CONTAMINATED MEDIA MANAGEMENT PLAN

ELK RIDGE ESTATES
NORTHEAST OF HANKEY ROAD AND BARRICK LANE
ST. HELENS, OREGON 97051

Prepared for:

Elk Ridge Estates Home Owners Association, Inc.
P.O. Box 288
Washougal, WA 98671

Prepared by:

EVREN NORTHWEST INC.
environmental / natural resource consultants

Mailing Address: P.O. Box 14488, Portland, Oregon 97293
Offices in Portland and Bend, Oregon / Spokane, Washington
T. 503-452-5561 / e. ENW@EVREN-NW.com

August 10, 2016

Project No. 826-12001-06

Purpose and Use

This **Contaminated Media Management Plan** (Plan) has been prepared by EVREN Northwest, Inc. (ENW) at the request of Elk Ridge Estates Home Owners Association, Inc. to assist both contractors during site development AND the future homeowner association (HOA) at the Elk Ridge Estates subdivision located in St. Helens, Oregon. This Plan applies to site development, operations, maintenance and other work, and:

- Has been designed as a tool for architects, engineers, and others involved in the design, planning, and implementation of subject site development.
- Has been designed to inform and guide the HOA once site development is complete.
- Has been prepared in accordance with State of Oregon requirements.
- Outlines methods to minimize risk to human health and the environment from historic contamination at the site.
- Provides guidance for managing impacted soil, sediment and water.

Any firm or person involved in any work with the potential to come in contact with contaminated media at the subject site must review, understand, and follow this Plan.

Use

Any firm or person with the potential to come in contact with the contaminated media at the subject site (e.g., contractors, maintenance workers, landscapers, utility companies, etc.) will each be provided a copy of this Plan and informed of their responsibility to ensure all work is conducted following the Plan, which:

- Explains the current understanding of impacted media at the site.
- Details contractor, subcontractor, field personnel and permitting requirements.
- Outlines guidance and requirements for managing impacted media in a manner that is protective of human health and the environment.

This Plan must be reviewed and signed by any person involved in any work with the potential to come in contact with contaminated media at the subject site prior to site work. A copy of this Plan will be made available to all personnel involved as a reference, with at least one copy being kept onsite during work. In order to document review and understanding, an acknowledgement page has been prepared (Appendix A) and ***must*** be signed by anyone conducting work involving contaminated media at the site prior to the commencement of this work.

Any person involved in any subsurface work at the subject property must review, understand, and follow this plan.

Assignment of Responsibility

At all times, a responsible representative shall be identified who will 1) ensure that any person or firm with the potential to come in contact with contaminated media will be provided a copy of this Plan, and 2) that the Plan review schedule described below is maintained.

Responsible Representative:

Name: _____ **Phone:** _____

Company: _____ **Position:** _____

Plan Review Schedule

This Plan requires review and updates anytime significant changes are made to the property that affect areas of residual contamination or the storm water drainage system. In addition, regulations should be reviewed for any updates applicable to the activities covered under this Plan.

NOTE: At the time of this Plan's preparation, the subdivision was still under development. As future phases are completed, the Plan should be updated.

Limitations

This Contaminated Media Management Plan (Plan) is reflective of site conditions discovered through environmental site assessments. Required actions described in this Plan are consistent with State of Oregon and Oregon Department of Environmental Quality (ODEQ) rules, regulations and guidance enforce and available as of July 2016. The Client is advised to check for any updates that may be applicable to a specific scope of work being conducted under this Plan.

No warranties are expressed or implied concerning potential contaminants or environmental media not addressed through sampling and analysis. EVREN Northwest is not responsible for conditions or consequences arising from information not available at the time of Plan preparation. This Plan was prepared in accordance with generally accepted professional practice in the area at this time for the exclusive use of our client and their agents or authorized third parties. No other warranty, either expressed or implied, is made.

CONTENTS

Figures (After TEXT)

Appendices

ACRONYM AND ABBREVIATION LIST

amsl	above mean sea level
AST	above-ground storage tank
bgs	below ground surface
BPA	Bonneville Power Administration
DRO	diesel-range organics
ENW	EVREN Northwest, Inc.
HOA	homeowner association
mg/Kg	milligrams per Kilogram
mg/L	milligrams per Liter
ODEQ	Oregon Department of Environmental Quality
OSHA	Occupational Safety & Health Administration
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
Plan	Contaminated Media Management Plan
RCRA	Resource Conservation and Recovery Act
RRO	residual (oil)-range organics
SLRBCS	screening-level risk-based concentrations
TCLP	Toxic Characteristic Leaching Procedure
µg/L	micrograms per Liter
USGS	US Geological Survey

1.0 SITE SETTING AND ENVIRONMENTAL CONDITIONS

This Plan applies to the subject property, the approximate 72-acre Elk Ridge Estates subdivision located northeast of the intersection of Hankey Road and Barrick Lane, west of St. Helens, Oregon, as shown on Figure 1. The property is to be developed in phases with residential lots, connecting drives and open spaces (Figure 2).

1.1 Site Setting

The residential Elk Ridge Estates subdivision is bounded by Barrick Lane to the southeast, Hankey Road and Milton Creek to the southwest, Perry Creek Road and Perry Creek to the west, forest land and farm land to the north, and forest land to the east. Single-family residences are developed south of the subject site along Hankey Road and Pittsburg Road. A rock quarry operated by Eagle Star Rock Products is west of Perry Creek and the site.

In preparation for developing this site, approximately 7,000 cubic yards of buried solid waste from the historical landfill proximal to a drainage ravine on the southern portion of the site were excavated under the direction of a former owner and developer of the property. The removed solid waste was screened, and the portion that passed the screen was placed back in the excavation. Part of the solid waste that did not pass the screen was disposed of at Hillsboro Landfill (822 tons), while the remainder of the solid waste was placed in an unlined cell within the Bonneville Power Administration (BPA) easement located on the northern part of the site.

The majority of the site has been re-graded and infrastructure (streets, vehicle turn-outs, medians, curbs, sidewalks, and utilities) installed for the future residential housing development. At the time of this assessment, several building lots had been developed and houses constructed in Phase 2 of the development on the southeast part of the site.

Topography. The subject site is located within the US Geological Survey (USGS) St. Helens 7.5-minute quadrangle. The topography rises from an elevation of approximately 190 feet above mean sea level (amsl) at the site's southern reach, to an elevation of approximately 430 feet amsl at the site's northern edge (see Figure 1).

Regional Geology. The site and surrounding area are located within the northern part of the Portland Basin, which is the northernmost of several sediment-filled structural basins that comprise the Willamette Valley segment of the Puget-Willamette Lowland[1]. This lowland is a complex structural and topographic sediment-filled trough that lies between Puget Sound to the north, west-central Oregon to the south, the Cascade Range to the east, and the Coast Range to the west. Geologic mapping in the site area indicates that the south and northwest portions of the site are underlain by Miocene tholeiitic basalt lava flows of the Sentinel Bluffs member of

[1] Evarts, R.C., 2004, Geologic Map of the Saint Helens Quadrangle, Columbia County, Oregon, and Clark and Cowlitz Counties, Washington: U.S. Geological Survey Scientific Investigations Pamphlet and Map 2834, 23 p., and map.

