to achieve unrestricted cleanup levels there. Remediation levels will be applied to portions of the property where unrestricted cleanup levels are not achieved. Remediation levels are defined as "… a concentration … of a hazardous substance in soil, water, air, or sediment above which a particular cleanup action component will be required as part of a cleanup action at a site." (WAC 173-340-200). Simply put, it is an action-based concentration; it is the level used to differentiate between different remedial actions at a Site. Table 6 shows the remediation levels that will be used at the Site. The alternative descriptions in Section 5.2 will state if and how a remediation level would be applied.

4.5 Point of Compliance

MTCA defines the point of compliance as the point or points where cleanup levels shall be attained. Once cleanup levels are met at the point of compliance, the Site is no longer considered a threat to human health or the environment.

WAC 173-340-740(6) gives the point of compliance requirements for soil. The standard soil point of compliance for indicator parameters based on human health protection is established at a depth of 15 feet below ground surface, and for ecological receptor protection at a depth of 6 feet below ground surface. Since soil cleanup levels are based on protection of ecological receptors and background, and site investigations did not find contamination exceeding human health levels from 6 to 15 feet below ground surface, the soil point of compliance will be set at 6 feet below ground surface throughout the Site. Groundwater is not contaminated, so no point of compliance needs to be established for it.

5.0 CLEANUP ACTION SELECTION

5.1 Remedial Action Objectives

The remedial action objectives are statements describing the actions necessary to protect human health and the environment through eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route. They are developed considering the characteristics of the contaminated media, the characteristics of the hazardous substances present, migration and exposure pathways, and potential receptor points.

Soil has been contaminated by past activities at the Site and erosional transport of stockpile materials. People may be exposed to contaminated soil via dermal contact or inhalation of dust. Potential human receptors include on-site workers, trespassers, and recreational users of the Spokane River shoreline. Both plant and animal receptors are also present due to the proximity to undeveloped land.

Given these potential exposure pathways, the following are the remedial action objectives for the Site:

- Prevent or minimize direct contact, ingestion, inhalation, or uptake of stockpile material by humans or ecological receptors.
- Prevent or minimize direct contact, ingestion, inhalation, or uptake of contaminated soil by humans or ecological receptors.
- Prevent or minimize direct contact, ingestion, or uptake of stormwater runoff from the stockpile.
- Prevent or minimize the potential for erosion to mobilize waste material and/or contaminated soil to adjacent properties.

5.2 Cleanup Action Alternatives

Cleanup alternatives to meet these remedial action objectives are evaluated as part of the RI/FS. The FS evaluated multiple alternatives for addressing all contaminated media at the Site. The following three alternatives are based on the proposals made by UPRR in their Revised FS.

5.2.1 Alternative 1: Institutional Controls and Monitoring

This alternative represents the Site with no active measures towards Site cleanup. Actions would include the addition of fencing to restrict access and institutional controls including deed restrictions. Access controls would need to be continuously maintained.

5.2.2 Alternative 2: On-Site Consolidation and Capping

This alternative involves consolidating all soils exceeding cleanup standards onto the main stockpile located on UPRR property. Soils exceeding cleanup standards that would not be placed on UPRR property due to volume restrictions would be disposed of offsite at a permitted landfill consistent with Alternative 3. The stockpile would be regraded, shaped, and compacted to minimize slope steepness. A multimedia cap comprised of a low-permeability barrier and a soil cover would then be installed over the stockpile. This would eliminate any direct contact with stockpile material by humans or ecological receptors, and would eliminate wind and water contact or erosion of the stockpile. Stockpile height is estimated at 32 feet with side slopes of 3:1 or less.

Regular maintenance of the cap would be performed to ensure it remains intact and protective. Institutional controls would be required for the UPRR property.

5.2.3 Alternative 3: Excavation and Disposal at a Permitted Landfill

This alternative would excavate and dispose stockpile material and contaminated soil at a permitted off-site landfill. Several landfills were evaluated in the Revised FS; the Waste Management Landfill at Graham Road was selected. Material would be transported by truck and disposed of at the landfill.

Contaminated soil exceeding cleanup standards would be excavated from the Pentzer and WSDOT properties. Remediation levels would be applied to the UPRR property; any soil exceeding the remediation levels would be excavated, and remaining soil exceeding cleanup levels would be capped in place. Figure 7 presents the anticipated area of soil excavation (the area outlined in yellow but not shaded blue) and the area where remediation levels would be applied (shaded in blue). Following removal of the dross stockpile, areas excavated to below grade would be backfilled to bring the final surface up to elevations comparable to the adjacent properties and to create a flat surface prior to placing the cap on the UPRR property. The cap would consist of a geotextile barrier overlain by a minimum of 6 inches of crushed rock, or a low-permeability surface such as asphalt or concrete. The cap is designed to minimize the potential for erosion by wind or runoff water, and to minimize the possibility of exposure to ecological receptors. Separation geotextile and clean aggregate have been determined to provide protection to burrowing animals from underlying contaminated soil (United States Department of the Interior, 2011).

5.2.4 Alternative 4: Reuse in Industrial Processes

This alternative would excavate all stockpile material and contaminated soil and transport to a selected industrial facility. Material testing was performed that showed the waste material was appropriate for use as an alternative raw material in cement production. Material would be loaded into rail cars and shipped to the selected facility in California. Similar to Alternative 3, remediation levels would be applied to the UPRR property.

5.3 Regulatory Requirements

MTCA sets forth the minimum requirements and procedures for selecting a cleanup action. A cleanup action must meet each of the minimum requirements specified in WAC 173-340-360(2), including certain threshold and other requirements. These requirements are outlined below.

5.3.1 Threshold Requirements

WAC 173-340-360(2)(a) requires that the cleanup action shall:

- Protect human health and the environment;
- Comply with cleanup standards (see Section 5.0);
- Comply with applicable state and federal laws (see Section 6.3.5); and
- Provide for compliance monitoring.

5.3.2 Other Requirements

In addition, WAC 173-340-360(2)(b) states the cleanup action shall:

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and
- Consider public concerns.

WAC 173-340-360(3) describes the specific requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable. A permanent solution is defined as one where cleanup levels can be met without further action being required at the Site other than the disposal of residue from the treatment of hazardous substances. To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, a disproportionate cost analysis is conducted. This analysis compares the costs and benefits of the cleanup action alternatives and considers several factors, including:

- Protectiveness;
- Permanent reduction of toxicity, mobility and volume;
- Cost;
- Long-term effectiveness;
- Short-term risk;
- Implementability; and

- Consideration of public concerns.

The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment.

WAC 173-340-360(4) describes the specific requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame.

