Portland General Electric Harborton Restoration Project: Implementation Monitoring Report

Portland General Electric

February 2021

Portland General Electric Harborton Restoration Project: Implementation Monitoring Report

Portland General Electric
121 SW Salmon Street · Portland, Ore. 97204

Table of Contents

Tables

Appendices

Harborton Statistics

Habitat Area (acres):	53.39
Highest Elevation (ft):	44
Lowest Elevation (ft):	8
Off-channel Habitat Created (acres):	28
Riparian Buffer Created (acres):	13.5
Soils Excavated (cubic yards):	154,000
Cement Dust Applied (tons):	2,383
Water Extracted (gallons):	6 to 7 million
Trees Planted:	16,202
Shrubs Planted:	18,330
Herbaceous Plants Installed:	37,660
Seed Applied (pounds):	410
Large Wood Pieces Placed:	393
Vertical Snags Installed:	70
Mink Rock Piles Created:	9
Total Days to Construct:	245

List of Acronyms and Abbreviations

CPD	City of Portland Datum
FWS	U.S. Fish and Wildlife Service
IMR	Implementation Monitoring Report
LWM	Large Woody Material
NMFS	National Marine Fisheries Service
ODFW	Oregon Department of Fish and Wildlife
PGE	Portland General Electric
Project	PGE's Harborton Restoration Project
Property or Site	PGE's Harborton Property
Trustees	Portland Harbor Natural Resources Trustee Council

1. Introduction

This report documents as-built conditions for the Portland General Electric Company (PGE) Harborton Habitat Restoration Project (Harborton). The Portland Harbor Natural Resources Trustee Council (Trustee Council) developed the Portland Harbor NRDA Monitoring and Stewardship Framework (M&S Framework; Trustee Council 2014) to aid Project Implementers (PIs) in designing site-specific monitoring and stewardship plans for Natural Resource Damage (NRD) restoration projects. As part of the guidance, the Trustee Council presented a model detailing the monitoring phases that will be required of PIs (see below). Under the model, restoration site monitoring is divided into four phases: Baseline Monitoring, **Implementation Monitoring**, Effectiveness Monitoring, and Long-Term Stewardship Monitoring, which are described by the Trustee Council (2014) as follows:

- Baseline Monitoring occurs before project work commences at the site to document pre-restoration conditions.
- **Implementation Monitoring occurs during and following project construction to document that the restoration elements were installed or constructed as proposed.**
- Effectiveness Monitoring takes place during an initial performance period of 10 years following construction/implementation or as needed until performance standards are met.
- Long-term Stewardship Monitoring begins after the 10-year effectiveness monitoring period and entails less intense monitoring to ensure restoration goals are stable and habitat functionality persists.

This document is the Implementation Monitoring Report (IMR) prepared for the Portland General Electric (PGE) Harborton Restoration Project (Project). This IMR discusses project goals, habitat components, the results of as-built conditions.

Habitat restoration activities at the 54-acre site occurred from June 2020 to February 2021 (Appendix A, As-Built Sheets 1-4). Orthomosaic images collected by drone during site work show the progression from pre-grubbing through near-project completion (Appendix B). Photos taken from two fixed vantage points to show construction progress from an on-the-ground perspective are found in Appendix C. The basic project tasks involved earthwork, habitat structure installation and plantings. This report presents as-built conditions requested and required by the following agencies:

- Harborton Trustee Council under the approved Habitat Development Plan (December 2020)
- US Army Corp of Engineers under Joint Permit #13-0338-2 (updated 02/22/2019)
- NOAA Fisheries Biological Opinion (11/14/2018)
- Oregon Department of State Lands under Joint Permit #58924-RF (03/04/2019)
- Oregon Department of Environmental Quality (DEQ) Section 404 Permit (12/07/2018)
- Oregon DEQ Beneficial Use Determination (01/17/2018)
- City of Portland (Portland) Site Development Permit #18-260795-SD (09/16/2019)

The Project's restoration goals are summarized as follows:

- Provide fish passage opportunities between Sub Areas 3, 4, and the Willamette River through construction of a new North Channel
- Provide 28 acres of seasonally available off-channel habitat associated with the North Channel, and an additional 13.5 acres of riparian buffer within the floodplain for out-migrating juvenile Chinook salmon (*Oncorhynchus tshawytsch)* through excavation and re-grading of portions of the Site.
- Enhancement of aquatic, riparian, and upland habitat characteristics in and proximate to the new, North Channel through installation of habitat enhancement features/elements, invasive species management, and re-vegetation with native emergent, herbaceous, shrub, and tree species.
- Preservation of existing wetland in areas utilized by northern red-legged frogs (*Rana aurora*) and other wildlife.
- Creation of new wetland in upland areas adjacent to known red-legged frog habitat through excavation and removal of imported fill in Sub Area 3, installation of aquatic and riparian habitat enhancement features/elements, management of invasive plant species, and re-vegetation with native emergent, herbaceous, shrub, and tree species.

This report is organized into sections that generally follow the chronological order of project activities performed at the site, from site preparation to establishment of performance monitoring stations and equipment. Site development is also chronicled in Appendices B, C, and D .

2. Site Preparation

2.1 MONITORING WELL ABANDONMENT

Prior to site grubbing and clearing four monitoring wells and a Portland State University seismic test boring were abandoned in June 2020 (Figure 1, Appendix A). Borings were decommissioned via removing surface monuments and plugging the holes with pelletized bentonite. Bore well abandonment was recorded and registered with DEQ.

2.2 CLEARING AND GRUBBING

Work site clearing and grubbing began June 26, 2020. Prior to the start of construction two efforts were made to walk the site to collect and relocate amphibians, reptiles, and any other wildlife to areas outside of the work zone. One Pacific chorus frog and one garter snake were observed. The snake was captured and relocated to Sub Area 4; the frog eluded capture. Dense, waist-high reed canarygrass and head high blackberry thickets made detection and capture difficult.

Clearing and grubbing activities included removal of all the remaining vegetation in Sub Area 3 to allow construction activities to proceed. . All vegetation and cleared material were added to the Sub Area 2 fill pile; larger trees were salvaged for reuse as habitat features (Appendix A, Photo 1).

2.3 DEWATERING

A geotechnical investigation of pre-construction conditions indicated that elevated soil moisture may complicate soil excavation, handling and placement. In anticipation, a dewatering system was developed and employed at the site (Appendix D – Photos 2-4). The principal system was comprised of approximately 200 perforated pipes inserted vertically via air-jet borings to depths of between 15 and 20 feet. The vertical pipes connected to a header or collection pipe network running along the ground surface to a set of eight 6" compressor pumps. Those pumps generated vacuum pressure to draw groundwater into the collection system; water from the collection system was then pumped to a discharge area in Sub Area 4.

A secondary dewatering strategy consisted of portable pumps deployed in sumps and operated as needed in work areas. Up to three such pumps were employed during construction.

The principal dewatering system operated from July 8 to mid-September 24 hours/day. At its peak the primary system was observed to consistently pump between 100 and 200 gallons per minute. Starting in September, sections of the principal system were decommissioned and removed to accommodate site excavation work. An estimated 6 to 7 million gallons of water were pumped from the site.

3. Earthwork

3.1 EXCAVATION, FILL PLACEMENT AND SOILS MANAGEMENT

Excavation in Sub Area 3 was performed between June 26, 2020 and October 28, 2020. An estimated total of 154,000 cubic yards of soils were excavated from Sub Area 3 and placed, spread, and

compacted in Sub Area 2. The final excavation volume was approximately 10 percent less than the estimated pre-construction volume of 162,000 cubic yards.