Grande Ronde Basalt, of the Columbia River Basalt Group; the north-central portion of the site is mapped as underlain by Miocene Sandy River Mudstone; and the northeast portion of the site is mapped as Quaternary landslide deposits. Intensely weathered basalt (saprolite), basalt fragments, and competent basalt were encountered in test pits and borings on the southern portion of the site. Claystone, mudstone, and/or siltstone were encountered throughout the site and appear to overlie weathered and competent basalt on the southern portion of the site. Landslide deposits encountered on the northern portion of the site consisted of siltstone and claystone with occasional basalt cobbles. These geologic units are described in ENW's *Beneficial Water Use Determination* report[2].

Surface Water. Topographic mapping by the USGS indicates that the majority of the site slopes toward the southwest to a gully located at the southern extent of the development adjacent to Barrick Lane. This area is a designated as Tract B Open Space and is 2.37 acres in size.[3]

A small, seasonal storm water treatment pond is located on Tract B and is recharged by storm-generated surface water at the site. During large precipitation events, impounded storm water overflows the impoundment structure (earthen dam) at the southwest end of the pond and ultimately flows into a culvert that passes under Hankey Road to the west (Figure 2). Storm water that passes through the culvert discharges into Milton Creek to the west of Hankey Road.

Perry Creek's confluence with Milton Creek is a short distance southwest of the site. Milton Creek flows just over three (3) miles southeast to a point where it discharges into the north end of Scappoose Bay, near the side channel west of the north end of Sauvie Island and the Columbia River.

Ground Water. The estimated depth to regional ground water at the site ranges from approximately 178 feet below ground surface (bgs) at the north end of the property to 97 feet bgs at the south end of the property[4]. Shallow perched ground water was encountered during exploration activities at varying depths.

The Columbia River Basalt Group is considered the geologic basement of the Portland Basin, and consists of a thick, flow on flow sequence of individual basalt lavas. Ground water aquifers are present within the Columbia River Basalt Group within rubbly flow tops of some individual flows. A northeastward ground water flow direction is presumed at the site.

---

[2] ENW, 2015, *Beneficial Water Use Determination,* Open Space Tracts B and E, Elk Ridge Estates Development, Former Landfill, Northeast of Hankey Road and Barrick Lane, St. Helens, Oregon 97051: Prepared for St. Helens Assets LLC, P.O. Box 288, Washougal, WA 98671, in preparation.

[3] Historical documents may refer to this area as Tract E Open Space.

[4] U.S. Geological Survey (USGS) and Oregon Water Science Center, Estimated Depth to Ground Water in the Portland, Oregon Area. website: http://or.water.usgs.gov/projs_dir/puz/

1.2 Summary of Environmental Work

A brief summary of previous environmental studies at the subject site is provided in this section. For additional information the reader is referred to Section 4 or the site's *Risk Assessment*.[5]

1.2.1 Waste Discovery

In 2007, buried solid waste was discovered by excavators near the gully on the southern part of the site (Tract B). A reported 7,000 cubic yards of inert waste was excavated and screened in preparation for disposal at Hillsboro Landfill. An ODEQ inspector described the waste as follows:

> *"The wastes were dry, mixed with soils, and appeared to be largely comprised of household wastes: mostly glass bottles, shoes, a lot of polyethylene film sheeting and polyethylene bread wrappers, polyethylene dishwash detergent bottles, some cans, steel cable, a small amount of old lumber, a few tires, a hubcap, and automobile shock absorber, small sections of scrap metal (possibly from home appliances). There didn't appear to be any significant undecomposed organic matter mixed with the wastes."*

St. Helens Assets purchased the subject property from Sterling Savings Bank around February 15, 2012. There was no disclosure to St. Helens Assets of buried solid waste on the property at that time. At the time of purchase, 62 lots were fully developed and approved for single-family home construction and the balance of the 70 acres site was partially developed with utility infrastructure. St. Helens Assets was first notified of a possible "dump site" on the subject property approximately three months following closing (approximately April 2012) from a local real estate agent. At that time St. Helens Assets contacted the Oregon Department of Environmental Quality (ODEQ), who informed St. Helens Assets that the subject site was listed as a cleanup site.

1.2.2 Waste Origin and Burial

Dwight Urban, who previously owned[6] the site, said he was familiar with the property during the time that the City was hauling household trash up there and dumping it. He said he flew over the property one time, and he could see the area on the lower part of the site where the trash was being dumped. Mr. Urban said that the trucks would come up Hankey Road and turn on Barrick Lane. From there, they would back up their trucks and dump their trash in the gully north of Barrick Lane. Mr. Urban said a lot of trash was dumped in the gully on the lower part of the site over a 10-year period in the 1950s-1960s. He noted that some of the overburden from the nearby quarry operation was used to cover the trash. Mr. Urban said a prior property owner had a pig farm, and

[5] ENW, January 2016, *Risk Assessment*, Elk Ridge Estates Development, Northeast of Hankey Road and Barrick Lane, St. Helens, Oregon 97051: Prepared for St. Helens Assets LLC, P.O. Box 288, Washougal, WA 98671.

[6] Dwight Urban owned the subject site from 1973 to 1974.

he allowed his pigs to feed on the garbage. Mr. Urban said that he didn't think trash was ever dumped on the upper parts of the property, only in the gully on the lower part of the site.[7]

1.2.3 Waste Removal, Separation and Management (2007)

During solid waste removal by the previous owner, Sun Tree, Inc, the waste layers were noted to range from 2 feet to 8 feet thick or more, and they followed the extent of waste meanders as they were encountered. The solid waste was reportedly screened from the soil. This screening operation was conducted near the east end of Barrick Lane at the southeast corner of the site.

The soil and smaller inert pieces of solid waste (mostly bits of glass) that passed through the screen were put back in the excavation from which it was removed in the area north of the gully (Tract B Open Space; see Figure 3). The separated waste that did not pass through the screen (larger bits and pieces of bottles, plastic containers, plastic film and wrappers, scrap metal, wood, and other debris) was initially stockpiled at the site. In August 2007, a total of 822.59 tons (25 truck and trailer loads) of soil and trash were transported and disposed at the Hillsboro Landfill.

ODEQ approved construction and placement of the remaining waste that did not pass the screen into an on-site solid waste disposal cell. Up to 2,000 cubic yards of separated waste were placed in this upland solid waste disposal cell (see Figure 4 for location).

After the waste was placed in the on-site cell, a portion of the clean soil from the pit was used to cap the solid waste cell (a 2- to 5-foot-thick cap). Reportedly, the majority of the clean soil removed from the borrow pit, along with screened soil, was used to fill the solid waste excavation on the southern part of the site.

