State of Oregon
Department of Environmental Quality Memorandum

Date: February 5, 2024

To: FILE

Through: Kevin Parrett, Katie Daugherty, and Erin McDonnell

From: Kevin Dana
Northwest Region

Subject: Elk Ridge Estates Development, ECSI #4857; Staff Memorandum in support of a Conditional No Further Action determination

This document presents the basis for the Oregon Department of Environmental Quality's (DEQ's) recommended Conditional No Further Action (CNFA) determination for the Elk Ridge Estates Development site in St. Helens. As discussed in this report, contaminant concentrations in soils and soil gas exceed acceptable risk levels for applicable exposure pathways. Consequently, the No Further Action determination will be conditioned upon adherence to restrictions recorded in two Easements & Equitable Servitudes.

The proposed CNFA determination meets the requirements of Oregon Administrative Rules (OAR) Chapter 340, Division 122, Sections 010 to 0140; and Oregon Revised Statutes (ORS) 465.200 through 465.455.

The proposal is based on information documented in the administrative record for this site. A copy of the administrative record index is presented at the end of this report.

1. BACKGROUND

Site location.
The site's location can be described as follows:
- Address: North of Hankey Road & Barrick Lane, Saint Helens, Columbia County, Oregon.
- Latitude 45.8682º North; Longitude 122.8334º West
- Tract E, Elk Ridge Estates, Phase 5; Tax Lot 100, Township 5 North, Range 1 West, Section 32 DC, and
- "Tract F" or "Revised Tract F", Elk Ridge Estates, Phase 6 (tax lot assignment pending).

Site setting.
Elk Ridge Estates is a single-family residential development being constructed on a south-facing hillside at the north end of the City of Saint Helens. See Attachment 1 for a topographic map of the area and Attachment 2 for an aerial photo of the site. A Former Solid Waste Disposal Area ("the landfill") is present at the bottom of the hill at the south end of the development. An Upper Solid Waste Disposal Cell ("the disposal cell") is present in a transmission line right-of-way near

the center of the development. The landfill covers 2.37 acres and the disposal cell covers 0.40 acres. The landfill is generally bounded by Hankey Road and Barrick Lane to the south and by houses to the north. The area around the disposal cell is currently open space but new homes are planned in the area in the next few years.

Hydrogeological setting.
Native soils at Elk Ridge Estates are generally clayey silts and silty clays. The surface soils rarely extend more than four feet below ground surface (bgs) before encountering weathered basalt bedrock. The estimated depth to groundwater (as determined by the U.S. Geological Survey) ranges from 97 feet bgs at the south end of Elk Ridge Estates to 178 feet bgs at the north end. The groundwater flow direction was not determined but is expected to be east or northeast towards the Columbia River.

Site history.
From around 1940 to 1970, garbage companies regularly picked up garbage in the City of St. Helens (the "City") and dumped it at a landfill on the north side of Barrick Lane. The landfill, which partially filled in a natural gully, was on property owned by Joseph Sasia. Plans to construct a residential subdivision on a hillside extending north of the landfill were first proposed in the 1970s, and in 1979 the City annexed a 75-acre area that included the landfill.

On November 10, 1994, the City produced a *Planning Staff Report* regarding an application to the City Planning Commission by John Green of Construction Dynamic, Inc., for approval of a preliminary plat for a 267-lot subdivision in the annexed area. About a month later, on December 13, the City Planning Commission received a warning from local residents about the presence of the landfill and the potential risk it posed to the City, future residents, and watershed.

Around November 1995, the City received an *Environmental Study* that described the recent removal of approximately 12,500 pounds of scrap metal from the landfill and detections of total metals in test pit water samples collected from within the landfill. In August 1996, the City communicated to the property owner that the area of the landfill had to be shown on the final plat, the landfill was not to be developed, and there could be no water wells in or downstream of the landfill because of the high levels of total metals in water samples from within the landfill.

In 1997 John Pearson arranged for Northwest Land Trust LLC to purchase the site and changed the name of the proposed development from St. Helens Heights to Elk Ridge Estates. After a series of ownership transfers, by 2001 the site was owned by John Pearson as a Trustee of Columbia Trust.

In 2006 Robert Bocci arranged for Elk Meadow Development, LLC to obtain ownership of the site from Columbia Trust. Sterling Savings Bank acquired ownership of the site by deed in lieu of foreclosure in June 2011. St. Helens Assets, LLC ("SHA") purchased Elk Ridge Estates from Sterling Savings Bank in February 2012. SHA subsequently entered the site into DEQ's Voluntary Cleanup Program (VCP) in August 2012.

2. BENEFICIAL LAND AND WATER USE DETERMINATIONS

Land use.
The Elk Ridge Estates Development is zoned Moderate Residential (R7) by the City of St. Helens, as shown on Attachment 3. The zoning requires residential lot sizes to be no smaller than 7,000 square feet.

Groundwater use.
A Beneficial Groundwater Use Determination for the site was completed in August 2015. About 25 domestic water wells were identified within a 1-mile radius of the site, as shown on Attachment 4. The nearest well, on Perry Creek Road, extended 190 feet through "clay stone" before encountering groundwater, as shown on Attachment 5. The other wells are either upgradient or cross-gradient from the site, or are too distant to be reasonably threatened by any contamination from the site.

Elk Ridge Estates receives a municipal water supply from the City of St. Helens. The city obtains its water from two wells on the banks of the Columbia River in Columbia City, about one mile north of the St. Helens city limits.

Surface water use.
Perry Creek borders the Elk Ridge Estates subdivision to the west, and flows south into Milton Creek. Milton Creek, across Hankey Road from the site, flows south and east about three miles to the Columbia River. Milton Creek provides spawning and rearing habitat for fall Chinook salmon, and supports steelhead and anadromous fish in general.

At the time the Elk Ridge Estates project entered the VCP, water was emerging from beneath the landfill and flowing into a sedimentation pond at the bottom of the gully. Overflow from the sedimentation pond discharged through a culvert beneath Hankey Road to Milton Creek.

As of 2023, stormwater from Elk Ridge Estates is captured by storm drains in the streets and piped to an outfall at the toe of the landfill, from where it discharges through the Hankey Road culvert to Milton Creek.

3. INVESTIGATION AND CLEANUP WORK

Initial investigations of the landfill were conducted in 1995. Several wrecked auto bodies, large appliances, bed frames, metal cables, and other scrap metals were removed from the surface of the landfill in October 1995. In total, about 12,500 pounds of scrap metal were reportedly shipped to Metro Metals in Portland for recycling. Five test pits were subsequently dug into the landfill, extending from 10 feet bgs up to 19 feet bgs. (See Attachment 6 for a drawing of the test pit locations. Note that north is to the lower right corner of the drawing). Household garbage (including glass bottles, plastic bottles and containers, scrap metal, and paper) was encountered to depths ranging from three feet to 15 feet bgs, underlain by clay or silty clay. Perched groundwater was encountered in one test pit at 16 feet bgs.

A single soil sample was collected from the bottom of each test pit, along with one localized, perched groundwater sample, and a surface water sample from the culvert under Hankey Road. The seven samples were analyzed for total petroleum hydrocarbons by the hydrocarbon identification method (TPH-HCID). Heavy oils were identified in one soil sample and in the groundwater sample, but the concentrations were not quantified. The five soil samples were further analyzed for leachable metals, and three of the soil samples were analyzed for polychlorinated biphenyls (PBCs) and volatile organic compounds (VOCs). PCBs (Aroclor 1254) were detected in one soil sample, at a concentration of 1.47 parts per million (ppm). Otherwise, only leachable metals were detected, including leachable arsenic (at a concentration of 0.01 milligrams per liter [mg/l]), leachable barium (at concentrations up to 3.5 mg/l), and leachable lead (at 1.3 mg/l).

The groundwater and surface water samples were further analyzed for total metals, PCBs and VOCs. PCBs (Aroclor 1260) were detected in the surface water sample, at a concentration of 8.12 parts per billion (ppb), along with barium (680 ppb), cadmium (3 ppb), chromium (20 ppb), lead (40 ppb), and mercury (1.9 ppb). Total metals were also detected in the groundwater sample, including arsenic (20 ppb), barium (3,600 ppb), cadmium (7 ppb), chromium (120 ppb), lead (2,100 ppb), mercury (1.8 ppb), and silver (10 ppb).

Initial Excavations (2007)

Initial construction of the Elk Ridge Estates subdivision began in the summer of 2007. The site developer began excavating wastes from the north edge of the landfill in July 2007 to clear more space for planned housing lots. Two vibrating screens were set up to separate garbage from the surrounding fill soils. Two samples of the separated soils were collected and analyzed for metals, PCBs, pesticides, and VOCs. Only metals were detected, including arsenic (33.5 ppm), barium (290 ppm), cadmium (1.85 ppm), chromium (26.2 ppm), lead (1,100 ppm), mercury (0.00191 ppm), and silver (2.03 ppm). Leachable lead was present at 0.53 mg/l.

DEQ's Cleanup Program was contacted about the landfill on August 1, 2007. The developer claimed to have been previously unaware of the landfill's presence, and said that about 7,000 cubic yards of material had been excavated from the northern and eastern edges of the landfill. A total of 822.59 tons of garbage were shipped to the Hillsboro Landfill for disposal.

The excavation company retained by the developer later claimed that they had received permission from DEQ to dispose of up to 2,000 cubic yards of garbage into an on-site disposal cell. However, DEQ's Cleanup and Solid Waste programs have no record of approving an on-site disposal. The disposal cell was excavated in the center of the Elk Ridge Estates Development in a Bonneville Power Administration transmission line right-of-way.