High moisture content in soils influenced the decision to dig from surface to finish elevations over small areas so that the drier, upper soils could be mixed with wetter, deep soils to reduce overall soil moisture content to workable levels. Orthomosaic images (Appendix B) illustrate this cellular excavation approach. Even with the dewatering system in operation and relatively dry summer season, saturated conditions were common at lower elevations. Consequently, excavated soils were temporarily stockpiled to allow additional drying time prior to being transported and placed in lifts in the Sub Area 2 berm.

Excavated soils were placed in Sub Area 2 as shown on Sheet 3, Appendix A. Soils were added in 12-inch lifts that were spread, disced, and left exposed to dry before being compacted with a sheepfoot vibratory roller (Appendix D, Photo 5). Soils were then checked for moisture content by a geotechnical consultan using a nuclear densiometer before the next lift was added. A bulldozer pulling a disc tiller operated constantly during work hoursto turn the soil lifts to increase the drying rate.

The decision to incorporate cement dust into the fill material was made in late September in consultation with PGE's geotechnical consultant. Cement dust is commonly used to reduce soil moisture content and increase soil bonding propertiesk. Beginning in late September, an outside contractor was hired to apply cement on Sub Area 2 soil lifts using equipment specially designed for that purpose (Appendix D, Photo 6) then mixed into the soil with a specialized mixing equipment (Photo 7). Cement was added at 3-8% in a pattern to create a spine down the middle of the berm with branches coming off the spine. This approach minimized the application of cement only to areas required to truck excavated material to the berm. No cement dust was added to the final 3-foot layer of soil so that conditions would be more favorable to plant development. A total of 2,383 tons of cement were applied.

Final maximum fill elevation reached 44 feet City of Portland Datum (CPD) for a berm measuring 16 feet from base to peak (Appendix A, Sheet 3). Project design anticipated a maximum elevation of 56 feet CPD. The discrepancy in heights between anticipated and as-built conditions is due to fill volume being less than anticipated, soil settling, and volume lost from reducing soil moisture content.

The beneficial use determination from DEQ required the natural material from the bottom of the excavation to be used to cap soils in Sub Area 2. Testing was performed on cap soils to determine whether they would provide a suitable growing medium for plants. Four samples collected from cap material were submitted to A&L Western Agricultural Laboratories for analysis. Based on testing results soils used for the cap are suitable but not ideal for plant propagation (Appendix E). The laboratory recommended application of lime to adjust pH and fertilizer to improve growth performance. Plant development through the first growing season will be monitored to determine whether fertilizer and/or soils amendment measures need to be taken to meet performance criteria.

3.2 CONTAMINATED MEDIA MANAGEMENT

A management plan was developed to sample soil using a decision unit (DU) basis under incremental sampling methodology (ISM). This approach was used for two decision units in the western portion of the excavation. Subsequent ISM was not conducted as the site was over excavated by one foot with placement of clean fill to achieve final elevations.

A Decision Unit (DU) plan created to provide a way of distinguishing contaminated and non-contaminated excavated soils was followed as far as testing two decision units. Results of DU testing are included in Appendix E. Based on test results, the excavation schedule and constraints caused by soil moisture management the decision was made to over-excavate soils in all DU soils and backfill those areas with clean, imported material. Topsoil placement on over-excavated areas is described in Section 3.3 below.

Contaminated soils were placed in the center of the Sub Area 2 berm and capped with clean native material taken from Sub Area 3. Clean cap material is a minimum of 1-foot thick and in most places exceeds 3 feet in thickness. Wattles were placed at intervals along the berm's slope faces; straw mulch was applied to areas draining towards the North Channel.

3.3 TOPSOIL PLACEMENT AND FINAL CONTOURING

Topsoil and a gravel/topsoil mix were applied to broad areas of Sub Area 3 to improve soil characteristics and provide soils stability, respectively. A 1-foot layer of mixed ¾-inch minus gravel and topsoil was added to the floodplain to provide a stable soil base within the floodplain (Appendix D, Photo 8). Pre-construction studies suggested that soils at the finish grade may include a high percentage of fine sands that may allow the North Channel to migrate, braid and/or avulse. In anticipation of such conditions, project design specified the gravel/topsoil mix. 13,100 tons of gravel/topsoil mix were added to the Sub Area 3 floodplain. Over excavation to accommodate the additional fill allowed the finish grade to meet project design elevations.

Rock ballast was added to the toe of the slope generally abutting the Harborton substation per design. Photo 9 (Appendix D) shows installation of the rock toe prior to backfilling with topsoil.

Imported topsoil was applied to excavated surfaces, including the floodplain bottom and side slopes, in Sub Area 3. Topsoil was added Over 17,000 cubic yards of imported soil was applied in a 6-inch layer across this area.

Site elevations were monitored throughout the excavation effort to ensure that finish grades matched design elevations (Appendix D, Photo 10). Results of the post-construction survey performed by a professional land survey team are shown on Sheets 1-4 (Appendix A). Based on the survey as-built conditions closely match design.

Jute matting and straw were employed around key disturbed and newly excavated surfaces to minimize erosion and sedimentation (Appendix D, Photo 11). Silt fences were installed in key areas such as toes of slopes and near sensitive surface water areas, and a sediment curtain was deployed at the mouth of the North Channel outlet (Appendix D, Photo 12). Based on a field inspection with

DEQ the sediment curtain is likely to remain in place until significant groundcover is established – likely sometime in late spring or early summer 2021.

4. Vegetation

4.1 PLANTS INSTALLED

A total of 72,200 native plants were installed at Harborton (Table 1 below). The number of plants by form included the following:

- 16,200 trees
- 18,330 shrubs
- 37,660 herbaceous plants

Distribution of plants by species generally followed the planting plan design with field adjustment made based on a species' moisture preference/tolerance and on observed site conditions. Plants with relatively high tolerance to persistent standing water and periodic flooding, such as willow, cottonwood, Douglas spirea, and wapato, were more frequently planted near the North Channel outlet and its surrounding floodplain; plants with lower tolerance for persistent wetness were more frequently installed at higher elevations and in areas less prone to persistent wetness.

One notable deviation from project design involved the number and form of herbaceous species. Mature potted plants replaced several 1" plugs at a 5:1 ratio due to two factors: 1) survivorship of potted plants in low-lying areas near the North Channel outlet is expected to be higher than plants in plug form; and 2) mature potted plants were able to be sourced during the planting effort – plugs are typically available in spring and summer. The total number of herbaceous plants installed at the site is 35,000 less than designed.

Douglas fir and lodgepole pine were substituted for western red cedar based on observations of soils conditions, expected soil moisture regime, and on observations of poor survivorship of recently planted cedar at a nearby location. Spreading rush was substituted for hardstem bulrush, the latter of which could not be sourced in time for plantings.

Plants material was staged near the southwestern corner of the substation, then distributed through the site using tracked flatbed and forklift equipment (Appendix D, Photos 13 and 14). Crews numbering between 3 and 25 persons used hand tools to install potted plants, plugs, bulbs, and bare root form plants. The planting effort extended from the second week in November 2020 to February 26, 2021.