5.3.3 Cleanup Action Expectations

WAC 173-340-370 sets forth the following expectations for developing cleanup action alternatives and selecting cleanup actions. These expectations represent the types of cleanup actions Ecology considers likely results of the remedy selection process; however, Ecology recognizes that there may be some sites where cleanup actions conforming to these expectations are not appropriate.

- Treatment technologies will be emphasized at sites with liquid wastes, areas with high concentrations of hazardous substances, or with highly mobile and/or highly treatable contaminants;
- To minimize the need for long-term management of contaminated materials, hazardous substances will be destroyed, detoxified, and/or removed to concentrations below cleanup levels throughout sites with small volumes of hazardous substances;
- Engineering controls, such as containment, may need to be used at sites with large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable;
- To minimize the potential for migration of hazardous substances, active measures will be taken to prevent precipitation and runoff from coming into contact with contaminated soil or waste materials;
- When hazardous substances remain on-site at concentrations that exceed cleanup levels, they will be consolidated to the maximum extent practicable where needed to minimize the potential for direct contact and migration of hazardous substances;
- For sites adjacent to surface water, active measures will be taken to prevent/minimize releases to that water; dilution will not be the sole method for demonstrating compliance;
- Natural attenuation of hazardous substances may be appropriate at sites under certain specified conditions (see WAC 173-340-370(7)); and
- Cleanup actions will not result in a significantly greater overall threat to human health and the environment than other alternatives.

5.3.4 Applicable, Relevant, and Appropriate State and Federal Laws and Local Requirements

WAC 173-340-710(1) requires that all cleanup actions comply with all applicable state and federal law. It further states the term “applicable state and federal laws” shall include legally applicable requirements and those requirements that the department determines “… are

relevant and appropriate requirements." This section discusses applicable state and federal law, relevant and appropriate requirements, and local permitting requirements that were considered and were of primary importance in selecting cleanup requirements. If other requirements are identified at a later date, they will be applied to the cleanup actions at that time.

MTCA provides an exemption from the procedural requirements of several state laws and from any laws authorizing local government permits or approvals for remedial actions conducted under a consent decree, order, or agreed order (RCW 70A.305.090). However, the substantive requirements of a required permit must be met. The procedural requirements of the following state laws are exempted:

- Ch. 70.94 RCW, Washington Clean Air Act;
- Ch. 70.95 RCW, Solid Waste Management, Reduction, and Recycling;
- Ch. 70A.305 RCW, Hazardous Waste Management;
- Ch. 75.20 RCW, Construction Projects in State Waters;
- Ch. 90.48 RCW, Water Pollution Control; and
- Ch. 90.58 RCW, Shoreline Management Act of 1971.

WAC 173-340-710(4) sets forth the criteria Ecology evaluates when determining whether certain requirements are relevant and appropriate for a cleanup action. Table 7 lists the state and federal laws containing the applicable or relevant and appropriate requirements that apply to the cleanup action at the Site. Local laws, which may be more stringent than specified state and federal laws, will govern where applicable.

5.4 Evaluation of Cleanup Action Alternatives

The requirements and criteria outlined in Section 5.3 are used to conduct a comparative evaluation the alternatives and to select a cleanup action from them. Table 8 provides a summary of the ranking of the alternatives against the various criteria.

5.4.1 Threshold Requirements

5.4.1.1 Protection of Human Health and the Environment

Alternative 1 provides no additional protection to human health and the environment, and allows contaminated soil and stockpile exposures to remain. Alternatives 2, 3, and 4 would eliminate the risk due to contaminated soil through either capping or removal. As such, they would protect human health and the environment.

5.4.1.2 Compliance with State and Federal Laws

Alternative 1 would not be in compliance with state and federal laws because contaminated media would not be remediated, and would represent a violation of MTCA. Alternatives 2, 3, and 4 would be in compliance with applicable state and federal laws listed in Table 7. Local

laws, which can be more stringent, will govern actions when they are applicable. These will be established during the design phase of the project.

5.4.1.3 Provision for Compliance Monitoring

There are three types of compliance monitoring: protection, performance, and confirmational. Protection monitoring is designed to protect human health and the environment during the construction and operation and maintenance phases of the cleanup action. Performance monitoring confirms the cleanup action has met cleanup and/or performance standards. Confirmational monitoring confirms the long-term effectiveness of the cleanup action once cleanup standards have been met or other performance standards have been attained. Alternatives 2, 3, and would meet this provision as all would require varying levels of all three types of compliance monitoring.

5.4.2 Other Requirements

5.4.2.1 Use of Permanent Solutions to the Maximum Extent Practicable

As discussed previously, to determine whether a cleanup action uses permanent solutions to the maximum extent practicable, the disproportionate cost analysis specified in the regulation is used. The analysis compares the costs and benefits of the cleanup action alternatives and involves the consideration of several factors. The comparison of costs and benefits may be quantitative, but will often be qualitative and require the use of best professional judgment. Alternative 1 is not evaluated here because it does not meet threshold requirements. Table 8 provides a summary of the relative ranking of each alternative in the decision process.

- Protectiveness

  Protectiveness measures the degree to which existing risks are reduced, time required to reduce risk and attain cleanup standards, on- and off-site risks resulting from implementing the alternative, and improvement of overall environmental quality.

  Alternatives 2, 3, and 4 would be protective. All would equivalently reduce risks, attain cleanup standards, and improve overall environmental quality. All would have risks associated with their implementation, but Alternatives 3 and 4 would be slightly higher because of the removal of the most highly contaminated materials.

- Permanent Reduction of Toxicity, Mobility, and Volume

  Permanence measures the adequacy of the alternative in destroying the hazardous substance(s), the reduction or elimination of releases or sources of releases, the degree of irreversibility of any treatment process, and the characteristics and quantity of any treatment residuals.

  Alternatives 3 and 4 would have the highest degree of reduction because stockpile material and most contaminated soil would be removed, representing the largest

volume of material of all the alternatives. Both alternatives would also significantly reduce mobility by capping lower concentration contaminated soil that is left in place. Alternative 2 would rely on cap maintenance and institutional controls, thereby making it less permanent because future actions could undo them.

- Cleanup Costs

  Costs are approximated based on specific design assumptions for each alternative. Although the costs provided by UPRR and its consultants are estimates based on design assumptions that might change, the relative costs can be used for this evaluation. For a detailed description of the costs involved with each alternative, please refer to the Revised FS.

  Alternative 2 would involve consolidating contaminated soils onto the stockpile, and constructing a multimedia cap over the stockpile. Costs also include fencing, constructing stormwater drainage ditches, preparing reports, and long-term cap maintenance. The estimate for this alternative is $3,929,000, which does not include costs associated with required access and use of the Pentzer property.

  Alternative 3 would involve removing contaminated soil and the stockpile. It includes costs for excavation, staging, transport by truck, and disposal of contamination at the Graham Road Landfill in Medical Lake, WA. Costs also include restorating the Site, abandoning monitoring wells, and preparing reports. The estimate for this alternative is $8,082,000.