Initial Investigations (2012)

Investigations into the nature and extent of waste materials in both the landfill and disposal cell began in 2012. A total of 27 test pits (TP01 through TP27) were excavated at the site in September 2012 to determine the extent of the landfill. As shown on Attachment 7, most of the test pits fell outside of the landfill footprint. These pits only extended two feet to four feet through silty clay soils before encountering weathered basalt bedrock. Little to no garbage was

encountered in these pits. Five of the test pits encountered the solid waste removal area from 2007. These pits extended 5-7 feet bgs and found small pieces of glass, plastics, ceramics, and other wastes mixed in with soils that had passed through the waste separation screens. The test pits that encountered the landfill extended nine feet bgs and identified "abundant solid waste".

In November 2012, 23 additional test pits (TP28 through TP50) were excavated in and around the disposal cell, as shown on Attachment 8. Waste materials in the disposal cell (including metal, wood, plastic, glass, paper, and fabric) extended from one foot bgs to over 10 feet bgs. Outside of the disposal cell, the test pits only extended 2-3 feet bgs through native soils before encountering weathered basalt bedrock.

As part of the investigations, five soil gas samples were collected from the northern edge of the landfill, and six soil gas samples were collected in and around the disposal cell. The soil gas locations, labeled SG01 through SG11, are shown on Attachments 7 and 8. Soil gas samples were collected from five feet bgs at each location and analyzed for methane. Methane was only detected in SG07, on the southeast edge of the disposal cell, where concentrations ranged from 20.1% to 34.1% by volume (pbv). Separately, a surface water sample was collected from the culvert beneath Hankey Road and analyzed for total metals and VOCs. Detected metals included barium (93.6 ppb), copper (5.71 ppb), iron (1,360 ppb), magnesium (2,080 ppb), nickel (4.09 ppb), and zinc (93.1 ppb). No VOCs were detected.

Additional Investigation (2013)

In May and June 2013, 19 borings (B1 through B19) were advanced on seven planned homesites adjacent to the landfill, as shown on Attachment 9. A total of 40 soil samples were collected from the borings and analyzed for petroleum hydrocarbons and metals. A selection of the samples (from Lots 1-3) were further analyzed for polycyclic aromatic hydrocarbons (PAHs), PCBs, pesticides, and VOCs. Four contaminants of potential concern were identified: arsenic (which was detected at concentrations up to 12.7 ppm), benzo[a]pyrene (up to 0.0695 ppm), lead (up to 728 ppm), and PCBs (up to 1.18 ppm). Other contaminants were either not detected or were below concentrations of concern.

Soils with contaminant concentrations of potential concern were identified in five of the 19 borings, as shown on Attachment 9. St. Helens Assets subsequently decided to replat the seven lots so that the impacted areas would fall within the undeveloped "open space" surrounding the landfill, as proposed on Attachment 9.

Additional Investigation (2015)

In January 2015, 12 soil samples and four composite sediment samples were collected in and around the landfill, and 12 soil gas samples were collected in and around the disposal cell.

Six borings (B20 through B25) were advanced through the landfill wastes to depths ranging from 15-20 feet bgs. The boring locations are shown on Attachment 10. A single soil sample was collected from each boring and analyzed for petroleum hydrocarbons and metals. No petroleum hydrocarbons were detected, and concentrations of metals were generally consistent with naturally-occurring background levels. However, the soil sample from boring B22, collected at

19½ feet bgs, identified antimony (5.94 ppm), arsenic (33.2 ppm), cadmium (2.62 ppm), copper (1,060 ppm), lead (2,730 ppm), mercury (0.790 ppm), silver (2.09 ppm), and zinc (2,480 ppm). The sample was further analyzed for leachable metals, finding only leachable barium at 2.42 mg/l and leachable lead at 2.86 mg/l.

Six additional borings (SS01 through SS05, plus SS03B) were advanced around the stream and sedimentation pond at the bottom of the gully at the west end of the landfill, as shown on Attachment 10. A single soil sample was collected from each boring and analyzed for petroleum hydrocarbons and metals. Heavy oils (119 ppm) were detected in a soil sample collected 9½ feet bgs in boring SS03, where water emerged from beneath the landfill. Elevated concentrations of metals were also detected in the sample, including antimony (3.72 ppm), arsenic (13.5 ppm), cadmium (7.72 ppm), copper (736 ppm), lead (940 ppm), mercury (0.666 ppm), silver (1.71 ppm), and zinc (1,940 ppm). The sample was further analyzed for PAHs, PCBs, and leachable metals, finding low levels of PCBs (0.6589 ppm) and leachable lead (0.48 mg/l). No petroleum hydrocarbons were detected in the other soil samples, and metals concentrations in the other soil samples were consistent with naturally-occurring background levels.

Four composite sediment samples were collected from the upper 12 inches of sediments at the edges of the sedimentation pond, as shown on Attachment 11. Each composite sample consisted of eight discrete samples. The four composite samples were analyzed for petroleum products, PAHs, PCBs, and total metals. Diesel and/or heavy oils were detected in all four samples, at concentrations up to 114 ppm and 3,490 ppm, respectively. Low concentrations of PCBs (up to 0.2169 ppm) were detected in two samples. Metals included antimony (6.13 ppm), cadmium (15.4 ppm), copper (881 ppm), lead (148 ppm), silver (1.24 ppm), and zinc (3,680 ppm).

The 12 additional soil gas samples (SG12 through SG23) were collected at depths of 5 feet bgs, following up on the detection of methane (up to 34.1 pbv) in SG07 in November 2012. The soil gas locations are shown on Attachment 12. Methane was detected in SG14 at concentrations up to 67.6 pbv. Methane concentrations in the other locations around the south end of the disposal cell ranged from 0.1 pbv to 1.8 pbv. No methane was detected in soil gas samples from the north end of the disposal cell.

Finally, in March 2015, three borings (B26 through B28) were advanced through the disposal cell, as shown on Attachment 12. A single soil sample was collected from each boring, at depths of about 7-8 feet bgs, and analyzed for petroleum hydrocarbons and metals. Only metals were detected, at concentrations generally consistent with naturally-occurring background levels.

Data Gaps Investigation (2016)

In a March 2016 letter, DEQ noted two data gaps in the site investigations. First, sediment samples needed to be collected between the sedimentation pond and Milton Creek to determine if contaminants in the pond sediments were reaching the creek. Second, additional methane samples were needed around the south end of the disposal cell to determine if the high methane concentrations were isolated pockets or indicative of a larger problem.

Three sediment samples were collected from the stream segment between the sedimentation pond and the Hankey Road culvert in May 2016. The samples, collected from six inches bgs, were analyzed for cadmium, copper, and lead. All three metals were detected, at concentrations up to 5.56 ppm for cadmium, 436 ppm for copper, and 51.3 ppm for lead.

Nine soil gas samples (SG24 through SG32) were collected in and around the southern half of the disposal cell in June 2016, as shown on Attachment 13. The samples were collected at 5 feet bgs and were analyzed for methane. Methane was detected at maximum concentrations of 7.9 pbv in SG24 and 8.1 pbv in SG29. Methane concentrations in the other locations did not exceed 0.4 pbv.

Remedy Selection (2020)

Various potential remedial actions for the landfill and disposal cell were proposed and evaluated from 2017 to 2019. After completion of a Staff Report in March 2020 and a 30-day public notice and comment period in May 2020, DEQ issued a Record of Decision (ROD) for the site in June 2020.

The landfill was estimated to be 600 feet long, 60-140 feet wide, and up to 19½ feet deep (including 3 feet of soil cover), with a volume of approximately 28,000 cubic yards. The solid waste disposal cell was about 245 feet long, 70-100 feet wide, and up to 10 feet deep, with a volume of approximately 4,600 cubic yards.

For the final remedy, the gully would be regraded to a shallower angle, the sedimentation pond would be filled in, and stormwater from Elk Ridge Estates would be directed through a buried pipe to a discharge point just above the Hankey Road culvert. The landfill and the disposal cell would be capped with demarcation layers and three feet of clean soils. Stormwater atop the landfill would be directed to a lined channel along Barrick Lane that would also discharge just above the Hankey Road culvert. Institutional controls would be recorded to prohibit the construction of any structures atop the landfill or disposal cell (due to methane accumulation concerns). The institutional controls would require annual cap inspections, and require that any cap-disturbing activities follow protective procedures outlined in both a Contaminated Media Management Plan (CMMP) and a Soil Cap Management Plan (SCMP).

Remedy Implementation (2022)

Work to regrade the gully and cap the landfill began in September 2022. A stormwater pipe, 155 feet long with a 30-inch inside diameter, was installed to convey stormwater from Elk Ridge Estates to an energy dissipation pad below the landfill and above the Hankey Road culvert. An underdrain (180 feet long, 8-9 feet wide, and up to 3 feet deep) was installed at the bottom of the gully to carry water emerging from the toe of the landfill to the Hankey Road culvert. The underdrain was filled with 3-inch drain rock wrapped in non-woven geotextile and topped with 1-2 feet of additional rock.

In October, the regraded landfill was topped with “orange demarcation non-woven geotextile” and 9,400 cubic yards of imported clean cap soils. A total of 242.27 tons of soils and solid wastes were removed from the landfill during the regrading work and shipped to the Hillsboro

Landfill for disposal. The disposal cell was capped with orange demarcation geotextile and 2,000 cubic yards of imported clean soils in December 2022. The CMMP and SCMP were completed in February and April 2023, respectively. See Attachment 14 for an as-built diagram of the regraded and capped landfill.