1.2.4 Columbia Inspection – Waste Sampling (July 2007)

On July 24, 2007, Columbia Inspection collected two composite samples (North and South), one each from "two mounds of dirt and trash" at the site. The samples were analyzed at Columbia Inspection's laboratory for volatile organic constituents, organophosphorus and organochlorine pesticides, polychlorinated biphenyls (PCBs), and Resource Conservation and Recovery Act (RCRA) metals. Only metals were detected, notably: arsenic at concentrations of 30.6 milligrams per Kilogram (mg/Kg; North) and 33.5 mg/Kg (South); and lead at concentrations of 161 mg/Kg (North) and 1,100 mg/Kg (South). Lead was extracted using the Toxic Characteristic Leaching Procedure (TCLP), and analysis of the lead extracts yielded leachable lead concentrations of 0.35 milligrams per Liter (mg/L; North) and 0.53 mg/L (South). Neither soil pile nor sampling locations were indicated.

1.2.5 EVREN NW – Subsurface Investigation (September and November 2012)

In September 2012, ENW advanced 27 test pits to investigate the extent, depth, and character of solid waste in the historical landfill on the southern part of the site. Later in November 2012, ENW completed 21 more test pits on and around the reported location of the (upland) solid waste disposal cell within the BPA easement, and two test pits in the central part of the site. As a result

[7] Urban, D., 2012, Personal Communication, Dwight Urban with Paul Trone of ENW, September 18, 2012

of this investigation, the historical landfill was mapped on the southern part of the site, and the solid waste disposal cell was mapped on the upper central part of the site. No soil samples were submitted for analytical laboratory analysis. Results of the September 2012 and November 2012 investigations are presented in ENW's *Technical Memorandum – Limited Surface Water and Subsurface Investigations*[8].

1.2.6 EVREN NW - Surface Water Sampling (October 2012)

On October 15, 2012, ENW sampled surface or storm water inside the culvert west of Hankey Road. Analytical results are presented in ENW's *Technical Memorandum – Limited Surface Water and Subsurface Investigations.*8 The constituents that were detected, with the exception of iron and total alkalinity, were below their respective screened aquatic life or human health water quality criteria. Iron was detected at a concentration of 1,360 micrograms per Liter (µg/L), just slightly greater than the aquatic life water quality criteria of 1,000 µg/L. Total alkalinity in the sample was 35,000 µg/L, which is greater than the aquatic life water quality criteria of 20,000 µg/L.

1.2.7 EVREN NW - Landfill Gas Survey (November 2012)

On November 14, 2012, ENW monitored soil gas at five probe locations along the north edge of the historical landfill and six probe locations adjacent to the upland solid waste disposal cell. Survey results are presented in ENW's *Technical Memorandum – Limited Surface Water and Subsurface Investigations*8. Methane was detected in only two probes, at concentrations of 0.1% and 34.1%.

1.2.8 Additional Soil Characterization (July 2013)

In May and June 2013, ENW completed 19 borings located within the Lots now identified as 67 through 73 of Phase I[9]. Soil samples were collected at depths ranging from 2.5 to 8 feet bgs and analyzed for petroleum hydrocarbons, polynuclear aromatic hydrocarbons (PAHs), PCBs, organochlorine herbicides, organophosphorous and organochlorine pesticides, and metals. Ground water was not encountered in any of the borings.

Residual (oil)-range organics (RRO), total PCBs, PAHs, and metals impacts were detected in one or more surface and subsurface soil samples in borings sited within the footprint of the historical landfill. Total PCBs, the PAH benzo[a]pyrene, arsenic, and lead concentrations exceeded ODEQ's screening-level (most conservative / lowest level) risk-based concentration for a particular media regardless of pathway and receptor. These are known as screening-level risk-based concentrations (SLRBCs) and are typically associated with the residential receptor scenario. Based on these results a simple lot-line adjustment was recommended and made such

[8] EVREN Northwest, Inc., 2013, Elk Ridge Estates Development, *Technical Memorandum – Limited Surface Water and Subsurface Investigations, Revision 2.0,* North of Hankey Road and Barrick Lane, St. Helens, Oregon, ECSI Site ID: 4857, dated January 8, 2013.

[9] EVREN Northwest, Inc., 2013, *Additional Soil Characterization Lots 1 Through 7*, Elk Ridge Estates, Northeast of Hankey Road and Barrick Lane, St. Helens, Oregon 97051, dated July 25, 2013.

that areas where soil had contaminant concentrations exceeding SLRBCs was relocated to Tract B Open Space. Tract B includes areas where undisturbed solid waste is presently located.

1.2.9 ODEQ Determination of Areas of Concern

On October 7, 2014 ODEQ issued a letter to St. Helens Assets stating two solid waste disposal area were present at the Elk Ridge Estate subject site, specifically in Tracts B and E; however, "no contamination is known or suspected to be present on any other lots or tracts in the Development."

1.2.10 Additional Soil Characterization (April 2015)

At ODEQ's request, in January and March 2015, ENW conducted additional soil, sediment and soil gas characterization of the historical landfill (and pond) and the upland solid waste disposal cell.

Historical Landfill. RRO, arsenic, lead, and total PCBs exceeded ODEQ's SLRBCs in a sample collected from 19.5 feet bgs, and arsenic and lead exceeded their SLRBCs in a sample from different boring, also collected from 19.5 feet bgs.

Upland Disposal Cell. At the upland solid waste disposal cell, total lead in a soil sample collected 0.5 feet below the solid waste/native soil interface (total depth of 8 feet bgs) exceeded its SLRBC and ODEQ background concentration. Methane was detected in two soil-gas probes completed within the south part of the upland disposal cell at concentrations greater than ODEQ's hazardous waste level for methane of 1.25%.

Pond. Sediment samples were enriched in metals (cadmium, copper, lead, and silver) in one or more samples. Diesel-range organics (DRO) were detected in two of the samples, RRO in three of the samples, PAHs in one of the samples, and total PCBs in two of the samples. Such detections of metals and other constituents commonly found in storm water indicate that the sediment retention pond is functioning as intended. The pond is dammed at its downstream end to prevent sediment from discharging into Milton Creek and on to the Columbia River. Downstream storm water sample analytical results from October 2012 confirmed the effectiveness of the storm water settlement pond: no detected volatiles; constituent detections, with the exception of iron and total alkalinity, were below their respective aquatic life or human health water quality criteria; iron was just slightly greater than the aquatic life water quality criteria; and all the detected constituents were much lower than the range of constituents detected municipal solid waste landfill leachate.

1.2.11 Beneficial Ground Water Use Determination (July 2015)

ENW evaluated beneficial water use in a conservative Hydrogeologic Area of Study that was developed based on location, ground water flow direction, and geologic/hydrogeologic literature. A review of Oregon Water Resources water well and water rights databases showed:

Municipal Water Supply. Most properties in the vicinity of the subject property are connected to the City of St. Helens water system. The water system is sourced from water wells on the banks

of the Columbia River, in Columbia City, Oregon, a distance of one mile north. The water is treated at the facility in Columbia City before piped to users.