TABLE 1. PGE Harborton Plant List

Wetland Zone					
PROPOSED			**AS BUILT**		
Common Name	**Size**	**Total Stems**	Size/Condition	QTY	**NOTES**
EMERGENT PLUGS					
slough sledge	1" Plug	16,650	1" plug	10,000	
slough sledge			1 gallon	4,000	equals 20,000 plugs (5 to 1)
creeping spikerush	1" Plug	13,660	1" plug	2,000	
wapato	1" Plug	13,660	bulb	13,660	
hardstem bulrush	1" Plug	13,660		0	
SUB: Juncus pattens			1 gallon	4,000	equals 20,000 plugs (5 to 1)
small-fruited bulrush	1" Plug	16,650		0	
small-fruited bulrush	1" Plug		1 gallon	2,000	equals 10,000 plugs (5 to 1)
Plugs Total		**74,280**		**35,660**	
SHRUBS/TREES					
red-osier dogwood	#1 or BR (12-16" ht)	1,400	1 gallon	1,400	
Nootka rose	#1 or BR (12-16" ht)	735	1 gallon	735	
Scouler's willow	4' Stake	735	4' stake	735	
Sitka willow	4' Stake	735	4' stake	735	
Douglas' spiraea	#1 or BR (12-16" ht)	735	1 gallon	735	
Oregon ash	BR (12-16"ht)	735	BR (12-16"ht)	735	
black cottonwood	BR (12-16"ht)	1,400	BR (12-16"ht)	1,400	
Pacific willow	4' Stake	735	4' stake	585	
			4' Stake	150	
Shrubs/Trees Total		**7,210**		**7,210**	Equivalent
WETLAND TOTAL		**81,490**		**42,870**	**82,870**

Riparian Zone		
		AS BUILT

Common Name	**Type**	**Total Stems**		Size/Condition	QTY	**Notes**
SHRUBS/TREES						
beaked hazelnut	BR (12-16" ht)	2,320		BR (12-16"ht)	700	
SUB: Serviceberry				1 gallon	1,000	
SUB: Pacific ninebark				1 gallon	620	
Nootka rose	#1 or BR (12-16" ht)	2,320		BR (12-16"ht)	820	850 received
Nootka rose				1 gallon	1,500	
Scouler's willow	4' Live Stake	2,320		4' stake	1,120	
SUB: Salix lasiandra				4' stake	1,200	
Douglas' spiraea	#1 or BR (12-16" ht)	2,320		BR (12-16"ht)	720	
Douglas' spiraea				1 gallon	1,600	
common snowberry	#1 or BR (12-16" ht)	4,640		BR (12-16"ht)	4,640	
red alder	BR (12-16"ht)	3,520		BR (12-16"ht)	3,520	
black hawthorn	BR (12-16"ht)	1,200		BR (12-16"ht)	1,200	
western red cedar	#1 or BR (12-16" ht)	2,320		1 gallon	100	
SUB: Shore Pines				#1 Band Pots	1,175	
SUB: Shore Pines				Band Pots	122	
SUB: Doug Firs				#1	800	
SUB: Doug Firs				BR 12"+	123	
Oregon Ash	BR (12-16"ht)	1,200		BR (12-24"ht)	1,200	
black cottonwood	BR (12-16"ht)	1,200		BR (12-16"ht)	1,200	
TOTAL		**23,360**			**23,360**	

Upland Zone					
PER DRAWING			AS BUILT		
Common Name	**Type**	**Total Stems**	Size/Condition	QTY	**Notes**
SHRUBS/TREES					
oceanspray	#1 or BR (12-16" ht)	1,115	BR (12-16"ht)	1,115	
tall Oregon grape	#1 or BR (12-16" ht)	405	1 gallon	405	
red elderberry	#1 or BR (12-16" ht)	405	Large BR	405	
common snowberry	#1 or BR (12-16" ht)	1,520	BR (12-16"ht)	1,520	1,560 received
bigleaf maple	BR (12-16"ht)	1,080	Large BR	1,080	1,092 received
red alder	BR (12-16"ht)	1,050	BR (12-16"ht)	1,050	
cascara	BR (12-16"ht)	850	Large BR	850	900 received
Oregon white oak	BR (12-16"ht)	850	BR (12-16"ht)	350	850 plants
Oregon white oak			2 gallon	500	
TOTAL		**7,275**		**7,275**	

4.2 SEED APPLIED

Following earthwork seed mixes were applied in the following areas at the rates and quantities noted below:

- Wetland Zone (6.4 acres) – 96 lbs applied
- Riparian Zone (11.3 acres) – 113 lbs applied
- Upland Zone (7.25 acres) – 130.5 lbs applied
- Grass Planting Zone (3.9 acres) – 70.2 lbs applied

Native plant-seed substitutions were made due to seed specified in some mixes being unavailable. Substitutions include the following:

- Wetland Zone
    - large camas for nodding beggar's-tick
    - water plantain for willow-leaved dock
- Riparian Zone
    - Slender hairgrass for miner's lettuce
    - Tufted hairgrass for Kentucky bluegrass
- Upland Zone
    - California brome for Columbia brome
    - Streambank lupine for American bird's-foot trefoil
    - Blue wildrye for Kentucky bluegrass
- Grass Planting Zone
    - California brome for Columbia brome
    - Red fescue for Kentucky bluegrass

5. Habitat Structures

A total of 324 logs with rootwads, 69 logs without rootwads, and 70 vertical snags were installed at the site (Appendix A, Sheet 3). Rootwads were ballasted with boulders affixed to the logs via threaded bolts, metal plate washers and nuts (Appendix D, Photo 15). A backhoe with a thumb attachment on the bucket was used to distribute and place the LWM. Distribution and LWM orientation in Sub Area 3 were based on the concept of a flooded backwater that rafted in wood from the Willamette then stranded the logs as floodwater receded. In Sub Area 4, LWM with rootwads were oriented to face south to provide basking opportunities (Appendix D, Photo 16). Sheet 4 (Appendix A) shows exact location and orientation of the installed LWM.

A total of 70 vertical snags were installed in Sub Area 3. Snags consisted of fir and hemlock logs imported to the site as well as several large trees, mostly cottonwood, salvaged during grubbing and clearing (Appendix D, Photo 17). Snags were installed using a backhoe with a thumb attachment on the bucket that was able to press the logs into the substrate then set the logs by hammering the tops with the backhoe bucket.

Nine mink rock piles were installed in Sub Areas 2 and 3 in locations shown on Sheets 3 and 4, Appendix A. Rock piles were installed in areas not expected to flood during high water event but close to channels and areas of open water. Photo 18 shows a typical mink rock pile.

6. Monitoring Stations and Equipment

6.1 SITE TRANSECTS

A total of nineteen permanent transects were marked and mapped on the site (Appendix A, Figures 2 and 3). Transect endpoints are marked by 4-foot long white fiberglass rods and by etched aluminum tags affixed to the ground near the base of the rods. The rods, normally used for electric fences, are highly visible and weather resistant. The aluminum tags serve as a secondary, durable marker that labels the transect and can be used to re-establish rod markers lost due to theft or, in the case of markers at lower elevations, to flood events. Marker locations were recorded using a hand-held GPS unit accurate to within 5 feet.

Ten of the fixed transects cross perpendicular to the North Channel and are of variable length depending on terrain (Figure 2). Nine of the transects run from the Willamette River shoreline on a line perpendicular to NW Mariana Way (Figure 3).