Nature and extent of contamination.
Contaminated soils remain in-place at the site beneath the landfill and disposal cell soil caps.

4. RISK EVALUATION

Conceptual site model.
A conceptual site model identifies the sources of contamination at a site, the human or ecological receptors that could be exposed to the contamination, and the pathways by which the exposures could occur.

To evaluate human exposure to residual chemical contamination requires an assessment of the type and extent of that exposure. This is based on current and reasonably likely future site use. DEQ publishes risk-based concentrations (RBCs) for contaminants commonly encountered, for different types of exposure scenarios. These RBCs are conservative estimates of protective levels of contaminants in soil, groundwater and air. Table 1 shows potential exposure pathways and receptors for this site. Based on this, applicable RBCs are identified and used for risk screening.

Table 1. Identification of applicable RBCs, based on pertinent pathways and receptors

Pathway	Receptor	Applicable RBC?	Basis for selection/exclusion
SOIL			
Ingestion, dermal contact, and inhalation	Residential	No	See Note 1.
	Urban residential	No	See Note 2.
	Occupational	No	See Note 3.
	Construction worker	Yes	
	Excavation worker	Yes	
Volatilization to outdoor air	Residential	No	See Note 4.
	Urban residential	No	See Note 2 & Note 4.
	Occupational	No	See Note 3 & Note 4.
Leaching to groundwater	Residential	No	See Note 5.
	Urban residential	No	See Note 2 & Note 5.
	Occupational	No	See Note 3 & Note 5.
GROUNDWATER			
Ingestion and inhalation from tap water	Residential	No	See Note 5.
	Urban residential	No	See Note 2 & Note 5.
	Occupational	No	See Note 3 & Note 5.
Volatilization to outdoor air	Residential	No	See Note 6.
	Urban residential	No	See Note 2 & Note 6.
	Occupational	No	See Note 3 & Note 6.

Pathway	Receptor	Applicable RBC?	Basis for selection/exclusion
Groundwater in excavation	Construction and excavation worker	No	See Note 7.

Notes:

1. The landfill and disposal cell have been capped with a demarcation layer and three feet of imported clean soils. Residents of Elk Ridge Estates are unlikely to come into direct contact with contaminated soils below the caps.
2. Based on the current zoning, redevelopment of adjacent properties for high-density urban residential use is unlikely.
3. Based on the current zoning, redevelopment of adjacent properties for commercial or industrial use is unlikely.
4. No volatile contaminants were detected in soil samples collected at the site.
5. A municipal water supply is available to the area, and no shallow domestic wells have been identified in the vicinity of the site. This exposure pathway is not likely to be complete.
6. No volatile contaminants were detected in water samples collected at the site.
7. The estimated depth to groundwater is 97 feet bgs in the landfill area.

Human health risk.
With the capping of the landfill and disposal cell at Elk Ridge Estates, the only potentially complete exposure pathway is direct contact with contaminated soil by construction and excavation workers. Construction and excavation workers may come into direct contact with contaminated soils beneath the caps when conducting work at the site (e.g., when installing subsurface utility lines). The risks can be minimized if construction and excavation workers are alerted to the presence of the contamination prior to beginning work, so that a Health and Safety Plan (HASP) can be prepared and followed while conducting the work, in conjunction with the practices and procedures outlined in the CMMP.

Ecological risk.
DEQ screened the site for potential ecological risks in the spring of 2020. Soil sampling results from the landfill, and surface water and sediment sampling results from the sedimentation pond and discharge flow to Milton Creek, were screened against RBCs for various ecological exposure groups (plants, birds, mammals, etc.) and exposure pathways (direct contact, ingestion, etc.). Total PAHs, total PCBs, and 10 metals were evaluated.

Numerous potentially unacceptable risks were identified. For plants, the greatest risks were from copper and lead in the soil, with Hazard Indices (HI) of 15.1 and 22.8, respectively. For birds, the greatest risk was from lead in surface soils (HI=31.7), while for mammals it was PCBs in surface soils (HI=16.2). For invertebrates in sediments, the greatest risks were from cadmium (HI=25.7), copper (HI=24.5), and PCBs (HI=19.9). The baseline Hazard Index screening level for all exposure pathways is 1.0.

After the ecological risk screening was completed, the landfill was regraded and the sedimentation pond was removed. The soil exposure pathways for plants, birds, and mammals are no longer complete, as the landfill (and disposal cell) have been capped with three feet of

imported clean soils. With the capping of residual contaminated soils and the redirection of stormwater away from the landfill, no future adverse ecological impacts from the landfill wastes are expected.

5. RECOMMENDATION

The landfill and disposal cell at Elk Ridge Estates have been capped with an orange demarcation layer and three feet of imported clean cap soils. Residents of Elk Ridge Estates are unlikely to come into direct contact with landfill and disposal cell wastes so long as the caps are maintained. To ensure the long-term integrity of the caps, and to provide notice to future construction and excavation workers, Easements and Equitable Servitudes will be recorded requiring that the caps be appropriately monitored and maintained in accordance with the SCMP to prevent exposures to the underlying wastes and contaminants.

With the capping of the landfill and disposal cell, acceptable risk levels are not exceeded, and a No Further Action determination is recommended, conditioned upon adherence to the requirements in the Easements and Equitable Servitudes. The Conditional No Further Action determination will be recorded in Your DEQ Online (YDO) under Environmental Cleanup Site Information (ECSI) file #4857.

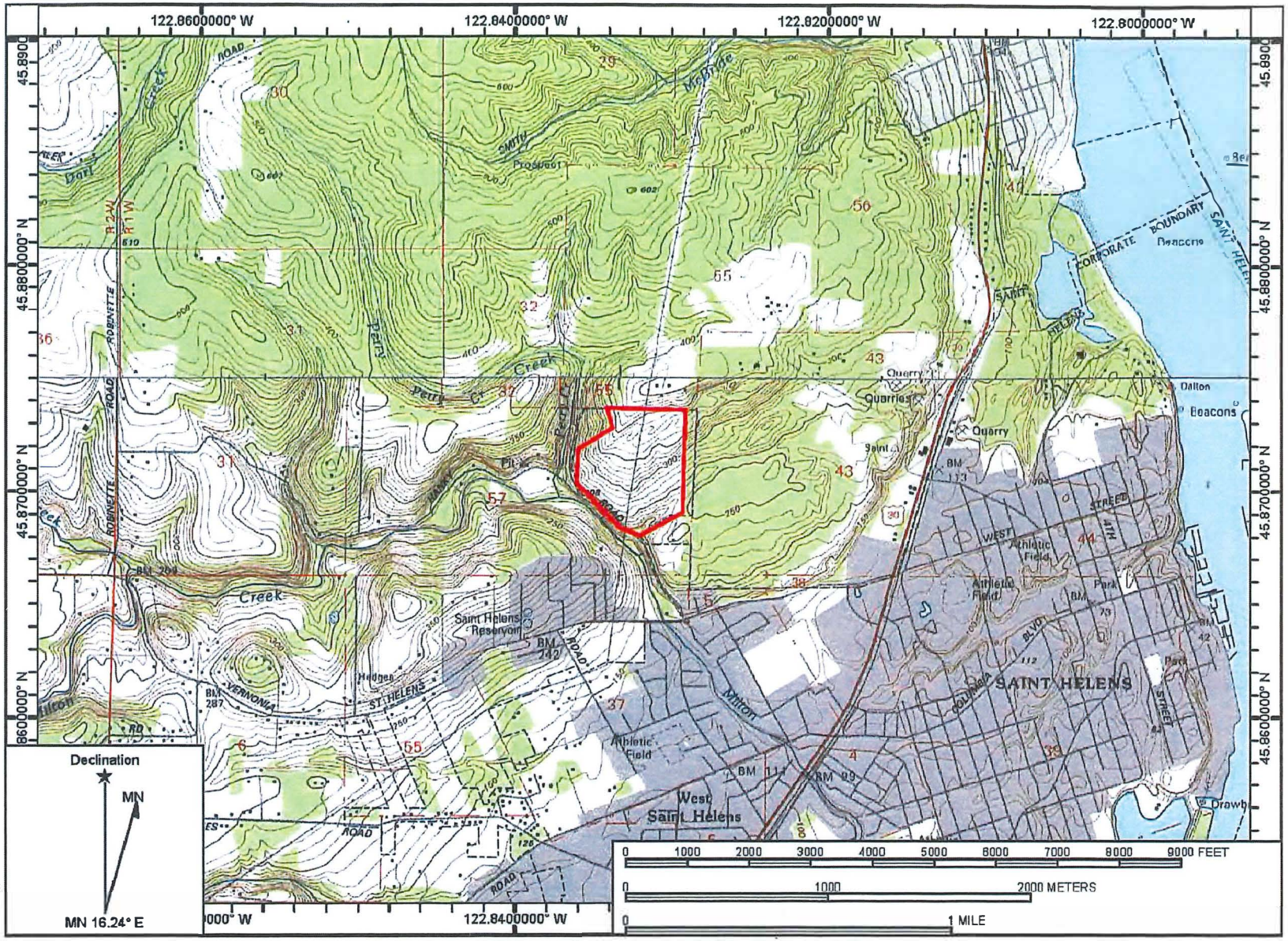
6. ADMINISTRATIVE RECORD

1. EVREN “Technical Memorandum” (January 8, 2013).
2. EVREN “Background Information” (January 31, 2013).
3. EVREN “Additional Soil Characterization” (July 25, 2013).
4. EVREN “Additional Soil Characterization of Open Space Tracts B and E” (April 23, 2015).
5. EVREN “Beneficial Ground Water Use Determination” (August 5, 2015).
6. EVREN “Risk Assessment” (January 20, 2016).
7. EVREN “Data Gaps Investigation” (August 15, 2016).
8. EVREN “Analysis of Cleanup Alternatives” (September 5, 2019).
9. DEQ “Staff Report” (March 28, 2020).
10. DEQ “Ecological Risk Assessment” (April 14, 2020).
11. DEQ “Record of Decision” (June 29, 2020).
12. EVREN “Remedial Design/Remedial Action Work Plan” (November 24, 2021).
13. EVREN “Contaminated Media Management Plan” (February 16, 2023).
14. EVREN “Remedial Design/Remedial Action Implementation Report” (April 3, 2023).
15. EVREN “Soil Cap Management Plan” (April 6, 2023).