Hydrologic Separation. Water wells located within Section 33 (located in another drainage and other side of the hills from the site) and Section 5 (other side of Milton Creek from the site) are hydrologically separated from the site; therefore, they are unlikely to be impacted by the release on the subject property. Wells within Section 32 are cross- or up-gradient, completed in deep basalt aquifers and constructed with a surface seal; therefore they are unlikely to be affected by site impacts.

Ground Water Rights. Existing ground water right holders are unlikely to be impacted by the impacts at the site due its location in another drainage to the northeast.

Surface Water Rights. Existing surface water right holders down-gradient exist in an area that is currently heavily residential. Domestic water use is unlikely since the city of St. Helens has supplied this area with city drinking water since at least 1972.

Other Beneficial Uses. Other beneficial uses for the surface water may be ecological habitats. Forested land to the north and east of the site may be wildlife habitats, and open areas of the site may be used, even in passing by some area wildlife. The on-site pond is small and designed to handle surface runoff from up-gradient areas of the site.

1.2.12 EVREN NW – Risk Assessment (January 2016)[5]

ENW compiled all assessment results available for the site and evaluated risk to human health and the environment. Media with contaminants present at concentrations with the potential to cause harm to humans was identified at the historical landfill (Tract B) and the upland disposal cell.

1.3 Description of Areas with Residual Contaminated Media

Two areas of the site, where residual solid waste is located, have been identified and characterized (see Section 1.2 for a summary of characterization findings). Any work within the boundaries of these two areas must be conducted in a manner that is consistent with all State regulations, ODEQ requirements specific to the subject site, and this Plan.

Tract B Open Space. This tract is located in the southern part of site and was the location of the historical landfill (see Figure 3). This area includes undisturbed solid waste (placed in the 1950s and 1960s), areas of screened waste along the north-central and northeast part of the historical landfill, which may overlay undisturbed waste, and the storm water retention system for the site.

The physical characteristics of the historical landfill undisturbed solid waste area are outlined below.

- Length: approximately 600 feet northeast to southwest.
- Width: ranges from 70 feet at its southwest end, 140 feet through its middle-section, to 60 feet at its northeast end.

- Depth: up to 19.5 feet at its maximum (including soil cover) at the northeast end of the landfill.
- Area: approximately 46,000 square feet.
- Soil Cover: three feet thick and composed of silty soil mixed with angular rock. The cover is not entirely free of solid waste. A typical solid waste to soil ratio in the cover is estimated to be less than 1:20.
- Solid Waste: greater than 19.5 feet at its northeast end and composed of solid waste in a clay-silt matrix. The solid waste to soil ratio is estimated to range from 1:10 to 3:20. The soil was typically gray to brown and moist in the presence of decomposing solid waste below a depth of 4 feet (west end). An odor of decomposing waste was present in one of the test pits (TP27) and borings (B22).
- Elevation: approximately 197 feet amsl at the west end of the area to 205 feet amsl at its east end.
- Native Soil: native clayey silt underlies the historical landfill.
- Ground Water: perched ground water was encountered in the borings completed in the portion of the historical landfill centered along the axis of the ravine at depths ranging from a few inches bgs to 12 feet bgs.
- Surface Water: Tract B is the natural collection point of storm water leaving the subject site. As such, the subdivision storm water design incorporated this natural drainage feature and the large majority of storm water captured from the developed portion of the site is conveyed to Tract B and discharged at the north side of the gully after going through a storm water treatment manhole.

  Surface water collects on Tract B in a small detention/settling pond. Sampling (described above in Section 1.2.9) has shown pond sediments to be impacted. The pond is impounded at its downstream end to prevent sediment from discharging into Milton Creek and on to the Columbia River. Regular maintenance of Tract B to support storm water detention and treatment, and to protect against sediment migration downstream is described in the Storm Water Management Plan for the site. *Any work conducted in Tract B must be conducted according to the requirements of this Plan, including management of any disturbed sediment, soil or water.*
- Potential Contaminants: metals, petroleum hydrocarbons, PAHs, PCBs, pesticides, herbicides, and methane (in soil gas). *Note: Due to the variable nature of materials within historic landfills it is possible that additional contamination may be present that has not yet been identified by site characterization and assessment.*

(Upland) Solid Waste Disposal Cell. As described above, a portion of the screened solid waste (the solid waste debris that was too large to pass through the screen) was placed in an unlined cell under the high tension power lines within the BPA easement in the upper (northern) portion of the site (see Figure 4).

The physical characteristics of the upland disposal cell are outlined below.

- Length: approximately 245 feet north-northeast to south-southwest.
- Width: ranges from 70 feet at its south end, 100 feet through its middle-section, to 80 feet at its north end.
- Depth: up to 10 feet at its maximum (including soil cover) at the north end of the cell (TP30).
- Area: approximately 12,500 square feet.
- Soil Cover: 0.5 to 4 feet thick and composed of silty soil with occasional rounded cobbles. The cover is not entirely free of solid waste. A typical solid waste to soil ratio in the cover is estimated to be less than 1:20.
- Solid Waste: greater than 10 feet at its northeast end and composed of solid waste in a clay-silt matrix. The solid waste to soil ratio is estimated to range from 1:10 to 2:5. The soil was typically gray to brown and moist to wet in the presence of decomposing solid waste. Waste is typically more abundant below a depth of 4 feet. An odor of decomposing waste was present in two test pits.
- Elevation: approximately 340 feet amsl at the south end of the cell to 363 feet amsl at its north end.
- Native Soil: native clay, clayey silt, and weathered saprolitic bedrock underlies the fill in the cell.
- Ground Water: perched ground water was encountered at a depth of approximately 4 feet in a boring and test pit completed in the southern part of the upland disposal cell.
- Potential Contaminants: metals, petroleum hydrocarbons, PAHs, PCBs, pesticides, herbicides, and methane (in soil gas). *Note: Due to the variable nature of materials within historic landfills it is possible that additional contamination may be present that has not yet been identified by site characterization and assessment.*

All disturbed soil in the area of the historical landfill, or any soil containing evidence of solid waste, must be managed as impacted soil, unless proven otherwise by an ODEQ-approved method. If a large-scale earthwork project is planned, consultation with the Environmental Consultant and development of a sampling plan is recommend to minimize expense.

2.0 SITE WORK INITIATION

This section describes work to be conducted and requirements to be met prior to beginning site work.

2.1 Notifications, Permits and Other Approvals

All notifications, legally-required permits or other approvals required to conduct the work to be performed will be made or obtained prior to starting work at the site.

2.2 Contractor Requirements

Contractors and/or subcontractors hired to conduct subsurface work at the site will be competent and experienced in the management of media impacted with hazardous substances. Pre-planning of anticipated work with the Environmental Consultant (contact information in Appendix B) is recommended.