6.2 WATER LEVEL MEASUREMENTS

Eight hobo water level loggers were deployed to the site in locations shown on Figure 4. Two of the hobos are suspended by string in piezometers located in Sub Area 4. The location of these two hobos have been used over the past several years to monitor conditions in Sub Area 4. An additional hobo was deployed near the northwestern-most corner of Sub Area 4 near the original outlet notch of Sub Area 4. Four additional hobos were deployed in the North Channel as shown on Figure. The eighth hobo was deployed as an atmospheric monitor to calibrate the other seven and is suspended by string in a tree in Sub Area 4. Hobo locations were recorded using a hand-held GPS unit accurate to within 5 feet.

Two two-meter staff gauges were installed in Sub Area 3 as shown on Figure 4. The staff gauges were added to provide a quick visual reference of water levels during fieldwork. The gauges were located and oriented to be readable through binoculars or spotting scope during flood conditions. The gauge elevations were recorded by professional land survey during as-built survey work.

6.3 PHOTO MONITORING POINTS

Eight permanent photo monitoring points were established as shown on Figure 5. The locations were selected based on importance and interest of site features, such as the North Channel, anticipated wildlife movement corridors, large wood components, and northern red-legged frog habitat. Appendix F includes photographs from the monitoring point locations. Monitoring points were marked with etched aluminum tags affixed to the ground with a long nail. Monitoring locations were recorded using a hand-held GPS unit accurate to within 5 feet.

In addition to the eight permanent photo monitoring locations, four sites for game cameras were identified (Appendix A, Figure 5). The four camera locations were selected based on observations of wildlife tracks, proximity to habitat features and/or water features, and paths and passages likely to be used by wildlife.

7. Goals and Objectives

The following section summarizes project goals and objectives and provides an evaluation of the current status of each.

- Excavate and re-grade portions of the Site to provide approximately 28 acres of seasonally available off-channel habitat associated with the South Channel and North Channel, and an additional 13.5 acres of riparian buffer within the floodplain for out-migrating juvenile Chinook salmon (*Oncorhynchus tshawytscha*).

  Status: Met. Earthwork has provided the requisite site elevations and conditions to meet this objective.

- Construction of a new North Channel through Sub Area 3 to provide fish passage opportunities between Sub Areas 3, 4 and the Willamette River.

  Status: Met. The current North Channel conveys open water from Sub Area 4 to the Willamette River. Fish have been observed from throughout the channel, including up to the channel inlet between Sub Areas 3 and 4.

- Enhance aquatic, riparian, and upland habitat characteristics in and proximate to the new, North Channel through installation of habitat enhancement features/elements, invasive species management, and re-vegetation with native emergent, herbaceous, shrub, and tree species.

  Status: Met / On-Going. Habitat enhancement features are in place, and native trees, shrubs and herbaceous species have been planted. Invasive plants are present in and around the project site and will require on-going maintenance to manage and control those populations.

- Preservation of existing wetland in areas utilized by northern red-legged frogs (*Rana aurora*) and other wildlife.

  Status: Met. Early observations indicate that persistent open water favored by northern red-legged frogs and other amphibians occurs on site. O**ngoing monitoring will help assess long-term conditions.**

- Creation of new wetland in upland areas adjacent to known red-legged frog habitat through excavation and removal of imported fill in Sub Area 3

  Status: Met. Persistent, still, open water conditions have been observed in this area. Future egg-mass surveys that include this area will be used to verify.

- Installation of aquatic and riparian habitat enhancement features/elements

  Status: Met. Large woody material, vertical snags, mink rock piles, and extensive native plantings contribute to meeting this objective.

- Management of invasive plant species and enhancement of shoreline, riparian, and upland habitats through invasive species management

  Status: Ongoing. Invasive plants are present at the site. Management efforts over the next decade will help to manage and control invasive plants to promote native plant communities.

- Re-vegetation with native emergent, herbaceous, shrub, and tree species

  Status: Met. 82,318 plants and 339 pounds of native seed were added to the site.

8. Discussion and Variation from Design

Variations between design and as-built conditions were relatively minor for a project of this scope and scale. Discovery of a stormwater monument in the work area was a surprise but, fortunately, did not pose an issue. Soil composition and characteristics encountered during excavation provided both challenges in that soil moisture content was greater than anticipated, however, soils were more stable and cohesive than expected. A summary of changes and "field fit" measures undertaken during construction is given below:

- North Channel Layout – a stormwater manhole monument in Sub Area 3 not identified during pre-construction design phase caused a slight shift of the North Channel to the northeast. Reconfiguring or relocating the storm water monument and line was considered but rejected based on 1) desire to maintain the storm water discharge point in Sub Area 4 to preserve hydrologic conditions, and 2) the relatively minor adjustment made to the North Channel layout. Sheet 2 in Appendix A illustrates elevational differences between design and as-built conditions. Excavation volumes were balanced by slightly lowering the southwest corner of Sub Area 3.
- Sub Area 2 Berm Soils Management – the high moisture content of excavated soils led to two unanticipated factors related to the berm in Sub Area 2: additional drying measures and lower berm elevation. Measures to remove moisture from soil included spreading, tilling, temporary stockpiles and finally cement dust mixing. The latter involved application of 2,382 tons of cement dust to soil lifts in order to drive out moisture and allow compaction. Cement was applied starting in late September as the project schedule tightened and ability to condition lifts so that additional soil could be added became critical. An unanticipated consequence of removing soil moisture often exceeding 20 percent is that the soil volume placed in the berm decreased notably. The geotechnical consultant inspecting and reporting on the earthwork indicated that the 12-vertical foot difference between design and as-built berm elevation was consistent with soil drying and lower total excavation volume (154,000 excavated v. 162,000 anticipated).

- Sub Area 3 Soil Conditions – geotechnical investigations prior to construction indicated that soils would have a high sand content and, consequently, be highly susceptible to erosion and shifting. Design measures to counteract this potential condition included, principally but not exclusively, the rock toe incorporated into sections of Sub Area 3 and the application of the ¾" minus gravel/topsoil mix in the floodplain. Earthwork revealed that only a small portion of the Sub Area 3 slope in the northeast corner had sandy soils with high susceptibility to erosion.

9. References

Apfelbaum, S.I. and C.E. Sams. 1987. *Ecology and control of reed canary grass* (*Phalaris arundinacea.*L.). Natural Areas Journal 7(2): 69-74.

Bonham, C. D. 1989. *Measurements for Terrestrial Vegetation*. John Wiley & Sons, New York.

Dukes, T. 2000. *Reed canary grass control in the Olympic region, Washington State Dept. of Transportation*. Reed Canary Grass Working Group Conference, March 15, 2000, Olympia

Elzinga, C.L., D.W. Salzer, and J.W. Willoughby. 1998. *Measuring and Monitoring Plant Populations*. Bureau of Land Management Technical Reference 1730-1, BLM/RS/ST-98/005+ 1730. National Business Center, Denver, Colorado. Available online at: http://www.oregonflora.org/checklist.php

Huff, M. H., K. A. Bettinger, H. L. Ferguson, M. J. Brown, and B. Altman. 2000. *A habitat-based point- count protocol for terrestrial birds, emphasizing Washington and Oregon.* Gen. Tech. Rep. PNW- GTR-501. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR. 39 pp.

Inter-Fluve Inc. 2020. Portland General Electric Harborton Restoration Plan, 100% Design. Submitted July 2020.

Lipinski, B., M. Tu, J. Soll. 2004. *Reed canary grass (Phalaris arundinacea). Control and management in the Pacific Northwest.* The Nature Conservancy, Oregon Field Office. 12 pp.