7. ATTACHMENTS

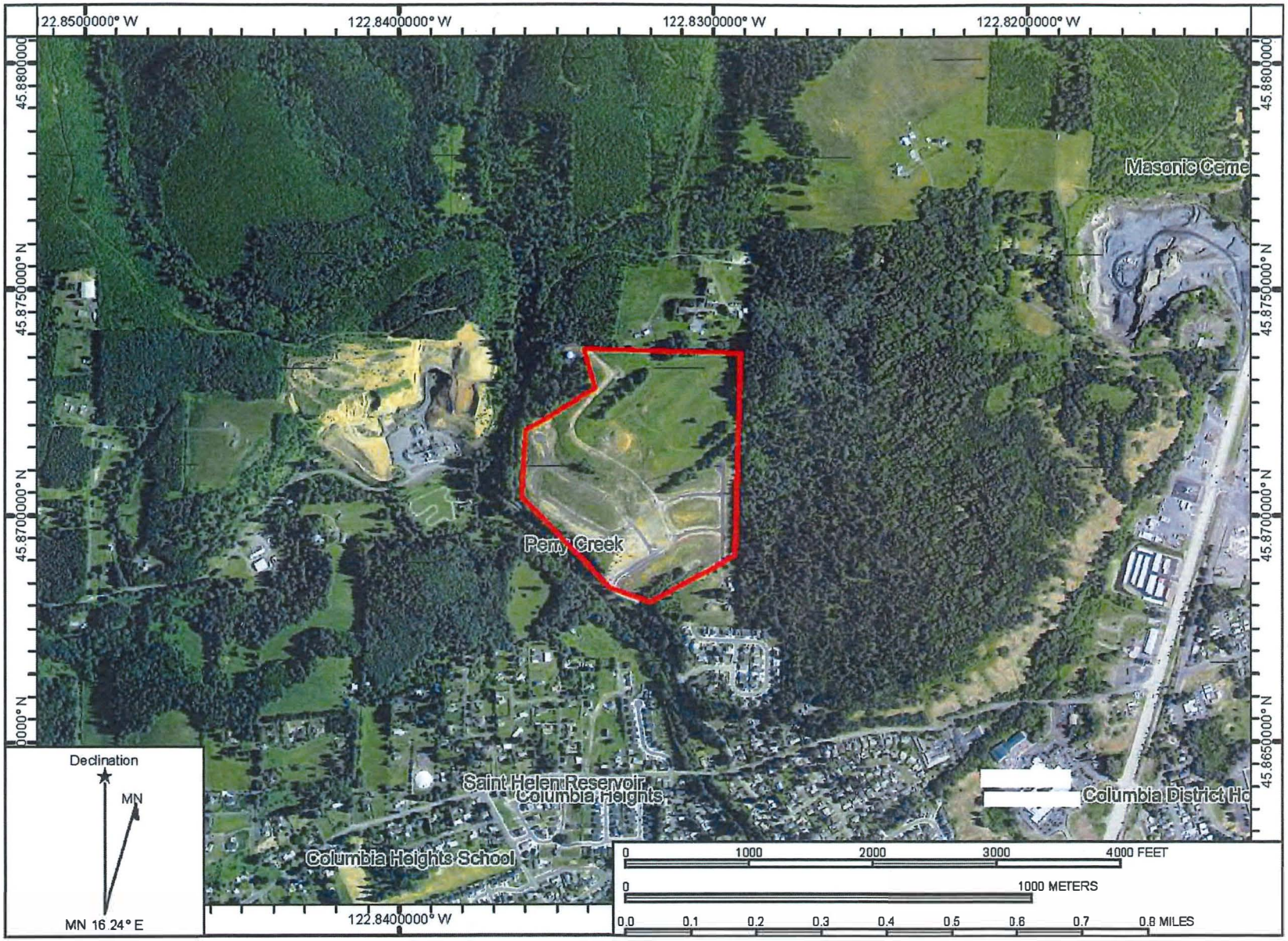
1. Topographic Map
2. Aerial Photo
3. Zoning Map
4. Well Location Map

5. Well Log
6. Sample Location Map (1995)
7. Sample Location Map – Landfill (2012)
8. Sample Location Map – Disposal Cell (2012)
9. Sample Location Map – Landfill (2013)
10. Sample Location Map – Landfill (2015)
11. Sedimentation Pond Sampling Map
12. Sample Location Map – Disposal Cell (2015)
13. Sample Location Map – Disposal Cell (2016)
14. Landfill As-Built Diagram



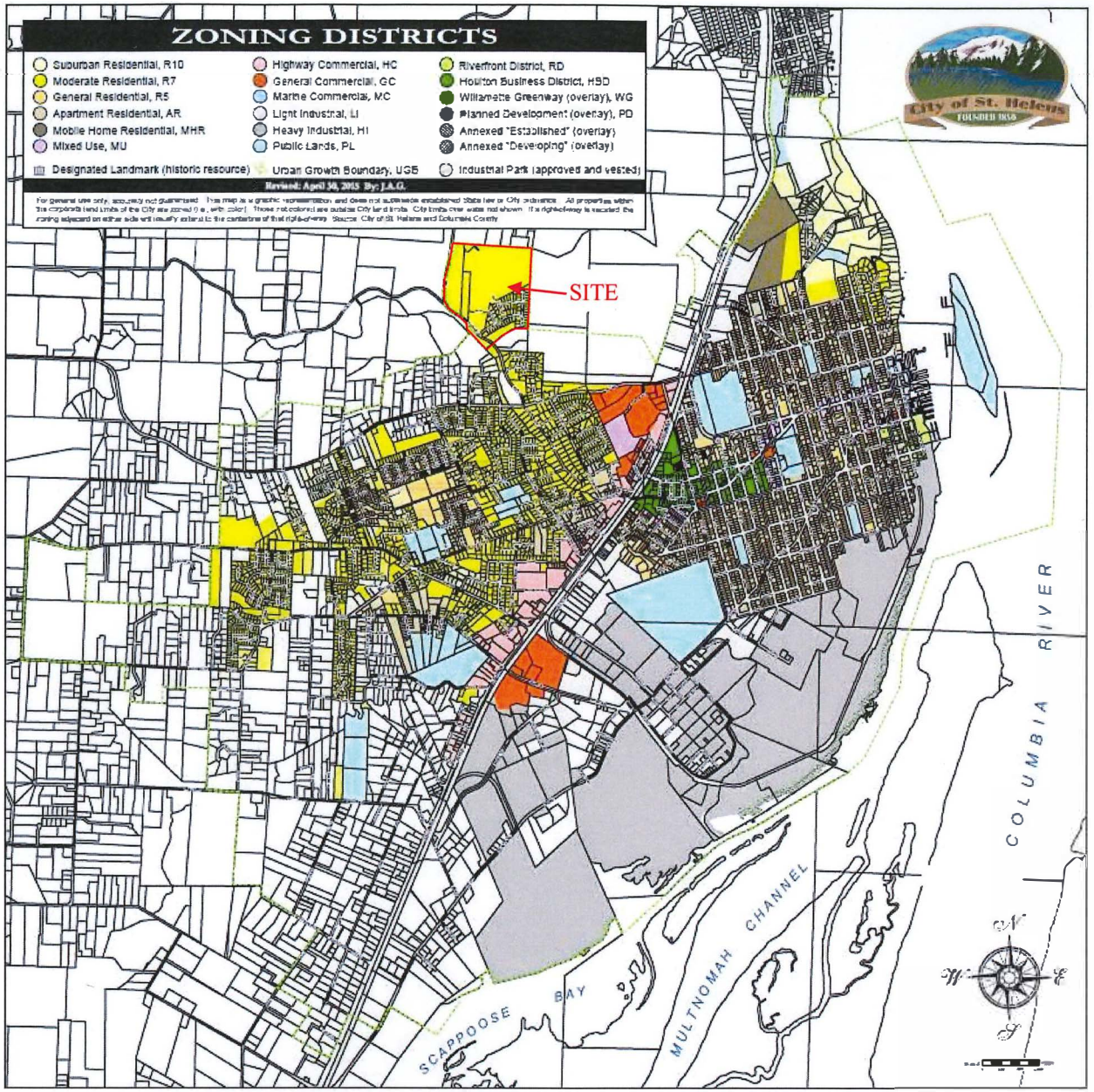
Source: USGS Topographic Map, 7.5-Minute St Helens Quadrangle, 1990

EVREN NORTHWEST INC	Date Drawn: 11/30/2012 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. 82r-12001-01 Attachment 1