2.3 On-Site Personnel

All field personnel who have the potential for coming in contact with impacted media will:

- Have their Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) Forty (40) Hour training and certification, as well as annual updates.
- Have a copy and be familiar with the Health and Safety Plan (see Section 2.4).
- Have reviewed and signed the acknowledgement page of this Plan (Appendix A). The signed acknowledgement pages will be available for the property owner's or site management's inspection and permanent record-keeping, if requested.

2.4 Health and Safety Plan

A Health and Safety Plan specific to the work to be performed will be prepared according to industry standards. At a minimum, Occupational Safety & Health Administration (OSHA) standards specific to the work to be performed will be met. The Health and Safety Plan should be prepared by a qualified specialist knowledgeable about health and safety issues, the contaminants identified at the site, the previously documented site conditions, and the proposed contractors' scope of work.

Each Health and Safety Plan prepared should take into consideration and address the potential for explosive gases (see Section 5).

3.0 SOIL AND SEDIMENT MANAGEMENT

ODEQ requires contaminated media to be adequately characterized to determine how it should be managed. When soil or sediment is highly contaminated, the generation, treatment, transportation and disposal may fall under both state and federal hazardous waste regulations.[10] Contaminated media that is not hazardous waste is regulated under OAR Chapter 340-093 for solid waste.

For the purposes of this Plan, contaminated soil and sediment are defined as having concentrations of hazardous substances greater than the clean fill screening levels (ODEQ July 2014). See OAR 340-093-0030. It is important for field personnel to know how to identify, characterize (if appropriate), and manage contaminated soil and sediment. To minimize expenses from any subsurface project, we recommend reviewing the scope with the Environmental Consultant.

3.1 Identification of Impacted Soil and Sediment

All soil associated with the historic landfill (see Figure 3 and 4), or any soil containing evidence of solid waste will be managed as impacted soil unless proven otherwise. Identification of impacted soil may be based on any single or combination of the following factors:

- Visual observation of solid waste (including but not limited to glass, plastic, metal and wood debris).
- Olfactory sensing of odor.
- Collection and analysis of soil or sediment samples for constituents pre-approved by the Environmental Consultant.
- Indication of impacts by instrumentation designed for screening for volatile constituents (e.g., photoionization meter [PID]).
- Knowledge of the vertical and lateral extent of areas of residual impacts based on Figures 3 and 4 and the description presented in Section 1 and referenced historical environmental reports.
- Where both soil and ground water are present, soil impacts may be indicated by observation of iridescent sheen or separated fluid phases (i.e., immiscible liquids).

The historic landfill on Tract B Open Space is a natural drainage feature and includes a pond and earthen dam. All sediments on Tract B Open Space (see Figures 2 and 3 for area) will be managed as impacted sediment unless proven otherwise.

If soil or sediment exhibiting evidence of contamination is encountered during excavation, this should be brought to the immediate attention of the Environmental Consultant.

[10] When soil is contaminated by a listed or characteristic hazardous waste, then soil contains a hazardous waste and must be managed accordingly. ODEQ hazardous waste generator requirements are triggered when the contaminated soil is removed from its original location.

However, it must be emphasized that some impacted soils and sediments do not exhibit any physical indication of their impacts (e.g., no odor or discoloration or PID response associated with metals-impacted soils). Therefore, the most reliable method of determining if chemical impacts are present is laboratory analysis.

Section 1.3 describes the area where residual impacts are known to be present on the subject property. However, anyone performing subsurface work at the site should be prepared for the possibility to encounter impacted media (soil, sediment, surface water, shallow perched ground water, and soil gas) in other areas as well.

If soils or sediments with significantly different characteristics than those previously identified are excavated at the site, they may need to be appropriately characterized by laboratory analyses prior to disposal or reuse onsite. They should be brought to the attention of the Project Manager or Environmental Consultant. A detailed soil sampling and analysis plan is outside the scope of this document as the particulars would be determined by the specific scope(s) of work to be conducted at the site.

If samples are to be collected, they should be collected by personnel knowledgeable in sampling methods and protocols specific to each media, ensuring that appropriate sample selection, collection (whether discrete or composite), labeling, and storage methods are followed.

3.2 Management of Impacted Soil and Sediment

During site excavation, all soil and sediment should be monitored and field-screened for potential impacts. If suspect subsurface features are encountered (e.g., underground storage tanks, piping, dry wells, sumps, etc.) or field-screening suggest impacts, all excavated or disturbed soil in these areas will be managed as impacted soil, unless the Project Manager chooses to conduct additional sampling and testing (according to ODEQ-approved methods) and determines the soil is not impacted. If any soils or sediments are identified through observation or olfactory indication (sight or smell) as being impacted outside previously identified areas (Section 1.3), this will be brought to the attention of the Environmental Consultant (see Attachment B for contact information) who will conduct testing if necessary.

If excavation is going to occur in the area of the historic landfill on Tract B Open Space (identified on Figure 3) or in the area of the upland solid waste disposal cell (identified on Figure 4), soil (and/or sediment) **must** be managed using one or more of the following approaches. Additionally, the three (3) feet of clean soil cap must be maintained in both Tracts B and E. It is highly advised that the Environmental Consultant be contacted *prior to starting work* to develop the least expensive approach to working with residual impacted soil and sediment.

If impacted soil or sediment is excavated, it must be managed as a hazardous material.

Unless otherwise directed by the Project Manager, the preferred method of excavation and disposal of impacted soil and sediment will be to load the material directly into transport vehicles

for off-site disposal. Note, if sediments contain moisture to the extent that they drain fluids, a lined transport truck or vacuum truck should be used for transport to prevent any leakage of potentially impacted material.

If necessary, soils and sediment may be temporarily managed by placing them in a segregated stockpile, on and enveloped by plastic sheeting. The margins of the lower liner should be rolled and bermed with the top layer to prevent contact with storm water. These stockpiles may be temporarily managed on-site for no more than 30 days. Any longer on-site storage/management will require a special permit from ODEQ.

Transport to a landfill authorized to accept hazardous materials will require a waste disposal permit. It is anticipated that disposal of impacted soils, if necessary, will be acceptable at a SubTitle D Landfill Facility, such as Hillsboro Landfill.

3.3 Protective Measures for Workers

This section provides general measures to be taken to protect workers from impacted media. Please also reference the Health and Safety Plan developed for the specific scope of work to be conducted for additional protective measures.

On-site workers may be exposed to contaminants through incidental:

- Ingestion of soil
- Dermal contact (through the skin)
- Inhalation of impacted airborne dust and vapor

To reduce exposure:

- ✓ All personnel will minimize their direct contact with soil, and, wear project-specific personal protective equipment identified by the Health and Safety Plan.
- ✓ Contaminated clothing should be washed with a strong detergent and hot water before reuse.
- ✓ Personnel will thoroughly wash their hands and other exposed body parts, as necessary, upon leaving the work area and before eating, drinking, or other activities.
- ✓ Release of dust and vapors to the air should be minimized, and all personnel will remain upwind of the work areas to the maximum extent practical.