  Alternative 4 includes the costs for excavating and transporting contamination by rail to a cement-manufacturing company in California. Costs also include restoring the Site, abandoning monitoring wells, preparing reports, and possibly constructing a temporary rail crossing. The estimate for this alternative is $6,737,000.

- Long-Term Effectiveness

  Long-term effectiveness measures the degree of success, the reliability of the alternative during the period that hazardous substances will remain above cleanup levels, the magnitude of residual risk after implementation, and the effectiveness of controls required to manage remaining wastes.

  Alternatives 3 and 4 would rank higher than Alternative 2 because they completely remove the highest amount of contamination from the site.

  Alternatives 3 and 4 would have the highest degree of long-term effectiveness. By removing the most highly contaminated materials, the risk of contamination left behind is significantly reduced. Alternative 2 relies on containment of all contaminated material, so it would have the highest level of residual risk and require ongoing maintenance. The containment area created by Alternative 2 would be fairly steep-sided

and would be highly susceptible to erosion and trespass, leading to degradation of the cover system in the long-term. This would lead to lower long-term effectiveness.

- Short-Term Risk

  Short-term risk measures the risks related to an alternative during construction and implementation, and the effectiveness of measures taken to manage such risks.

  The highest risk related to all potential soil actions at this Site involves working on or very near active rail lines, but all alternatives are equivalent for that risk. All alternatives will involve earth work, and so will have equivalent measures to manage dust and potential exposures. Alternative 2 presents additional short-term risk due to the difficulty of earthwork on the steeper slopes of the containment area. Alternatives 3 and 4 would have additional short-term risk because of necessary measures to control contaminated material during transport. Alternative 4 risk is slightly higher due to longer transport distances to industrial users.

- Implementability

  Implementability considers whether the alternative is technically possible; the availability of necessary off-site facilities, services, and materials; administrative and regulatory requirements; scheduling; size; complexity; monitoring requirements; access for operations and monitoring; and integrations with existing facility operations.

  All alternatives are implementable at the Site. They are technically possible, have infrastructure to support them, and have similar size and access. Alternative 2 would have administrative and regulatory requirements due to the need for maintenance, institutional controls, and monitoring. Alternative 3 would have to meet characterization requirements for acceptance at the landfill. Alternative 4 would need to meet the shipping requirements for waste materials to be transported across state lines, and may need additional material handling to meet moisture requirements. Alternative 2 presents several engineering challenges related to the limited space at the current location of the stockpile. The slopes of the cap would need to be very steep and would require additional engineering controls. Creating a steep-sided landfill within a very limited area would be more difficult to implement. Alternative 3 ranks the highest, followed by Alternative 4, and then Alternative 2.

- Consider Public Concerns

  All alternatives would provide opportunity for members of the public to review and comment on any proposals or plans.

Costs are disproportionate to the benefits if the incremental costs of an alternative are disproportionate to the incremental benefits of that alternative. Based on the analysis of the factors above, Ecology determined Alternative 3 has the highest ranking for use of a permanent

solution to the maximum extent practicable, followed by Alternative 4, and then Alternative 2. Alternative 2 provides a high degree of protection at a lower cost, but the long-term risks are high and the action has a high degree of reliance on maintenance. Alternative 1 is not subject to this analysis because it does not meet the threshold criteria.

5.4.2.2 Provide a Reasonable Restoration Time Frame

WAC 173-340-360(4) describes the specific requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame, as required under subsection (2)(b)(ii). The factors used to determine whether a cleanup action provides a reasonable restoration time frame are set forth in WAC 173-340-360(4)(b).

All alternatives would have the same restoration time frame, as the actions would meet cleanup standards immediately upon completion. Alternative 2 would be less preferred since it would rely on institutional controls to sustain restoration. All alternatives are consistent with or meet the factors provided for evaluating this criterion.

However, the implementation time frame for each alternative differs. Alternative 4 would likely require time to build a temporary rail crossing and move the same amount of material to the staging area. However, due to limitations on the amount of material that can be used in the industrial process, Alternative 4 would require one to two years (or more) to remove all contamination. Therefore, Alternative 3 ranks higher than the other two alternatives because it permanently achieves cleanup standards in the shortest timeframe.

5.4.3 Cleanup Action Expectations

Specific expectations of cleanup levels are outlined in WAC 173-340-370 and are described in Section 5.3.3. Among those, all alternatives would address applicable expectations in the following manner:

- Alternatives 3 and 4 would minimize the need for long-term management of contaminated materials by removing a significant volume of contamination.
- Alternatives 2, 3, and 4 would use engineering controls with large volumes of materials at lower levels of contamination and would consolidate those materials.
- Alternatives 2, 3, and 4 would control surface runoff to prevent any impacts to surface water.

5.5 Decision

Based on the analysis described above, Alternative 3 has been selected as the proposed remedial action for the Site. The alternative meets each of the minimum requirements for remedial actions.

Alternative 3 meets each of the threshold requirements. Furthermore, Alternative 3 uses permanent solutions to the maximum extent practicable and provides a more reliable long-

term protection of human health and the environment than Alternatives 2 and 4 and does so in a shorter time frame. The incremental cost of Alternative 4 does not justify the incremental benefit of a reuse/recycling option.

6.0 SELECTED REMEDIAL ACTION

The proposed cleanup action for the Site includes excavating contaminated stockpile materials and soil above cleanup levels, transporting via truck to a permitted disposal facility, and grading and revegetating the ground surface on the Pentzer and WSDOT properties. For the UPRR property, the same actions will be taken except that remediation levels will be used to determine which soils will be excavated/disposed and which soils will be capped. For those soils exceeding cleanup levels but are below remediation levels, they will be capped with a combination of asphalt, concrete, and/or geotextile barrier/minimum of 6 inches of crushed rock.

Because contaminated material would remain on the UPRR property exceeding unrestricted cleanup levels, periodic monitoring and maintenance, institutional controls, and future periodic reviews would be required for that property.

6.1 Institutional Controls

Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at the Site. Such measures are required to assure both the continued protection of human health and the environment and the integrity of the cleanup action whenever hazardous substances remain at the Site at concentrations exceeding applicable cleanup levels. Institutional controls can include both physical measures and legal and administrative mechanisms. WAC 173-340-440 provides information on institutional controls, and the conditions under which they may be removed. Because contamination will be left behind and remediation levels will be used, an Environmental Covenant (in conformance with the Uniform Environmental Covenants Act, Ch. 64-70 RCW) will be required for the UPRR property.

Institutional controls will be included in the cleanup action to address soil contamination remaining below caps.