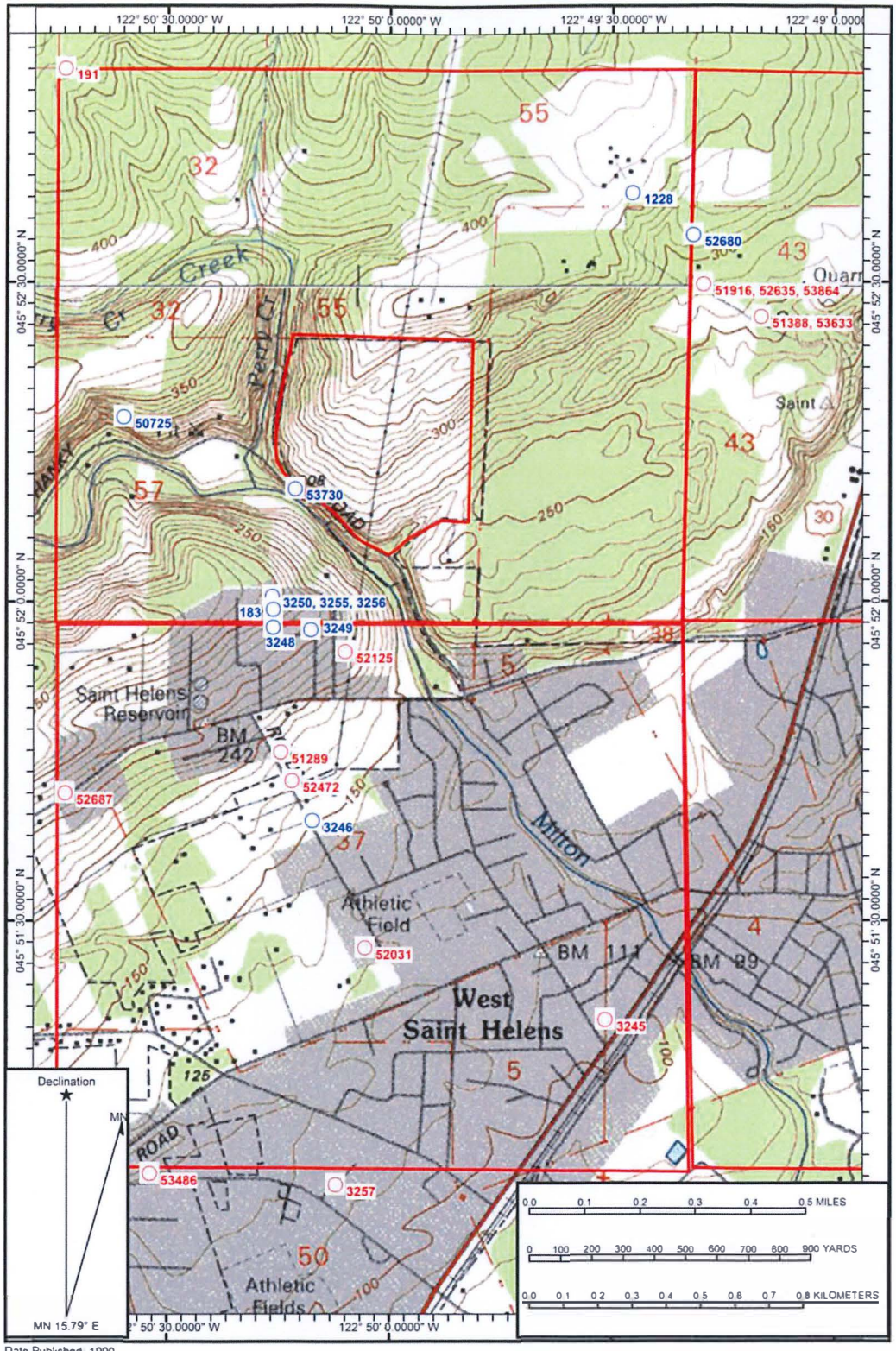


Source: USGS Orthophotography St Helens Quadrangle. NW Quarter, dated July 2, 2011

EVREN NORTHWEST	Date Drawn: 11/30/2012 CAD File Name:826-12001-01fig2aerial Drawn By: LDG Approved By: NMW	Elk Ridge Development N 45.8712 Deg / W 122.8321 Deg St. Helens, Oregon	**Aerial Photo Map**	Project No. 826-12001-01 Attachment **2**



EVREN NORTHWEST	Date Drawn: 7/14/2015 CAD File Name:826-12001-01_zoning_map-fig3(v01).docx Drawn By: LDG Approved By: NMW	Elk Ridge Development N 45.8712 Deg / W 122.8321 Deg St. Helens, Oregon	**Zoning Map**	Project No. 826-12001-08 Attachment **3**



Date Published: 1990
Map Name: ST HELENS

○ 3246 – Well location, < 0.75 mile away ○ 3257 – Well location, ≥ 0.75 mile away or abandoned.

EVREN NORTHWEST	Date Drawn: 7/29/2015 CAD File Name: 826-12001-08_well_locations-fig5(v02) Drawn By: PMT Approved By: LDG	Elk Ridge Development N 45.8712 Deg / W 122.8321 Deg St. Helens, Oregon	**Well Location Map**	Project No. 826-12001-08 Attachment **4**

COLU 53730

COLU 53730

02-25-2009

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765 & OAR 690-205-0210)

WELL LABEL # L 44742

START CARD # 1002814

(1) LAND OWNER

Owner Well I.D.

First Name AL Last Name FAYE

Company

Address 61424 PERRY CREEK ROAD

City SAINT HELENS State OR Zip 97051

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Conversion
☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD

☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger ☐ Cable Mud
☐ Reverse Rotary ☐ Other

(4) PROPOSED USE

☒ Domestic ☐ Irrigation ☐ Community
☐ Industrial/ Commericial ☐ Livestock ☐ Dewatering
☐ Thermal ☐ Injection ☐ Other

(5) BORE HOLE CONSTRUCTION

Special Standard ☐ Attach copy

Depth of Completed Well 200.00 ft.

BORE HOLE Dia	From	To	SEAL Material	From	To	Amt	sacks/ lbs
10	0	20	Bentonite	0	20	9	S
8	20	100	Bentonite Grout	20	90	9	S
6	100	200	Cement	90	100	3	S

How was seal placed: Method ☐ A ☒ B ☐ C ☐ D ☐ E
☒ Other POUR

Backfill placed from 20 ft. to 190 ft. Material BENT

Filter pack from ft. to ft. Material Size

Explosives used: ☐ Yes Type Amount

(6) CASING/LINER

Casing	Liner	Dia	+	From	To	Gauge	Stl	Plstc	Wld	Thrd
●	○	6	☒	1	100	250	●	○	☒	☐
○	●	4	☐	88	200	200	○	●	☒	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐
○	○		☐				○	○	☐	☐

Shoe ☐ Inside ☒ Outside ☐ Other Location of shoe(s) 100

Temp casing ☐ Yes Dia From To

(7) PERFORATIONS/SCREENS

Perforations Method SAW CUT

Screens Type Material

Perf/Screen	Casing/Liner	Screen Dia	From	To	Scrn/slot width	Slot length	# of slots	Tele/pipe size
Perf	Liner		160	200	25	4	60	

(8) WELL TESTS: Minimum testing time is 1 hour

○ Pump ○ Bailer ◉ Air ○ Flowing Artesian

Yield gal/min	Drawdown	Drill stem/Pump depth	Duration (hr)
15		200	1

Temperature 52 °F Lab analysis ☐ Yes By

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(9) LOCATION OF WELL (legal description)

County Columbia Twp 5.00 N N/S Range 1.00 W E/W WM

Sec 32 NW 1/4 of the SE 1/4 Tax Lot 100

Tax Map Number Lot

Lat ° 0 ' " or DMS or DD

Long ° 0 ' " or DMS or DD

◉ Street address of well ○ Nearest address

61424 PERRY CREEK ROAD
SAINT HELENS, OR 97051

(10) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well	01-31-2007			100

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found 190

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)
01-31-2007	190	200	15			100

(11) WELL LOG

Ground Elevation

Material	From	To
CLAY RED	0	90
TAN CLAY STONE	90	180
GRAY CLAY STONE	180	200

RECEIVED
DEC 21 2009
WATER RESOURCES DEPT
SALEM, OREGON

Date Started 12-27-2007 Completed 12-31-2007

(unbonded) Water Well Constructor Certification

I certify that the work I performed on the construction, deepening, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

License Number Date

Electronically Filed

Signed

(bonded) Water Well Constructor Certification

I accept responsibility for the construction, deepening, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