3.4 Protective Measures for the Environment

This section provides general measures to be taken to protect the environment from contaminants in soil. The environment may be exposed to contaminants through incidental:

- Wind-borne dispersion
- Transport by surface water
- Transport by site equipment or workers
- Contact by public or environmental receptors (e.g., birds and animals) that enter the work area

To reduce exposure:

- Control access to earthwork area through fencing, signage, or other means.
- Implement dust-control methods, if needed.
- Erosion controls, e.g. silt fences, wattles, and storm drain filters, to prevent any surface water and sediment from leaving the work area and entering the storm water system.
- Implement controls to prevent migration of impacted soils from tires of construction equipment and trucks to adjacent areas and streets.

3.5 Record Keeping

To document compliance with this Plan, the property owner and project manager will maintain and submit the following information d to the Environmental Consultant for all subsurface work:

- Company performing work
- Attachment A consisting of original signatures of all field personnel indicating that they have read and understood the content of this Plan.
- Documentation of the locations (aerial and vertical extents) where work was conducted and any impacted media encountered. A photo-documentation log of the field work and survey or high accuracy Global Positioning Satellite (GPS) data is highly recommended.
- Documentation (including photographs, as appropriate) of the location of, method of collection, and analytical results of any samples collected and analyzed. Chain-of-custody documentation should also be retained with the analytical data.
- If any impacted media is stored on-site, dates and methods of storage.
- Disposition of any impacted media, including permit and disposal receipts, as appropriate.

Based on these records, a Characterization or Removal Action report may be prepared and submitted to the property owner. All waste receipts must be retained on site and available for inspection; copies must be provided to the Environmental Consultant.

4.0 WATER MANAGEMENT

Work at the site may encounter shallow perched ground water or may need to manage proximate or captured surface water. All excavation work should have a plan on how water will be managed. Any water present during subsurface work will need to be managed as described in this section.

4.1 Managing Removed Water

Any dewatering where fluids had the potential for coming in contact with impacted soil will require management using one of the following methods:

- Above-ground management in a temporary holding vessel prior to disposal. Temporary holding vessels prior to disposal may consist of a 55-gallon drum, a small above-ground storage tank (AST), or large ASTs (such as Baker or Frac-Tanks), or other suitable storage vessels, depending on the amount of water to be removed. During the dewatering process, care should be taken to minimize the uptake of soil and sediment, so as not to require additional waste treatment or acceptance charges.
- Direct transfer to a truck designed and permitted to transport such wastes.
- Disposal into a sewer system, ***if allowed,*** must be pre-approved by the system owner and pretreatment may be required.

Dewatered fluids may require sampling and testing, dependent upon the disposal method(s) to be used. Contact the Environmental Consultant to ensure correct sampling protocol and methods are used.

4.2 Record-Keeping for Removed Water

The following information must be submitted to the Environmental Consultant for each batch of water:

- Company performing work
- Batch Identification
- Batch laboratory results
- Documentation of approval for discharge or waste manifest/receipt of trucking company
- Date discharged/transported
- Total gallons discharged/transported

Once work is complete, this information will be summarized for all occurrences and submitted to the appropriate agencies.

5.0 POTENTIAL FOR EXPLOSIVE GAS

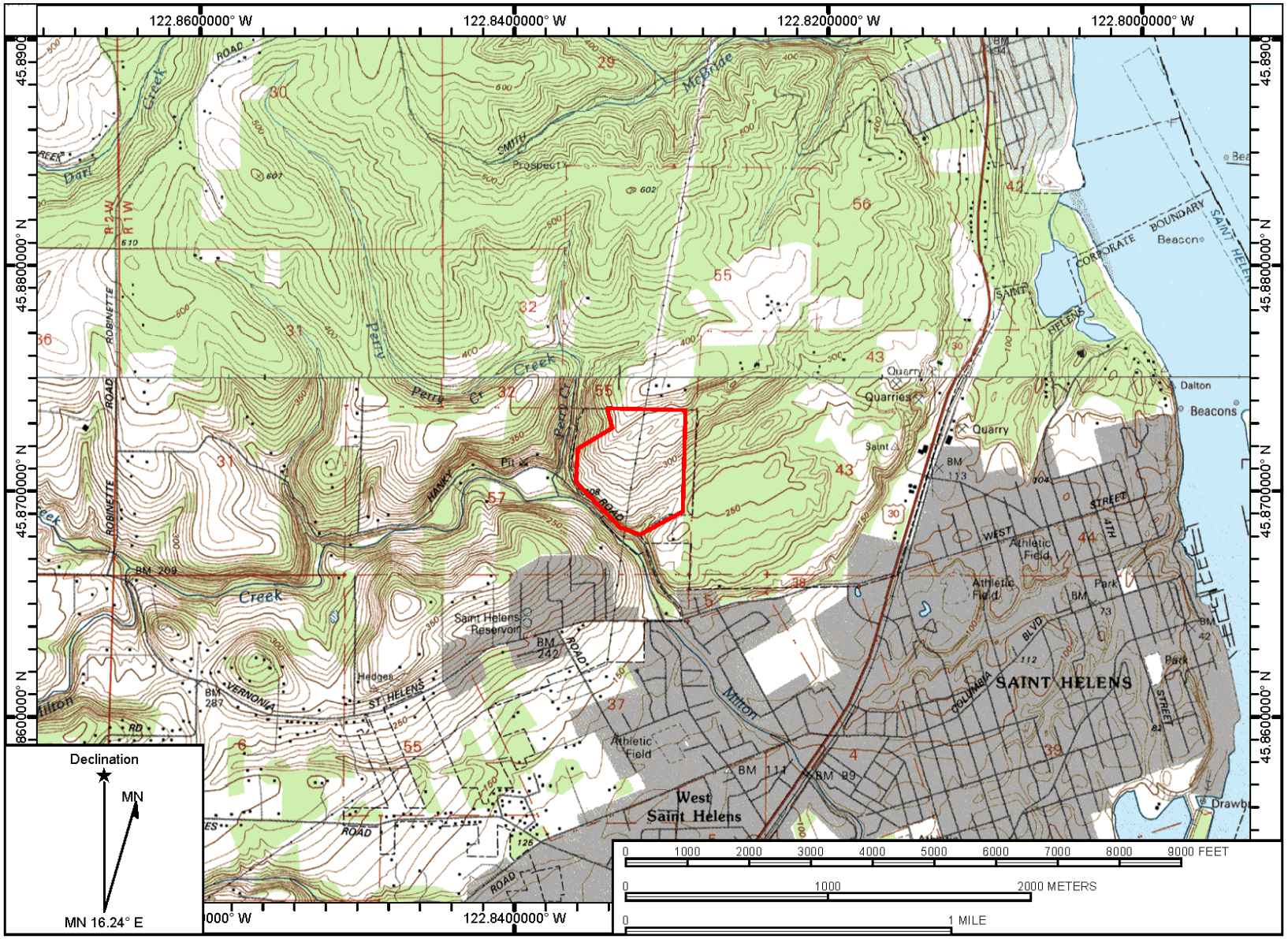
The historical landfill on Tract B Open Space and the upland solid waste disposal cell both have the potential to generate and accumulate landfill gas. Any work in these areas should consider and address the potential for encountering landfill gases. Landfill gas is generally composed of methane, carbon monoxide, carbon dioxide, hydrogen sulfide and other trace gases. Methane:

- Is a simple asphyxiant.
- Has a high fire hazard.
- Has a high explosion hazard.
- Is lighter than air.