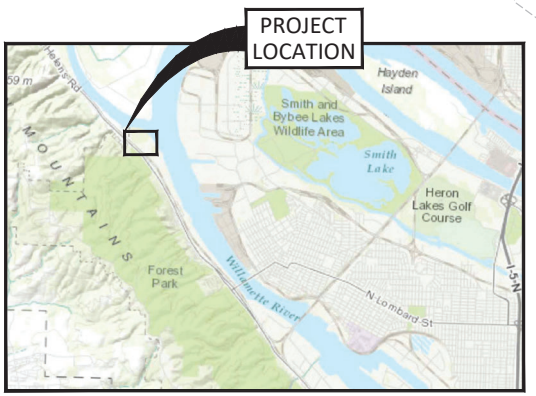
Moore, S., Ward, D. and B. Aldrich. 2000. *Transplanting large trees for reed canary grass control*. Reed Canary Grass Working Group Conference, March 15, 2000, Olympia.

NMFS (National Marine Fisheries Service). 2008. *Anadromous Salmonid Passage Facility Design*. NMFS, Northwest Region, Portland, Oregon.

Portland General Electric. 2020. *Habitat Development Plan*. Portland General Electric. December 2020.

Trustee Council (Portland Harbor Natural Resource Trustee Council). 2014. *Monitoring and Stewardship Framework*. Published May 15, 2014.

Williams, B. K., R. C. Szaro, and C. D. Shapiro. 2009. A*daptive Management: The U.S. Department of the Interior Technical Guide*. Adaptive Management Working Group, U.S. Department of the Interior, Washington, DC.



VICINITY MAP
SCALE 1" = 10000'

SITE PLAN
SCALE 1" = 200'

Harborton Restoration Project
As-Built Record Drawings

SHEET INDEX

NOTES:

1. AS-BUILT TOPOGRAPHY WAS SURVEYED BY MINISTER & GLAESER SURVEYING, 2200 E. EVERGREEN BLVD., VANCOUVER, WA 98661 AND PROVIDED BY ENVIROCON. ELEVATION DATUM = CPD
2. SOILS WERE OVER-EXCAVATED 1.0-FT BELOW FINISHED GRADE AND BACKFILLED WITH CLEAN SOIL MATERIALS TO AS-BUILT SURFACE.
3. LARGE WOOD AND HABITAT STRUCTURE LOCATIONS WERE CORRELATED TO DRONE ORTHOMOSAIC IMAGERY COLLECTED BY PGE

NO.	BY	DATE	REVISION DESCRIPTION

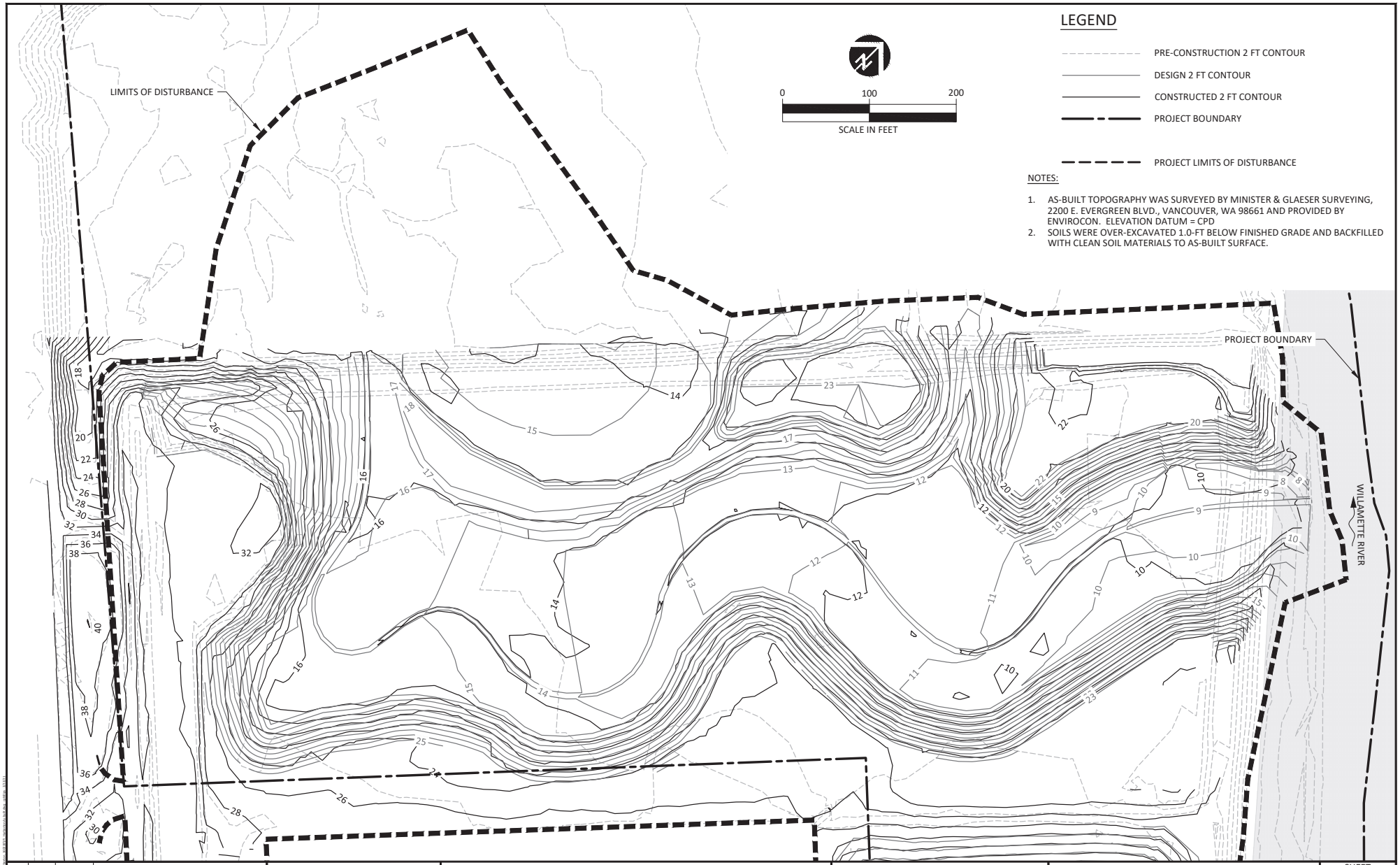
CP, RP	DM,JG,CM	DM
DRAWN	DESIGNED	CHECKED
	2/22/21	16-02-18
APPROVED	DATE	PROJECT

Portland General Electric
Harborton Restoration Project As-Built Record Drawings
Portland, Oregon

interfluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

TITLE SHEET & SHEET INDEX

SHEET
1 OF 4



NOTES:

1. AS-BUILT TOPOGRAPHY WAS SURVEYED BY MINISTER & GLAESER SURVEYING, 2200 E. EVERGREEN BLVD., VANCOUVER, WA 98661 AND PROVIDED BY ENVIROCON. ELEVATION DATUM = CPD
2. SOILS WERE OVER-EXCAVATED 1.0-FT BELOW FINISHED GRADE AND BACKFILLED WITH CLEAN SOIL MATERIALS TO AS-BUILT SURFACE.