License Number 1480 Date 02-25-2009

Electronically Filed

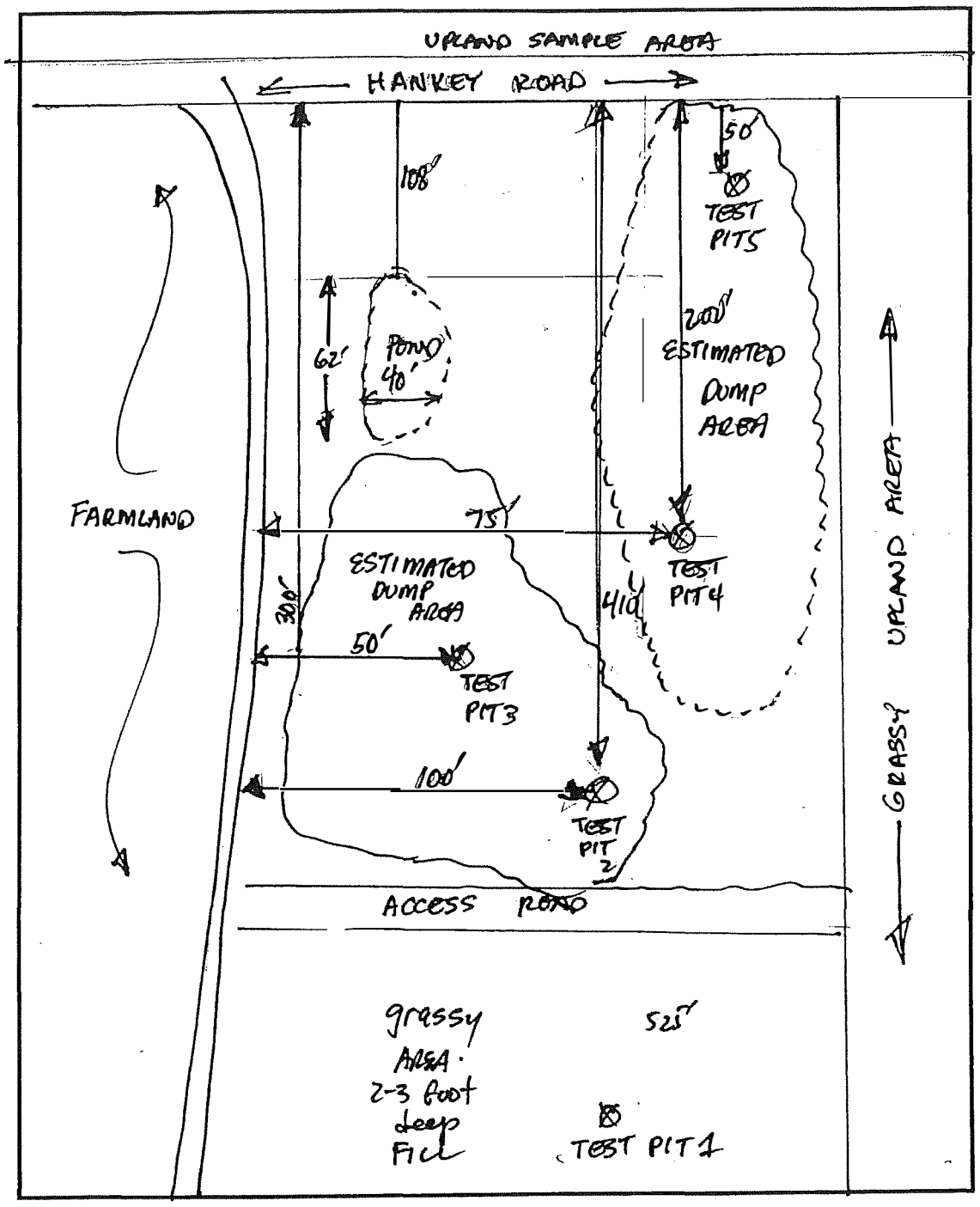
Signed *ARTHUR D MCMULLEN (E-filed)*

Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DEPARTMENT WITHIN 30 DAYS OF COMPLETION OF WORK

Form Version: 0.89



SITE

Attachment 6	SAMPLING PLAN	PLATE 1A
PROJECT Nº. 95130		

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
N.MORRIS 06/01/2009	L.GREEN 06/01/2009	N.WOLLER 06/01/2009	826-12001(v01)

PHASE 2

PHASE 1

TRACT A
OPEN SPACE

TRACT B
OPEN SPACE
2.08 ACRES

SOLID WASTE
SEPARATION
AREA

RESIDUAL UNSEPARATED
SOLID WASTE AREA

SOLID WASTE REMOVAL AND
SEPARATED WASTE
DISPOSAL AREA

ELK MEADOWS RD

HANKEY RD

BARRICK LANE

100' BPA EASEMENT

POND

CULVERT

TP01 TP02 TP03 TP04 TP05 TP06 TP07 TP08 TP09 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17 TP18 TP19 TP20 TP21 TP22 TP23 TP24 TP25 TP26 TP27

SG01 SG02 SG03 SG04 SG05

LEGEND:

- APPROXIMATE BUILDING LOCATIONS
- 146 APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS
- PROJECT PHASE AREAS
- SOLID WASTE REMOVAL AND SEPARATED WASTE (INERT MATERIALS) DISPOSAL AREA
- RESIDUAL UNSEPARATED SOLID WASTE AREA
- SOLID WASTE SEPARATION AREA
- TP01 TEST PIT EXPLORATION
- SG01 SOIL GAS / LANDFILL GAS MONITORING POINT

NOTES:

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

APPROXIMATE SCALE

0 80 160 FEET

N

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ATTACHMENT 7

SUB DIVISION PHASES AND LOTS
PHASE 1 / PHASE 2 TEST PITS
AND SOIL GAS / LANDFILL GAS POINTS

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY N.MORRIS 06/01/2009 | CHECKED BY L.GREEN 06/01/2009 | APPROVED BY N.WOLLER 06/01/2009 | DRAWING NUMBER 826 – 1200 1 (v01)

PHASE 8

PHASE 7

PHASE 6

PHASE 5

PHASE 4

TERRA VISTA

SOLID WASTE DISPOSAL CELL

TRACT E OPEN SPACE .39 ACERS

TRACT E OPEN SPACE .68 ACERS

VALLEY VIEW DR

TP01 TP02 TP03 TP04 TP05 TP06 TP07 TP08 TP09 TP10 TP11 TP12 TP13 TP14 TP15 TP16 TP17 TP18 TP19 TP20 TP21 TP22 TP23 TP24 TP25 TP26 TP27 TP28 TP29 TP30 TP31 TP32 TP33 TP34 TP35 TP36 TP37 TP38 TP39 TP40 TP41 TP42 TP43 TP44 TP45 TP46 TP47 TP48 TP49 TP50

SG01 SG02 SG03 SG04 SG05 SG06 SG07 SG08 SG09 SG10 SG11

LEGEND:

- APPROXIMATE BUILDING LOCATIONS
- 146 APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS
- PROJECT PHASE AREAS
- SOLID WASTE DISPOSAL CELL
- TP01 TEST PIT EXPLORATION
- SG01 SOIL GAS / LANDFILL GAS MONITORING POINT

NOTES:

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

APPROXIMATE SCALE

0 80 160 FEET

N

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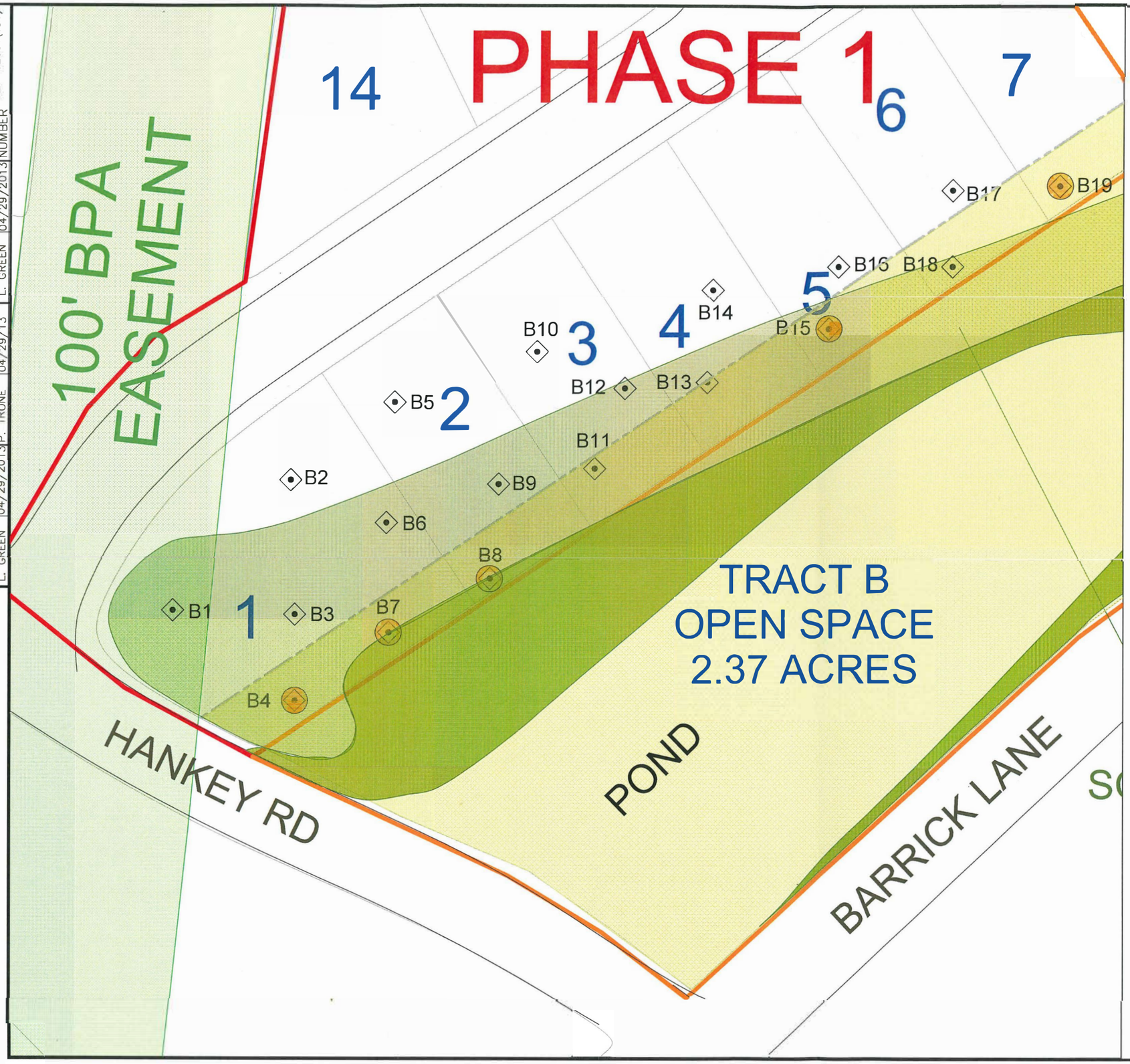
ATTACHMENT 8