Relevant measures to address these characteristics should be incorporated into the Health and Safety Plan (see Section 2.4) for each scope of work. Extra consideration should be given to any confined space work.

Environmental assessments have shown that the historical waste at the subject site is low in organic material, thereby lessening the potential production of gases as a product of decomposition. However, soil gas monitoring has identified the presence of methane, including one location where the concentration greatly exceeded the lower explosive limit.

FIGURES



Source: USGS Topographic Map, 7.5-Minute St Helens Quadrangle, 1990

EVREN NORTHWEST environmental natural resource consultants	Date Drawn: 4/29/2013 CAD File Name: 826-12001-01sv_map Drawn By: LDG Approved By: NMW	Elk Ridge Development N 45.8712 Deg / W 122.8321 Deg St. Helens, Oregon	**Site Vicinity Map**	Project No. 826-12001-05 Figure No. **1**

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
N.MORRIS 02/01/2013	P. TRONE 04/29/2013	L. GREEN 04/29/2013	826-12001(v01)

PHASE 1
PHASE 2
PHASE 3
PHASE 4
PHASE 5
PHASE 6
PHASE 7
PHASE 8

RESERVOIR SITE TRACT H
TRACT C OPEN SPACE 8.35 ACERS
TRACT F OPEN SPACE .85 ACRES
TRACT E OPEN SPACE 0.39 ACRES
TRACT E OPEN SPACE .88 ACERS
TRACT A OPEN SPACE
TRACT B OPEN SPACE 2.08 ACRES
TRACT C
TRACT D OPEN SPACE 1.22 ACRES
TRACT I OPEN SPACE 1.53 ACRES

AERIE CT
HAWK VIEW DR
TERRA VISTA CT
MOUNTAIN CREST DR
HILLCREST CT
ELK RIDGE DR
RIDGE VIEW DR
VALLEY VIEW DR
WOOD GLEN DR
ELK MEADOWS RD
HANKEY RD
BARRICK LANE
POND
CULVERT

PERRY CREEK
MILTON CREEK

LEGEND:

- APPROXIMATE BUILDING LOCATIONS
- 146 APPROXIMATE LOT BOUNDARIES AND LOT NUMBERS
- APPROXIMATE SUBJECT PROPERTY BOUNDARIES (COLOR INDICATING VARIOUS DEVELOPMENT AREAS)

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2011 AND ENW FIELD NOTES.

APPROXIMATE SCALE

0 300 600 FEET

N

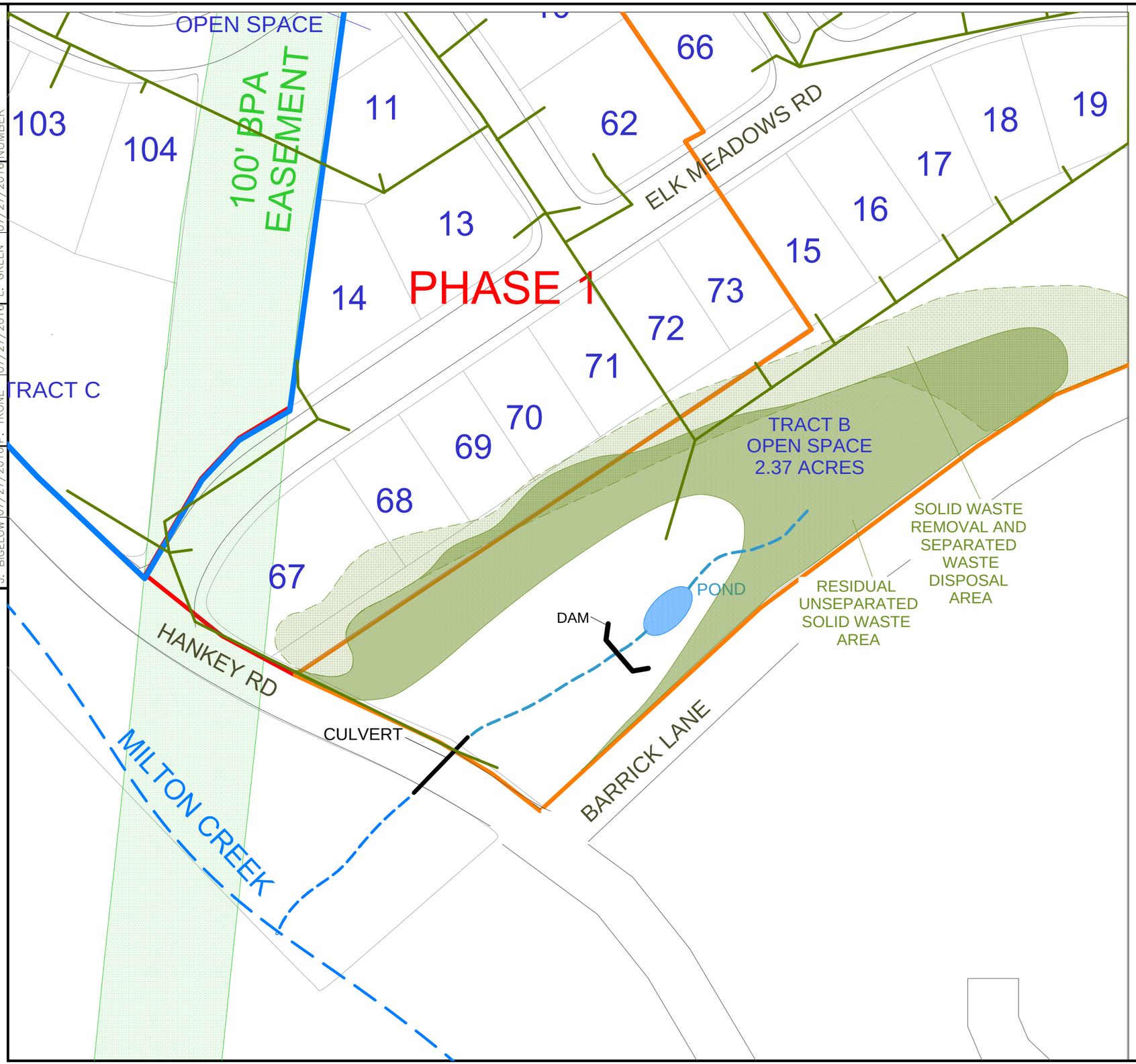
EVREN NORTHWEST INC.
environmental natural resource consultants
PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 2

SITE PLAN

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
J. BIGELOW 07/27/2016	P. TRONE 07/27/2016	L. GREEN 07/27/2016	826-12001(v01)



LEGEND:

- APPROXIMATE BUILDING LOCATIONS
- APPROXIMATE PROPERTY BOUNDARIES
- APPROXIMATE SUBJECT PROPERTY BOUNDARIES
- APPROXIMATE SUBJECT BUILDINGS
- HISTORIC LANDFILL – SOLID WASTE REMOVAL AND SEPARATED WASTE (INERT MATERIALS) PLACEMENT AREA
- HISTORIC LANDFILL – UNDISTURBED SOLID WASTE AREA
- SOLID WASTE SCREENING AREA

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2009, ENW FIELD NOTES AND SUPPILED SURVEY MAPS.