6.2 Financial Assurances

WAC 173-340-440 states that financial assurance mechanisms shall be required at sites where the selected cleanup action includes engineered and/or institutional controls. Financial assurances are required at this Site because institutional controls are required at the Site.

6.3 Periodic Review

WAC 173-340-420 states that at sites where a cleanup action requires an institutional control, a periodic review shall be completed no less frequently than every five years after the initiation of a cleanup action. Periodic reviews will be required for the Site.

7.0 REFERENCES CITED

Golder Associates Inc. 2021a. Revised Feasibility Study, Aluminum Recycling Trentwood Site.

_____. 2021b. Completion Report Dross Removal Project – WSDOT Property Union Pacific Railroad, Aluminum Recycling Trentwood Site.

_____. 2021c. Completion Report Pre-Design Investigation Union Pacific Railroad, Aluminum Recycling Trentwood Site.

United States Department of the Interior, Fish and Wildlife Service, 2011, Response to Comments Submitted for the Engineering Evaluation Cost Analysis Report for the Midway Atoll National Wildlife Refuge.

Washington State Department of Ecology, 2001, Model Toxics Cleanup Act Regulation Chapter 173-340 WAC.

FIGURES

Figure 1: Site Location

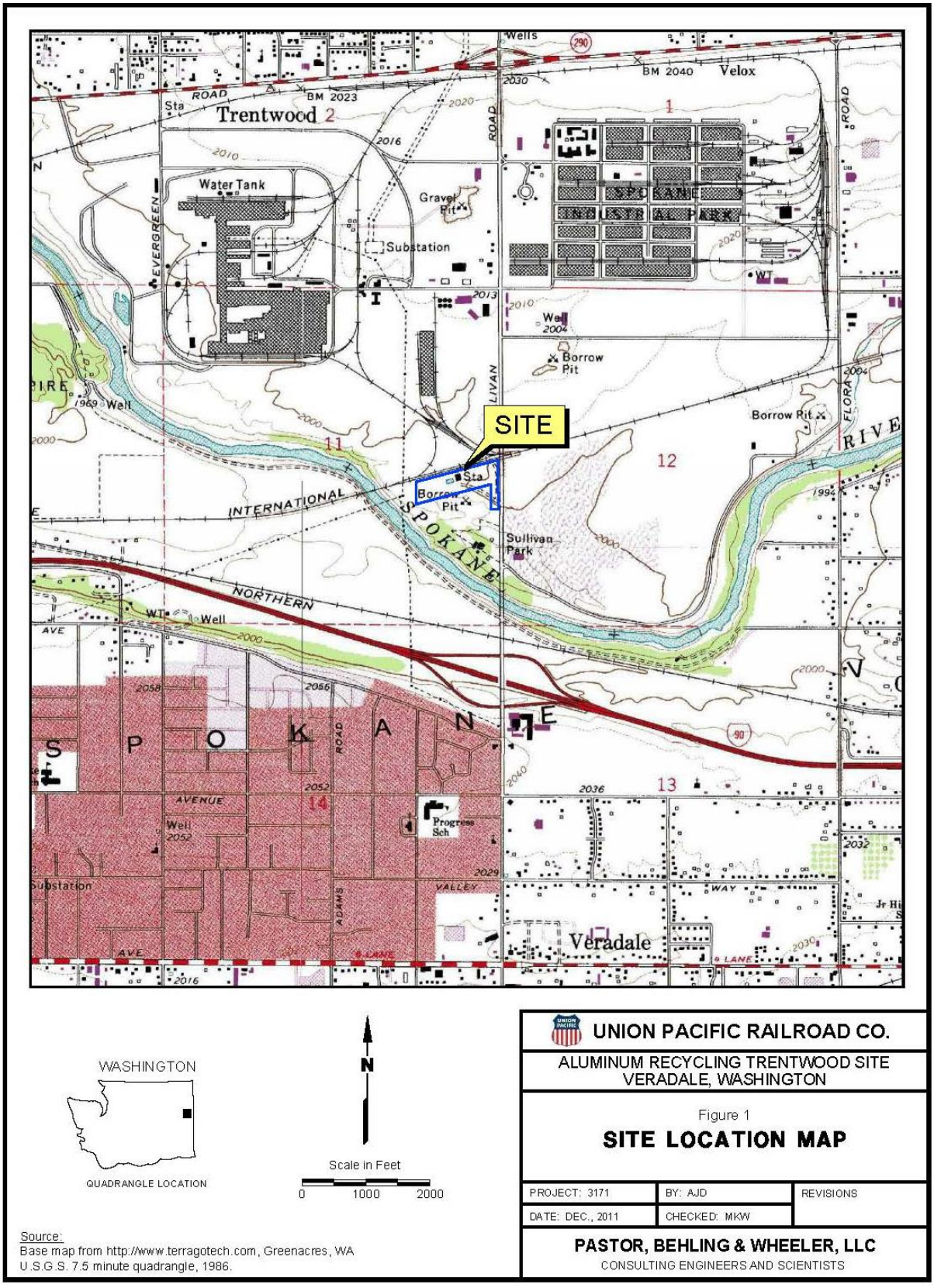


Figure 2: Site Map

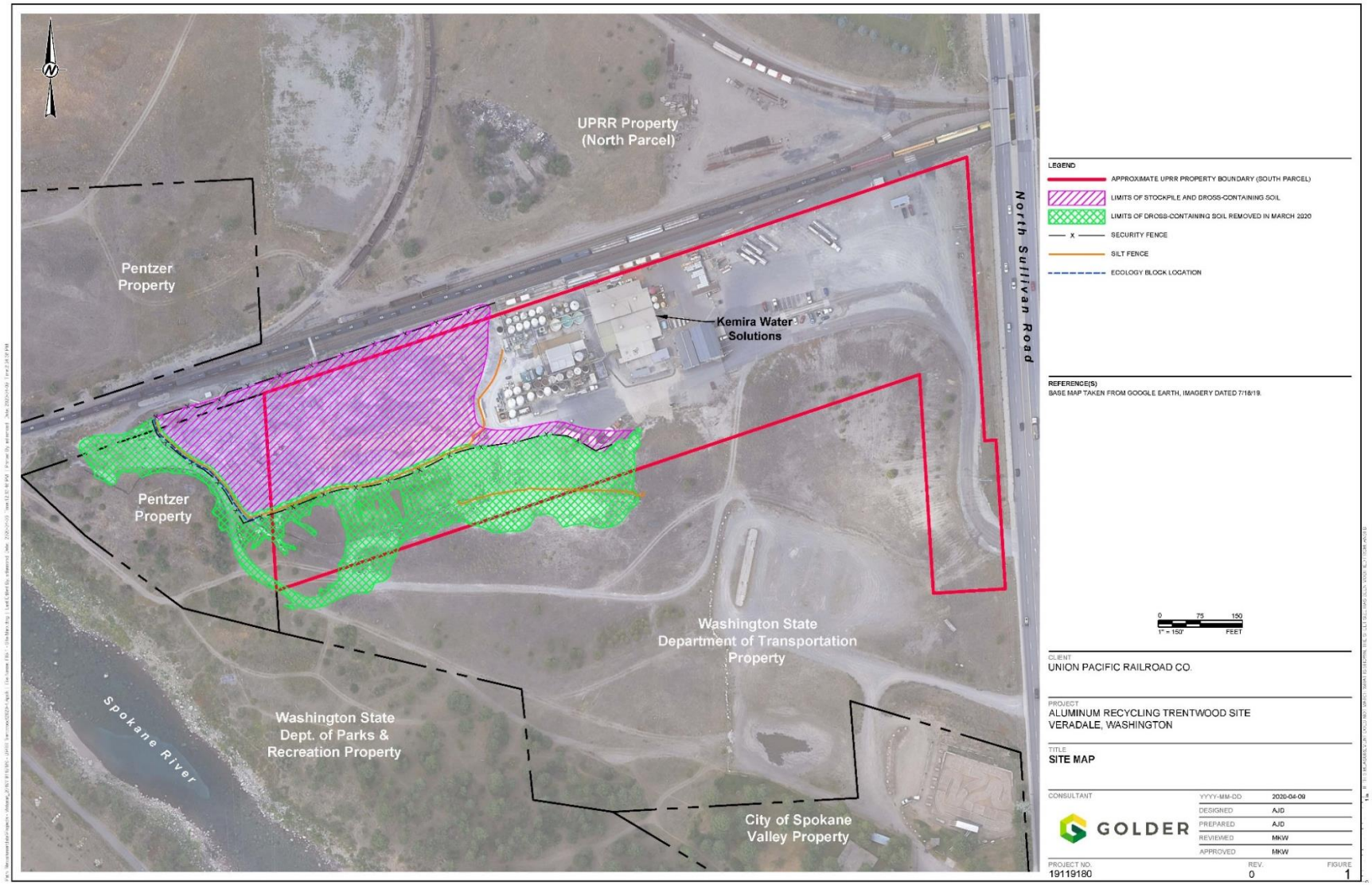


Figure 3: Remedial Investigation Sampling Locations

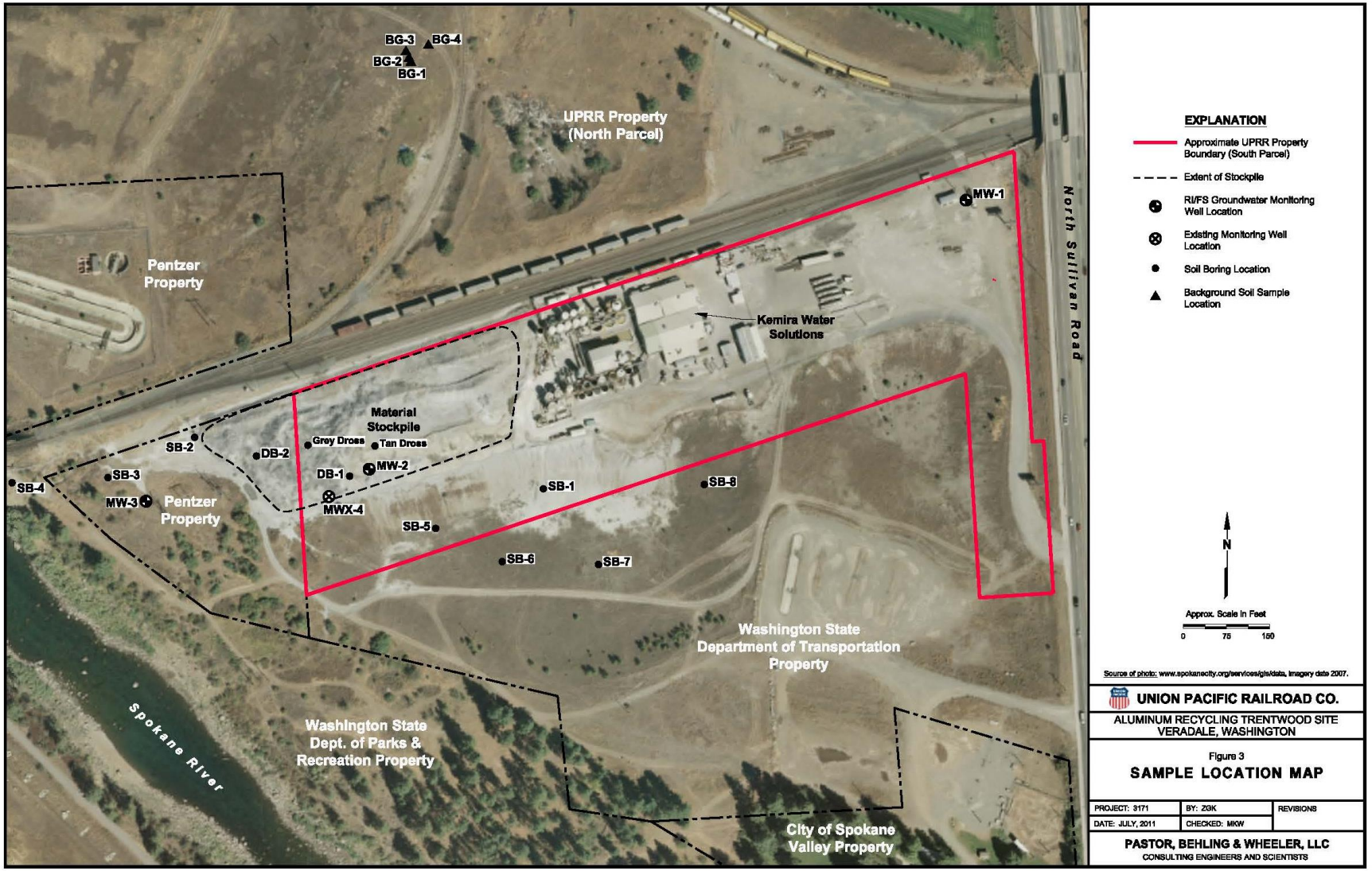


Figure 4: Post-Independent Cleanup Action Sample Locations

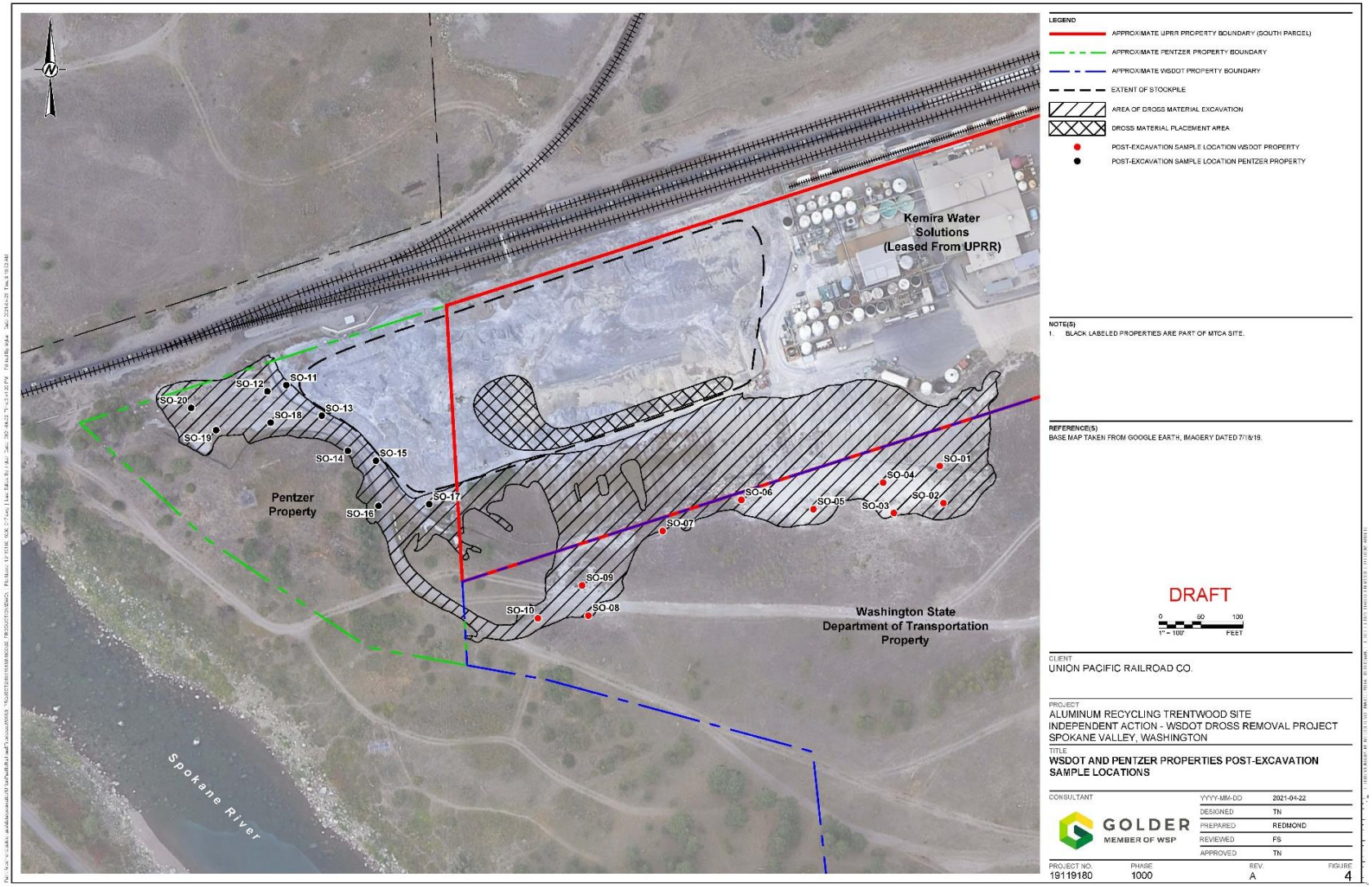


Figure 5: PDI Sample Locations

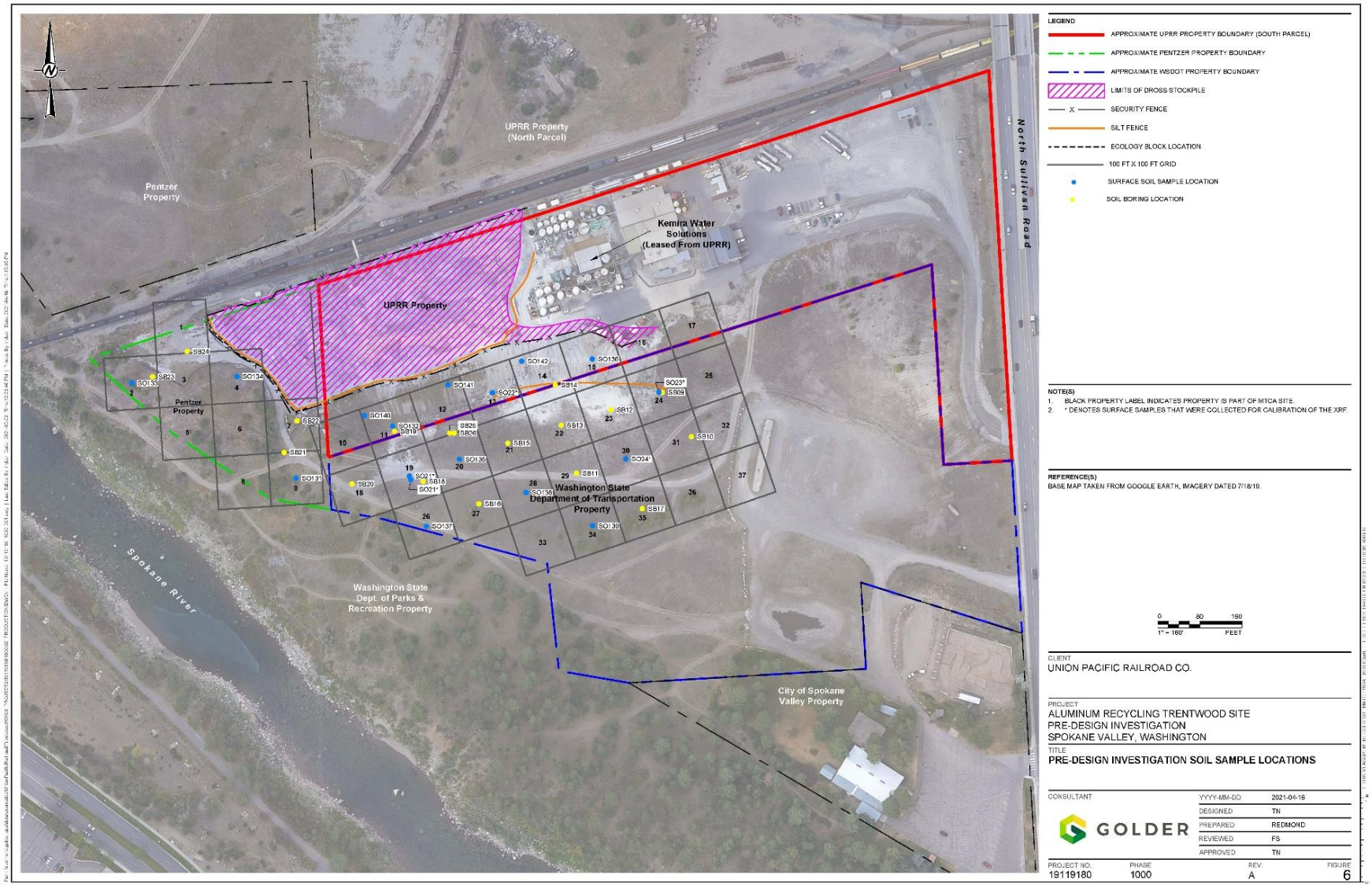
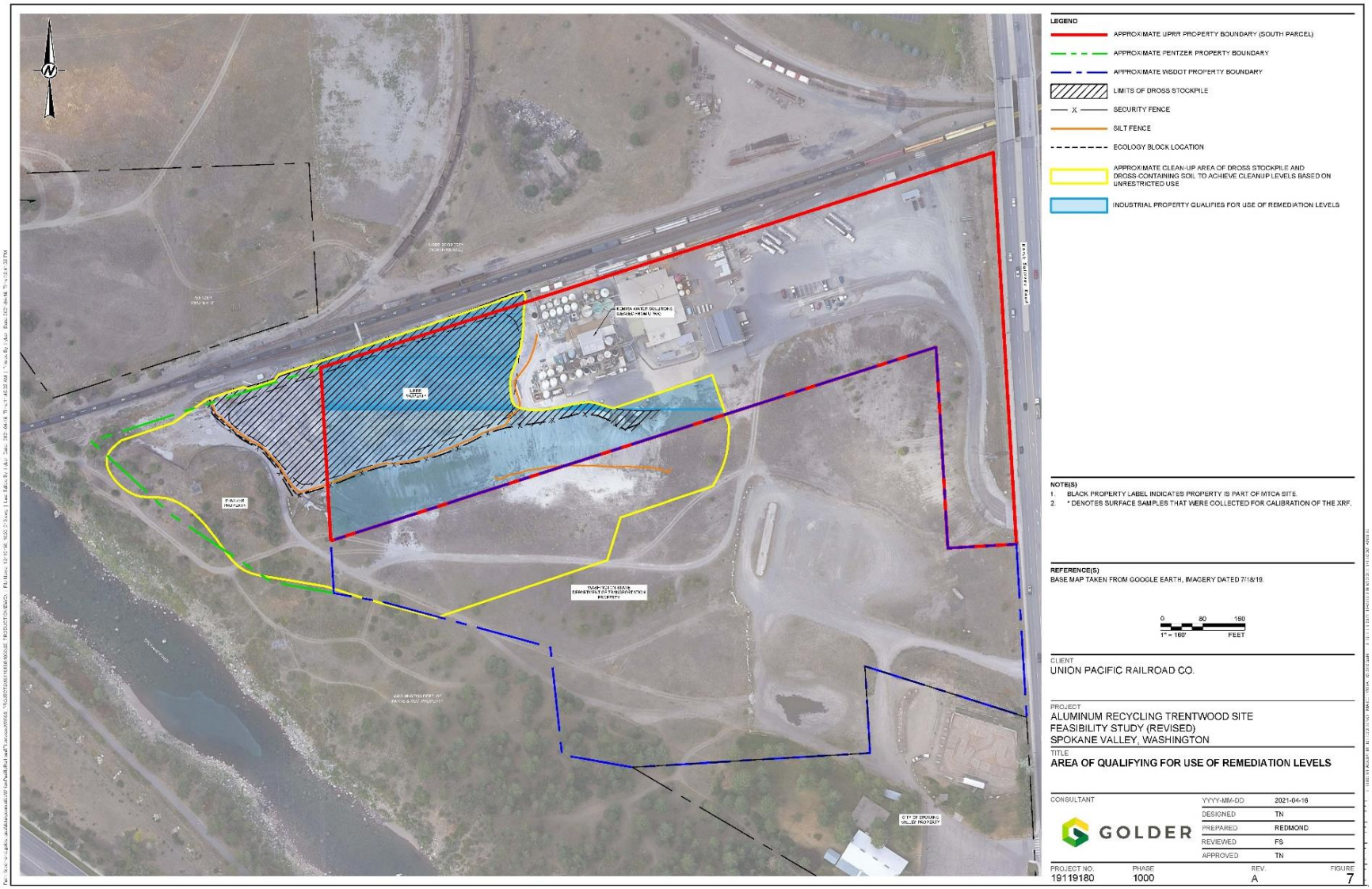