SUB DIVISION PHASES AND LOTS
PHASE 4 - PHASE 8 TEST PITS
AND SOIL GAS / LANDFILL GAS POINTS

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
L. GREEN 04/29/2013	P. TRONE 04/29/13	L. GREEN 04/29/2013	826-12001(v01)



LEGEND:

- APPROXIMATE BUILDING LOCATIONS
- 146 APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS
- PROJECT PHASE AREAS
- HISTORICAL LANDFILL – SOLID WASTE REMOVAL AND SEPARATED WASTE (INERT MATERIALS) PLACEMENT AREA
- HISTORICAL LANDFILL – UNDISTURBED SOLID WASTE AREA
- TRACT B OPEN SPACE
- PROPOSED NEW SOUTHERN LOT LINE (LOTS 1–7)
- BOREHOLE LOCATION
- SCREENING LEVEL RBC EXCEEDED FOR ARSENIC LEAD, PCBs, AND/OR BENZO(A)PYRENE

NOTES:

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

APPROXIMATE SCALE

0 45 90 FEET

N

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ATTACHMENT 9

SOIL SAMPLE LOCATION DIAGRAM

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
P. TRONE 04/17/2015	P. TRONE 04/17/2015	L. GREEN 04/17/2015	826-12001(v01)

100' EASEM

ELK MEADOW

12 13 16 17 15 7 6 5 4 3 2 1

PHASE 1

SOLID WAS SEPARATI AREA

TRACT B
OPEN SPACE
2.37 ACRES

SOLID WASTE REMOVAL AND SEPARATED WASTE DISPOSAL AREA

RESIDUAL UNSEPARATED SOLID WASTE AREA

POND

DAM

CULVERT

TRACT I
OPEN SPACE
1.53 ACRES

HANKEY RD

BARRICK LANE

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 B21 B22 B23 B24 B25

SS01 SS02 SS03 SS03B SS04 SS05

LEGEND:

- APPROXIMATE BUILDING LOCATIONS
- 146 APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS
- PROJECT PHASE AREAS
- HISTORICAL LANDFILL – SOLID WASTE REMOVAL AND SEPARATED WASTE (INERT MATERIALS) PLACEMENT AREA
- HISTORICAL LANDFILL – UNDISTURBED SOLID WASTE AREA
- B1 ENW SUBSURFACE SAMPLING LOCATIONS (BOREHOLES)
- SS01 ENW SURFACE SAMPLING LOCATIONS (BOREHOLES)

COPCS WHICH EXCEED SLRBCS AND BACKGROUND LEVELS

NOTES:

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

APPROXIMATE SCALE

0 60 120 FEET

N

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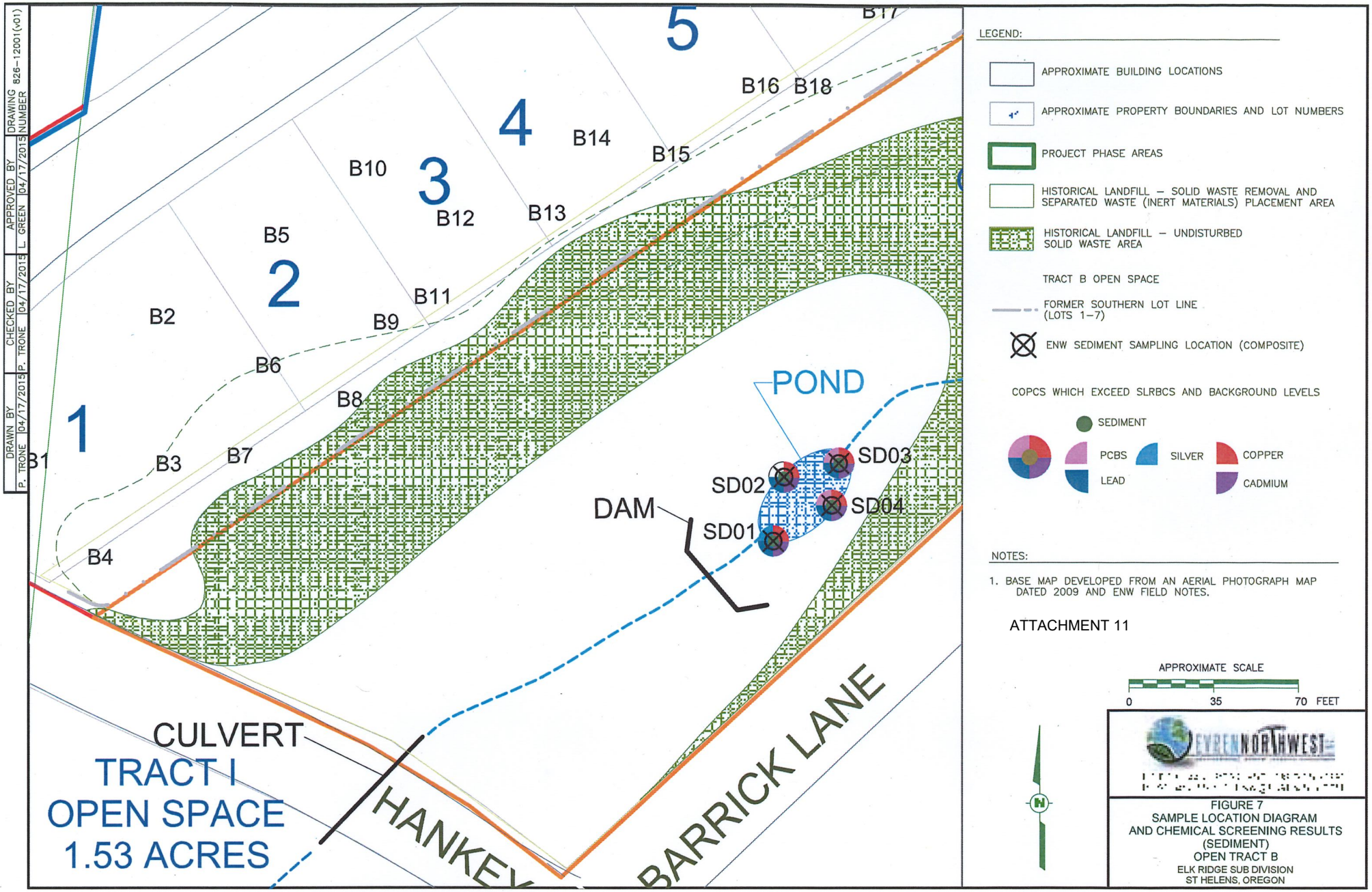
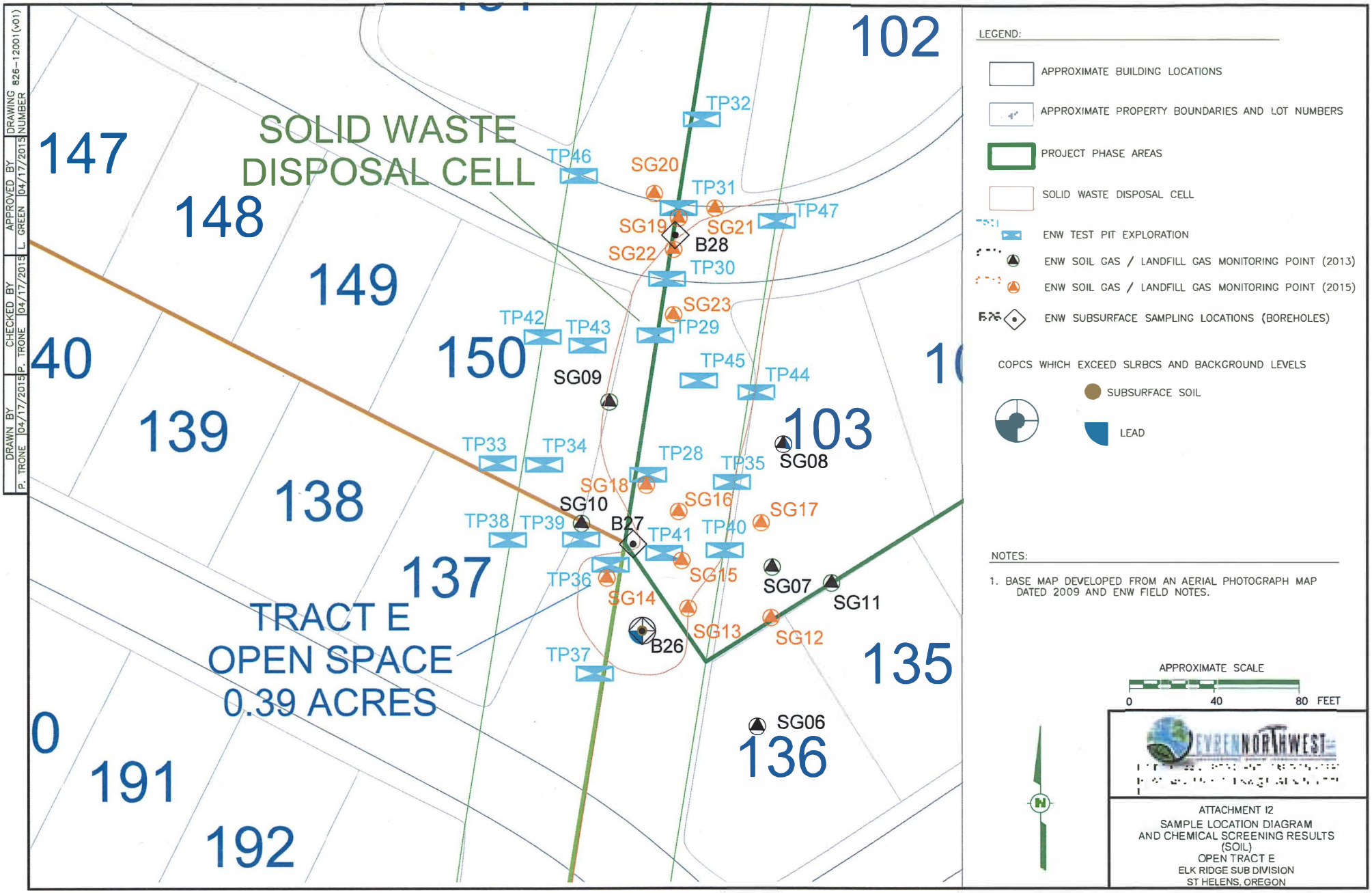
ATTACHMENT 10
SAMPLE LOCATION DIAGRAM
AND CHEMICAL SCREENING RESULTS
(SOIL)
OPEN TRACT B
ELK RIDGE SUB DIVISION
ST HELENS, OREGON