NO.	BY	DATE	REVISION DESCRIPTION

CP, RP	DM,JG,CM	DM
DRAWN	DESIGNED	CHECKED
	2/22/21	16-02-18
APPROVED	DATE	PROJECT

Portland General Electric
Harborton Restoration Project As-Built Record Drawings
Portland, Oregon

interfluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

NORTH CHANNEL AS-BUILT GRADING PLAN

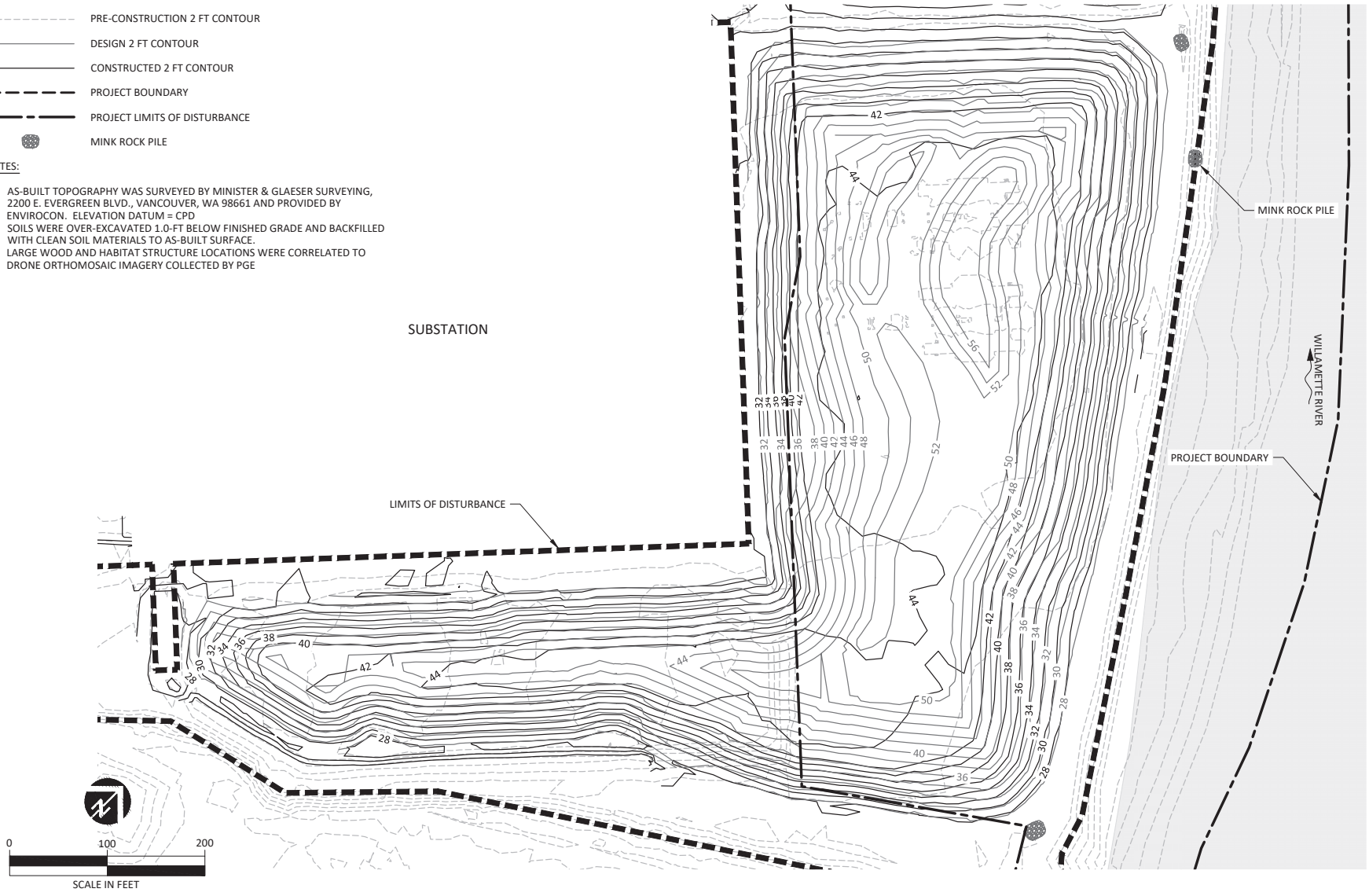
SHEET
2 OF 4

LEGEND

- PRE-CONSTRUCTION 2 FT CONTOUR
- DESIGN 2 FT CONTOUR
- CONSTRUCTED 2 FT CONTOUR
- PROJECT BOUNDARY
- PROJECT LIMITS OF DISTURBANCE
- MINK ROCK PILE

NOTES:

1. AS-BUILT TOPOGRAPHY WAS SURVEYED BY MINISTER & GLAESER SURVEYING, 2200 E. EVERGREEN BLVD., VANCOUVER, WA 98661 AND PROVIDED BY ENVIROCON. ELEVATION DATUM = CPD
2. SOILS WERE OVER-EXCAVATED 1.0-FT BELOW FINISHED GRADE AND BACKFILLED WITH CLEAN SOIL MATERIALS TO AS-BUILT SURFACE.
3. LARGE WOOD AND HABITAT STRUCTURE LOCATIONS WERE CORRELATED TO DRONE ORTHOMOSAIC IMAGERY COLLECTED BY PGE



NO.	BY	DATE	REVISION DESCRIPTION

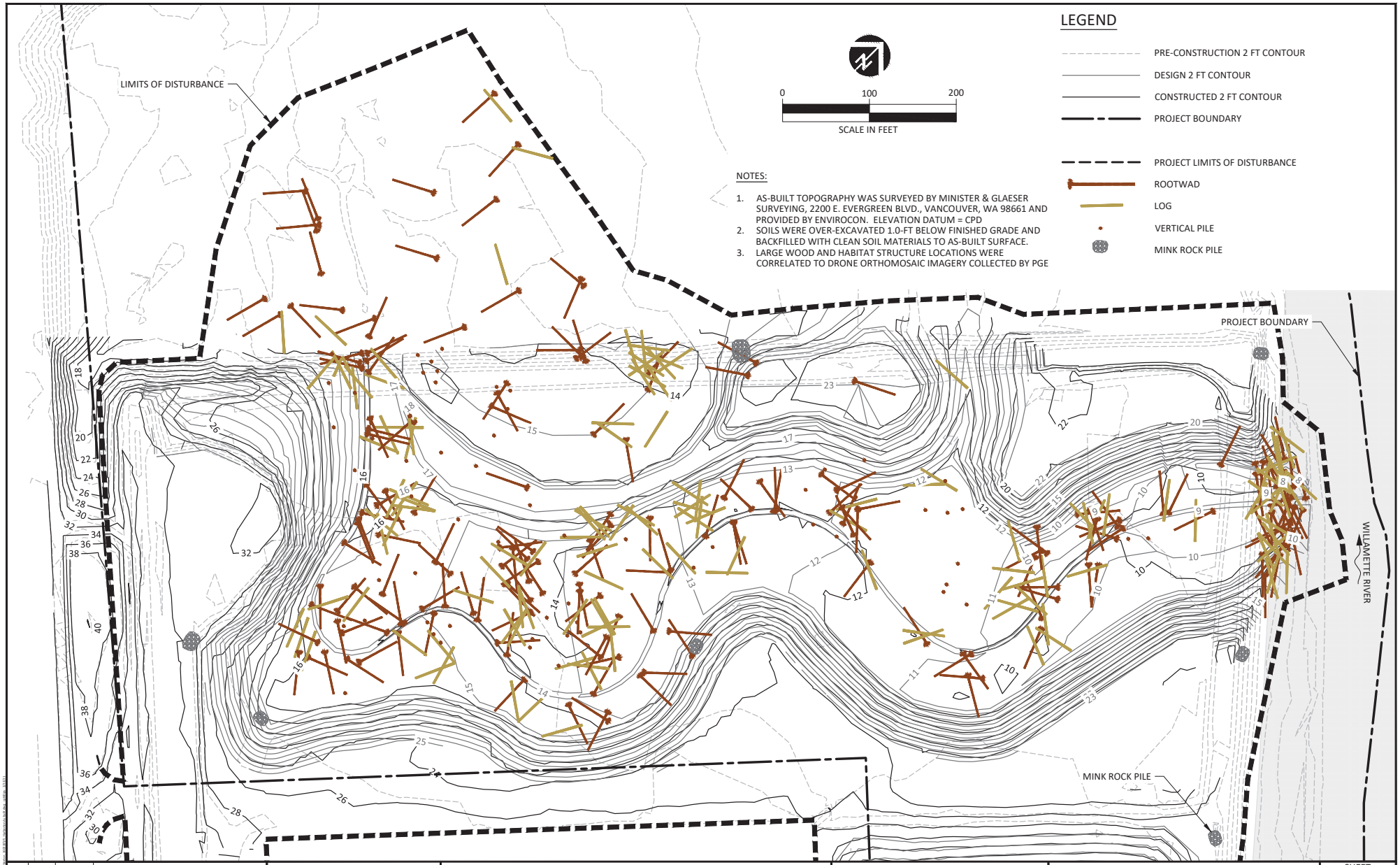
CP, RP	DM,JG,CM	DM
DRAWN	DESIGNED	CHECKED
	2/22/21	16-02-18
APPROVED	DATE	PROJECT