Figure 6: Selected Remedial Action Areas



TABLES

Table 1: Ecological Screening of Contaminants

Analyte	Maximum Detection	Protection of Plants [a]	Protection of Soil Biota [a]	Protection of Wildlife [a]	Potential Concern?
Aluminum	70,000	50			yes
Arsenic	16	10	60	132	yes
Barium	160	500		102	yes
Chromium (total)	86	42	42	67	yes
Copper	980	100	50	217	yes
Lead	40	50	500	118	no
Mercury	5.2	0.3	0.1	5.5	yes
Silver	0.11 [b]	2			no
Nitrate	101				no
Nitrite	4.2 [b]				no

All values are in milligrams per kilogram.

a = ecological indicator soil concentration from WAC 173-340 Table 749-3

b = analyte concentration is only an estimated value

Table 2: Groundwater Detection Frequency

Analyte [a]	Total Samples	Number of Detections	Detection Frequency	Maximum Concentration
Aluminum	6	1	16.67%	660 [b]
Arsenic	6	0	0.00%	<0.24
Barium	6	6	100.00%	35
Cadmium	6	0	0.00%	<0.14
Chromium (total)	6	3	50.00%	2.9 [b]
Copper	6	0	0.00%	<4.5
Lead	6	2	33.33%	5.9
Selenium	6	0	0.00%	<0.76 [b]
Silver	6	0	0.00%	<0.15
Mercury	6	3	50.00%	0.051 [b]
Fluoride	6	0	0.00%	<500
Nitrate	6	6	100.00%	990
Nitrite	6	1	16.67%	<200

All values are in micrograms per liter.

a = analytes are only listed if they have cleanup levels available

b = analyte concentration is only an estimated value

Table 3: Soil Detection Frequency

Analyte [a]	Total Samples	Number of Detections	Detection Frequency	Maximum Detection
Aluminum	28	27	96.43%	70,000
Arsenic	28	28	100.00%	16
Barium	28	28	100.00%	160
Cadmium	28	0	0.00%	
Chromium (total)	28	28	100.00%	86
Copper	28	28	100.00%	980
Lead	28	28	100.00%	40
Mercury	28	17	60.71%	5.2
Selenium	28	0	0.00%	
Silver	28	2	7.14%	0.11 [b]
Nitrate	28	20	71.43%	101
Nitrite	28	4	14.29%	4.2 [b]