APPROXIMATE SCALE

0 80 160 FEET

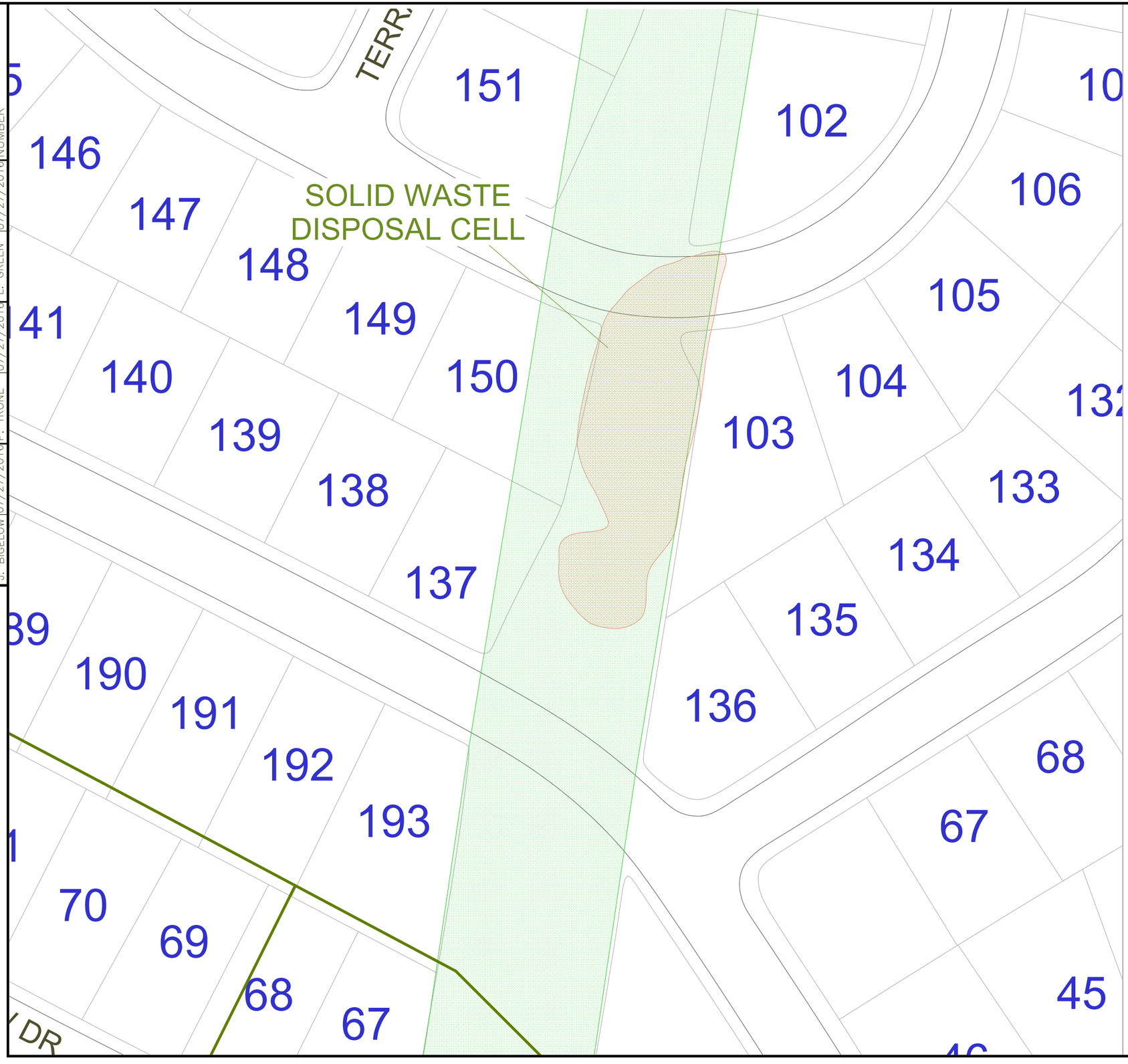
EVREN NORTHWEST INC.
environmental / natural resource consultants
PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 3

HISTORICAL LANDFILL
ON TRACT B OPEN SPACE

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
J. BIGELOW 07/27/2016	P. TRONE 07/27/2016	L. GREEN 07/27/2016	826-12001(v01)



LEGEND:

146 APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS

SOLID WASTE DISPOSAL CELL

BPA 100' EASEMENT

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2009 AND ENW FIELD NOTES.

APPROXIMATE SCALE

0 60 120 FEET

N

EVREN NORTHWEST INC.
environmental natural resource consultants
PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 4

(UPLAND) SOLID WASTE DISPOSAL CELL

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

APPENDIX A

Acknowledgement Signature Form

Copy and use the following form to document review and understanding of the Contaminated Media Management Plan. Any person responsible for or conducting subsurface work at the site must sign this form.

Acknowledgement Signature Form

To be signed by all personnel responsible for, or involved in subsurface work at the Elk Ridge Estates Subdivision in St. Helens, Oregon:

I have read this Contaminated Media Management Plan, and I agree to abide by these measures and safety rules and all applicable safety regulations while working in areas identified as potentially containing impacted media at this site. I understand that any violation of these rules will result in my removal from the work area.

Brief Description of Scope of Work

Signature / Title - Project Role	Date

APPENDIX B

Site Contacts

Copy and use the following form for each project. Site contacts should be reviewed and updated prior to each scope of work at the site.

Property Representative	**Environmental Consultant***
Elk Ridge Estates HOA Inc. Mark Zoller Phone: (360) 798-3921	Lynn D. Green, C.E.G. **EVREN Northwest, Inc.** Email: lynng@evren-nw.com Phone: (503) 452-5561

Site Project Manager*	**Geotechnical Engineer***
Name: **Company:** Email: Cell:	Name: **Company:** Email: Cell:
Architect	**Engineer**
Name: **Company:** Email: Cell:	Name: **Company:** Email: Cell:

Contractor Office / Field Contacts	
Name: **Company:** Email: Cell:	Name: **Company:** Email: Cell:

Add additional contacts as appropriate for the scope of work. This may include subcontractors, the Oregon Department of Environmental Quality and/or the City of Portland.