Portland General Electric
Harborton Restoration Project As-Built Record Drawings
Portland, Oregon

interfluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

FILL AREA AS-BUILT
GRADING PLAN

SHEET
3 OF 4



NO.	BY	DATE	REVISION DESCRIPTION

CP, RP	DM,JG,CM	DM
DRAWN	DESIGNED	CHECKED
	2/22/21	16-02-18
APPROVED	DATE	PROJECT

Portland General Electric
Harborton Restoration Project As-Built Record Drawings
Portland, Oregon

interfluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

NORTH CHANNEL AS-BUILT
GRADING & HABITAT PLAN

SHEET
4 OF 4

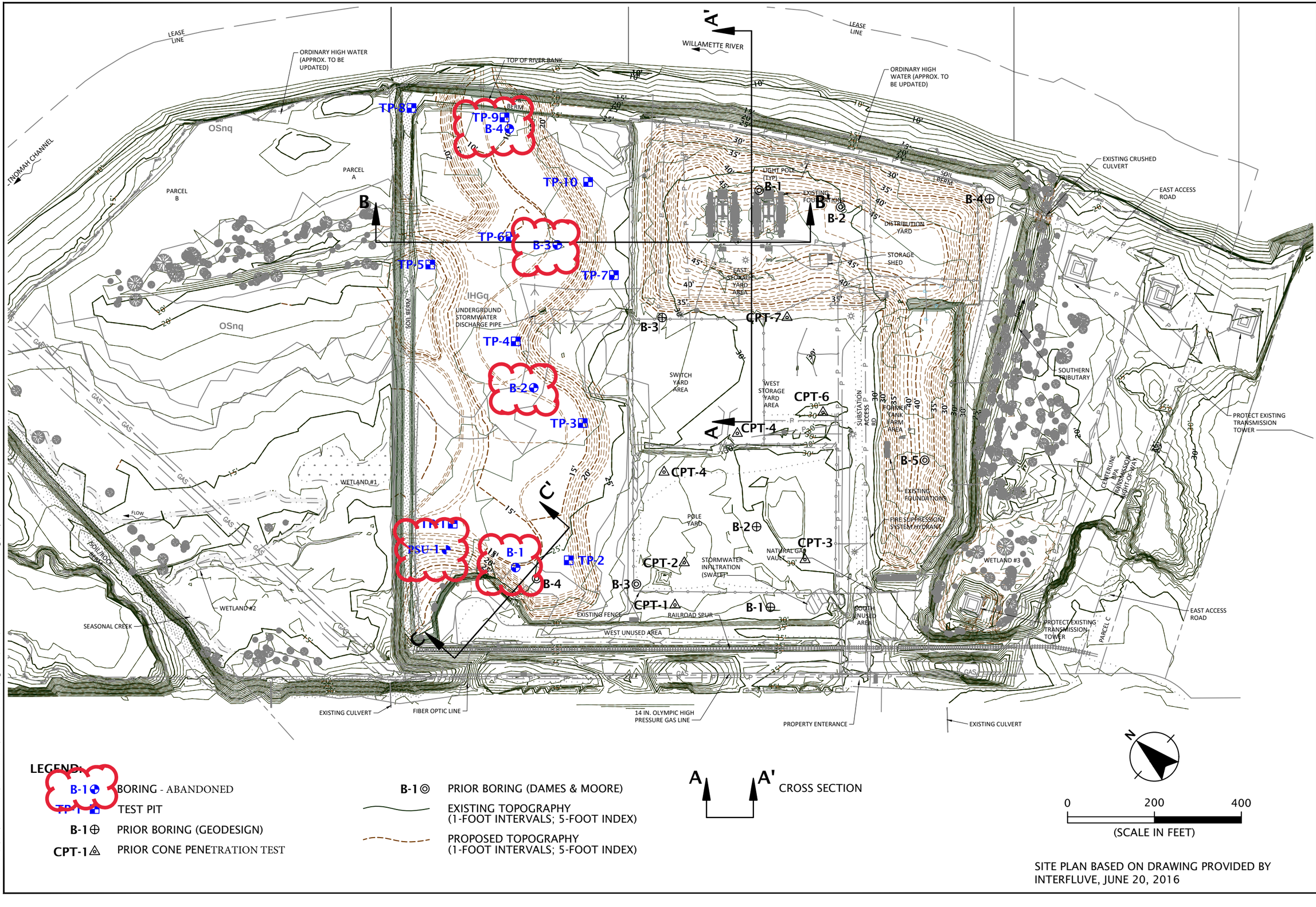
WELLABANDONMENT LOCATIONS

FIGURE 1

PGE HARBORTON SUBSTATION RESTORATION
PORTLAND, OR

INTERFLUVE-2-01

SEPTEMBER 2016

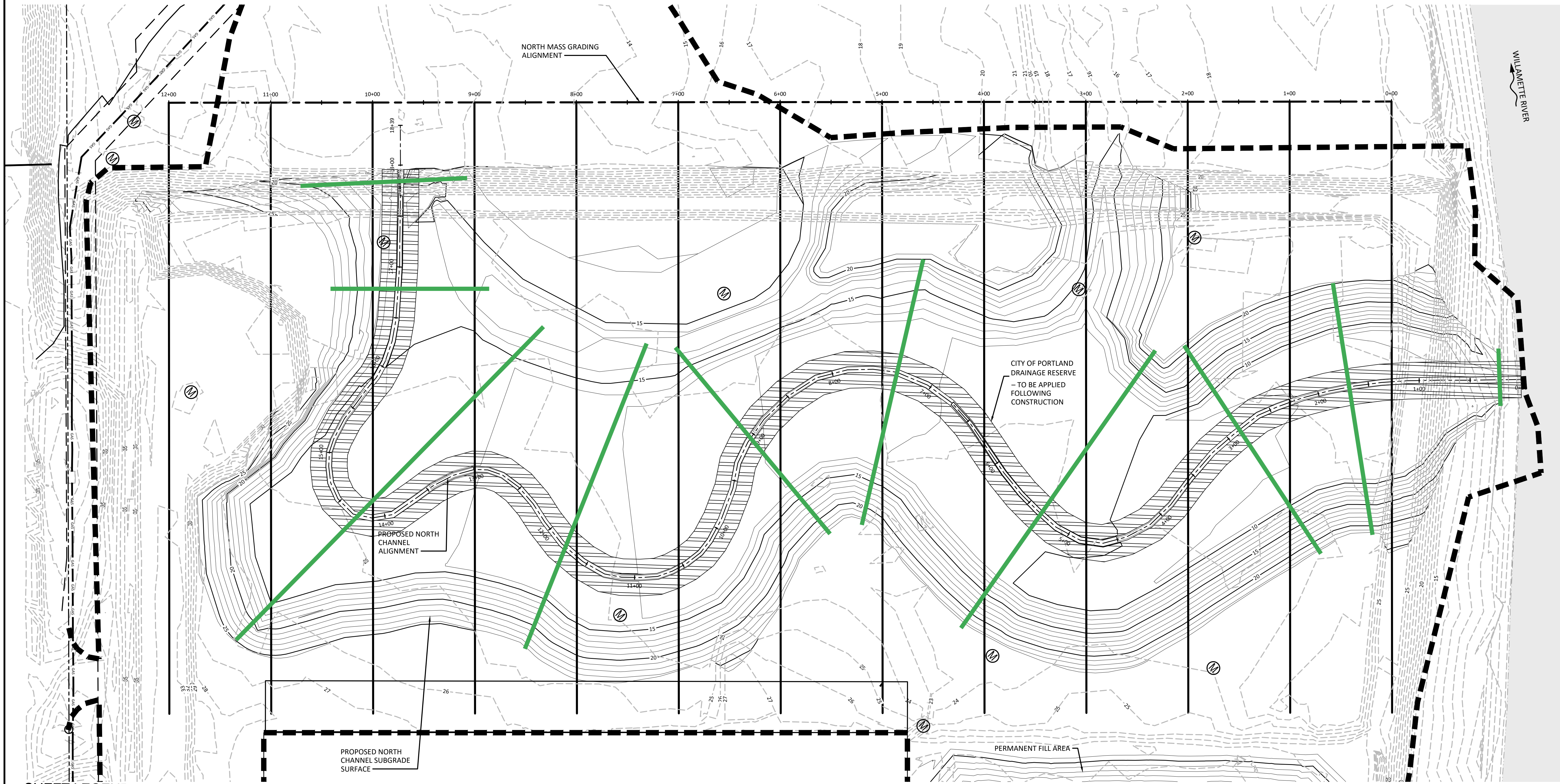


LEGEND:

- B-1 BORING - ABANDONED
- TP-1 TEST PIT
- B-1 PRIOR BORING (GEODESIGN)
- CPT-1 PRIOR CONE PENETRATION TEST
- B-1 PRIOR BORING (DAMES & MOORE)
- EXISTING TOPOGRAPHY (1-FOOT INTERVALS; 5-FOOT INDEX)
- PROPOSED TOPOGRAPHY (1-FOOT INTERVALS; 5-FOOT INDEX)
- A A' CROSS SECTION

SITE PLAN BASED ON DRAWING PROVIDED BY INTERFLUVE, JUNE 20, 2016

Printed By: mmiller | Print Date: 9/13/2016 4:26:16 PM
File Name: J:\E-L\InterFluve\InterFluve-2\InterFluve-2-01\Figures\CAD\Interfluve-2-01.SP01.dwg | Layout: FIGURE 2



SHEET LEGEND

- MONITORING TRANSECT
- LIMITS OF DISTURBANCE
- BLACK = PROPOSED ELEVATION
- GRAY = EXISTING ELEVATION
- DRAINAGE RESERVE

SCALE IN FEET: 0 – 50 – 100

NOTES:

1. SEE SHEET 6 FOR SITE ACCESS.
2. SEE SHEET 7 FOR EROSION CONTROL BMP'S.

PI Station	Northing	Easting
0+00.00	719,549.02	7,614,601.26
0+51.97	719,510.48	7,614,566.39
0+78.95	719,490.80	7,614,547.93
1+11.48	719,466.61	7,614,526.19
1+37.42	719,446.52	7,614,509.78
1+63.59	719,425.20	7,614,494.60
1+90.67	719,402.24	7,614,480.24
2+16.72	719,379.28	7,614,467.94
2+42.73	719,355.38	7,614,457.67