All values are milligrams per kilogram.

a = analytes are only listed if they have cleanup levels available

b = analyte concentration is only an estimated value

Table 4: Groundwater Cleanup Levels

Analyte	Max Conc-entration	Federal MCL	Federal MCLG	State MCL	MTCA Hazard Quotient at MCL	Is MCL Protective?	Method A	Method B, non-carcinogen	Drinking Water Protection Criteria	Cleanup Level	Indicator?	Basis
Aluminum	660							**16,000**		16,000	no	C_m<CUL
Barium	35	**2000**	2000	2000	0.625	yes		3200	2000	2000	no	C_m<CUL
Chromium (total)	2.9 [b]	100	100	100	NA		**50** [a]			50	no	C_m<CUL
Lead	5.9	**15**		15	NA		15		15	15	no	C_m<CUL
Mercury	0.051 [b]	**2**	2	2	NA		2			2	no	C_m<CUL
Nitrate	990	**10,000**	10,000	10,000	0.385	yes		26,000		10,000	no	C_m<CUL
Nitrite	<200	**1000**	1000	1000	0.625	yes		1600		1000	no	C_m<CUL

All values are in micrograms per liter.
a = conservatively assumes hexavalent chromium is present
b = analyte concentration is only an estimated value
C_m = maximum concentration
CUL = cleanup level
MCL = maximum contaminant levelI
MCLG = maximum contaminant level goal
MTCA = Model Toxics Control Act
bold = applicable value selected as cleanup level
NA = not applicable

Table 5: Soil Cleanup Levels

Analyte	Maximum Value	Method A Unrestricted	Method B Unrestricted, carcinogen	Method B Unrestricted, non-carcinogen	Ecological Indicator Values [a]	Detected in Groundwater?	Protection of Groundwater [b]	Back-ground	Cleanup Level	Indicator?	Basis
Aluminum	70,000			80,000	50	yes	6,900,000	**21,400**	21,400	yes	background
Arsenic	16	20	0.67	24	**10**	no	42	9	10	yes	ecological
Barium	160			16,000	**102**	yes	24,000		102	yes	ecological
Chromium (total)	86 [c]	2,000 [d]		120,000	**42**	yes	6,900,000	18	42	yes	ecological
Copper	980			3,200	**50**	no	4,100	22	50	yes	ecological
Lead	40	250			**50**	yes	43,000	15	50	no	C_m<CUL
Mercury	5.2	2			**0.1**	yes	30	0.02	0.1	yes	ecological
Nitrate	101			**130,000**		yes	no value		130,000	no	C_m<CUL
Nitrite	4.2 [d]			**8,000**		yes	no value		8,000	no	C_m<CUL
Silver	0.36 [d]			400	**2**	no	190		2	no	C_m<CUL

All values are milligrams per kilogram.

a = value represents the most conservative ecological receptor for each contaminant from Table 1

b = protective of unsaturated zone of groundwater, using site specific groundwater flow and infiltration values

c = this concentration represents total chromium; site data shows that over 98 percent of chromium is present as trivalent chromium; therefore, total chromium values are appropriate to use

d = analyte concentration is only an estimated value

bold = applicable value selected as cleanup level

C_m = maximum concentration

CUL = cleanup level

Table 6: Soil Remediation Levels

Analyte	Method C Industrial, carcinogen	Method C Industrial, non-carcinogen	Ecological Indicator Concentrations [a]	Protection of Groundwater [b]	Remediation Level	Basis
Aluminum	NR	**3,500,000**		6,900,000	3,500,000	human health
Arsenic	88	1,100	132	**42**	42	gw protection
Barium	NR	**700,000**	102	24,000	700,000	human health
Chromium (total)	NR	**5,300,000**	67	6,900,000	5,300,000	human health
Copper	NR	**140,000**	217	4,100	140,000	human health
Mercury	NR	NR	**5.5**	30	5.5	ecological

All values are milligrams per kilogram.

a = value represents exposure to wildlife in Table 749-3 for industrial site use; since a cap protective of ecological receptors will be placed over all contamination exceeding unrestrictive cleanup levels, these values won't drive remediation levels (unless no other appropriate values exist)

b = protective of unsaturated zone of groundwater, using site specific groundwater flow and infiltration values

NR = not researched; no value exists for this parameter

bold = applicable value selected as remediation level

Table 7: Applicable, Relevant, and Appropriate Requirements

Cleanup Action

Ch. 18.104 RCW;	Water Well Construction;
Ch. 173-160 WAC	Minimum Standards for Construction and Maintenance of Water Wells
Ch. 173-162 WAC	Rules & Regulations Governing the Licensing of Well Contractors & Operators
Ch. 70A.305 RCW;	Model Toxics Control Act;
Ch. 173-340 WAC	MTCA Cleanup Regulation
Ch. 43.21C RCW;	State Environmental Policy Act;
Ch. 197-11 WAC	SEPA Rules
29 CFR 1910	Occupational Safety and Health Act

Air

42 USC 7401;	Clean Air Act of 1977;
40 CFR 50	National Ambient Air Quality Standards
Ch. 70.94 RCW;	Washington Clean Air Act;
Ch. 43.21A RCW; Ch. 173-400 WAC	General Regulations for Air Pollution
Ch. 173-460 WAC	Controls for New Sources of Air Pollution
Ch. 173-470 WAC	Ambient Air Quality Standards for Particulate Matter
Ch. 70A.305 RCW;	Model Toxics Control Act;
Ch. 173-340 WAC	MTCA Cleanup Regulation

Table 8: Alternative Evaluation

Criteria	Alternative 1 - No action	Alternative 2 - On-site Consolidation & Capping	Alternative 3 - Excavation & Disposal at a Permitted Landfill	Alternative 4 - Reuse in Industrial Processes
Threshold Requirements				
Protection of human health & environment	no	yes	yes	yes
Compliance with cleanup standards	no	yes	yes	yes
Compliance with state & federal laws	no	yes	yes	yes
Provision for compliance monitoring	yes	yes	yes	yes
Other Requirements				
Use of Permanent Solutions (disproportionate cost analysis)	--	rank #3	rank #1	rank #2
1. Protectiveness	--	2	1	1
2. Permanent Reduction	--	2	1	1
3. Cleanup Cost (estimated)	--	$3,929,000	$8,082,000	$6,737,000
4. Long-term Effectiveness	--	2	1	1
5. Short-term Risk	--	2	1	1
6. Implementability	--	3	1	2
7. Consider Public Concerns	--	yes	yes	yes
Provide Reasonable Time Frame	--	yes	yes - highest	yes - lowest
Consider Public Comments	--	yes	yes	yes