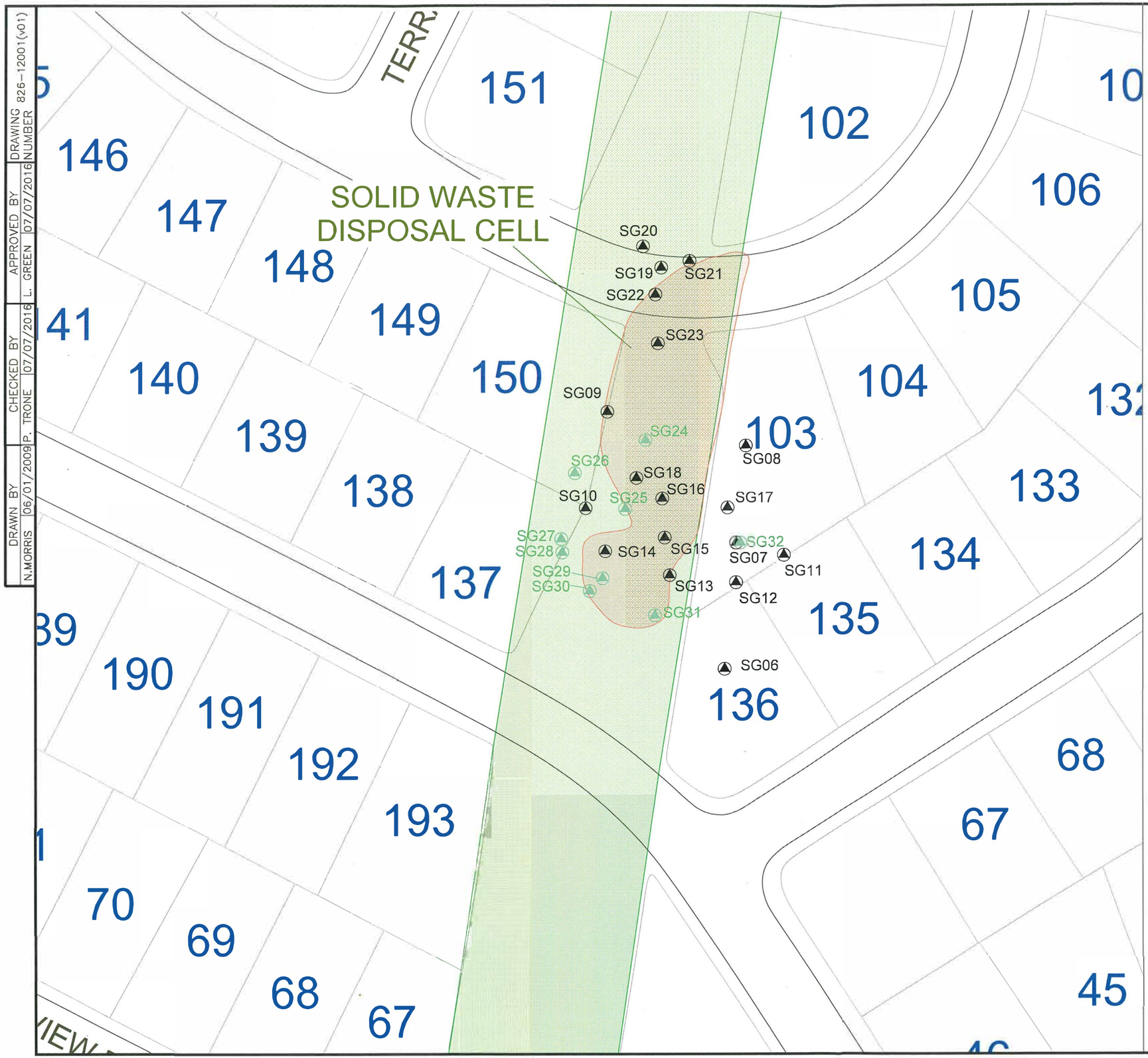

DRAWN BY P. TRONE 04/17/2015
CHECKED BY P. TRONE 04/17/2015
APPROVED BY L. GREEN 04/17/2015
DRAWING NUMBER 826-12001(v01)
1
2
3
4
5
B1
B2
B3
B4
B5
B6
B7
B8
B9
B10
B11
B12
B13
B14
B15
B16
B17
B18
POND
DAM
SD01
SD02
SD03
SD04
CULVERT
TRACT I
OPEN SPACE
1.53 ACRES
HANKEY
BARRICK LANE
LEGEND:
APPROXIMATE BUILDING LOCATIONS
APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS
PROJECT PHASE AREAS
HISTORICAL LANDFILL – SOLID WASTE REMOVAL AND SEPARATED WASTE (INERT MATERIALS) PLACEMENT AREA
HISTORICAL LANDFILL – UNDISTURBED SOLID WASTE AREA
TRACT B OPEN SPACE
FORMER SOUTHERN LOT LINE (LOTS 1–7)
ENW SEDIMENT SAMPLING LOCATION (COMPOSITE)
COPCS WHICH EXCEED SLRBCS AND BACKGROUND LEVELS
SEDIMENT
PCBS
SILVER
COPPER
LEAD
CADMIUM
NOTES:
1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2009 AND ENW FIELD NOTES.
ATTACHMENT 11
APPROXIMATE SCALE
0
35
70 FEET
N
ENW NORTHWEST
FIGURE 7
SAMPLE LOCATION DIAGRAM
AND CHEMICAL SCREENING RESULTS
(SEDIMENT)
OPEN TRACT B
ELK RIDGE SUB DIVISION
ST HELENS, OREGON



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
P. TRONE 04/17/2015	P. TRONE 04/17/2015	L. GREEN 04/17/2015	826-12001(v01)

ATTACHMENT I2
SAMPLE LOCATION DIAGRAM
AND CHEMICAL SCREENING RESULTS
(SOIL)
OPEN TRACT E
ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
N.MORRIS 06/01/2009	P. TRONE 07/07/2016	L. GREEN 07/07/2016	826-12001(v01)



LEGEND:

- 146 — APPROXIMATE PROPERTY BOUNDARIES AND LOT NUMBERS
- SOLID WASTE DISPOSAL CELL
- BPA 100' EASEMENT
- SG12 — SOIL GAS MONITORING POINT JANUARY 2015
- SG24 — SOIL GAS MONITORING POINT JUNE AND JULY 2016

NOTES:

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

APPROXIMATE SCALE

0 60 120 FEET

N

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ATTACHMENT 13

SAMPLE LOCATION DIAGRAM
SOIL GAS UPLAND DISPOSAL CELL

ELK RIDGE SUB DIVISION
ST HELENS, OREGON

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
H. ROMER 01/16/2023	P. TRONE 03/31/2023	L. GREEN 03/31/2023	826-12001(v11)

LEGEND:

- 146 — APPROXIMATE LOT BOUNDARIES AND LOT NUMBERS
- FSWDA
- REWORKED SOIL/WASTE INCREASED GRADE
- IMPORTED CLEAN SOIL CAP
- NEW STORM WATER CHANNEL
- CHECK DAMS IN NEW STORM WATER CHANNEL
- ROCK ON JUTE MAT BETWEEN CHECK DAMS
- UNDERDRAIN (180-FT-LONG BY 8-FT-WIDE BY 3-FT-DEEP WITH A 6-IN PERFORATED ADS PIPE BEDDED AND COVERED IN DRAIN ROCK AND WRAPPED IN NON-WOVEN GEOTEXTILE)
- STORM SYSTEM
- (S) SEDIMENTATION MANHOLE (POLLUTION CONTROL)
- CATCH BASIN
- MH STORM WATER MANHOLE

FSWDA = FORMER SOLID WASTE DISPOSAL AREA

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2011 AND ENW FIELD NOTES.
2. ALL LOT, ROAD, AND FEATURE LOCATIONS ARE APPROXIMATE.

APPROXIMATE SCALE

0 70 140 FEET

N

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P: (503)452-5561, E: ENW@EVREN-NW.COM

ATTACHMENT 14

FORMER SOLID WASTE DISPOSAL AREA (FSWDA) AS-BUILT DIAGRAM

ELK RIDGE ESTATES
ST HELENS, OREGON