2+62.96	719,336.29	7,614,450.97
2+93.81	719,305.56	7,614,448.35
3+20.75	719,278.63	7,614,447.37
3+53.83	719,245.76	7,614,451.00

PI Station	Northing	Easting
3+86.66	719,213.42	7,614,456.71
4+14.38	719,185.71	7,614,457.23
4+40.86	719,160.17	7,614,450.23
4+64.56	719,139.24	7,614,439.11
4+87.35	719,124.85	7,614,421.44
5+13.80	719,116.42	7,614,396.37
5+39.06	719,114.05	7,614,371.22
5+61.42	719,113.41	7,614,348.87
5+88.05	719,115.28	7,614,322.30
6+18.77	719,120.08	7,614,291.96
6+47.16	719,124.25	7,614,263.88
6+73.80	719,124.78	7,614,237.25
7+03.62	719,119.19	7,614,207.95

PI Station	Northing	Easting
7+36.46	719,105.63	7,614,178.05
7+59.83	719,090.59	7,614,160.16
7+84.88	719,071.89	7,614,143.48
8+16.35	719,044.26	7,614,128.44
8+49.01	719,012.09	7,614,122.74
8+81.98	718,979.12	7,614,123.14
9+09.85	718,951.84	7,614,128.83
9+32.38	718,930.86	7,614,137.04
9+57.81	718,910.30	7,614,152.01
9+90.96	718,880.58	7,614,166.70
10+13.92	718,858.83	7,614,174.04
10+29.04	718,843.91	7,614,176.45
10+46.74	718,826.28	7,614,174.84

PI Station	Northing	Easting
10+62.09	718,811.46	7,614,170.84
10+77.40	718,797.39	7,614,164.81
10+94.48	718,784.17	7,614,153.99
11+12.89	718,770.96	7,614,141.17
11+29.80	718,760.94	7,614,127.54
11+54.25	718,753.67	7,614,104.20
11+81.69	718,750.46	7,614,076.95
12+08.64	718,752.87	7,614,050.10
12+29.69	718,756.65	7,614,029.40
12+51.48	718,757.45	7,614,007.62
12+70.91	718,754.00	7,613,988.50
12+86.51	718,746.79	7,613,974.67
12+99.68	718,737.48	7,613,965.35

PI Station	Northing	Easting
13+20.98	718,718.60	7,613,955.49
13+43.84	718,696.57	7,613,949.38
13+62.02	718,678.52	7,613,947.26
13+92.31	718,648.53	7,613,943.01
14+12.99	718,631.38	7,613,931.45
14+31.67	718,620.56	7,613,916.23
14+52.77	718,619.87	7,613,895.14
14+70.15	718,625.41	7,613,878.67
14+86.36	718,635.03	7,613,865.62
15+00.77	718,645.30	7,613,855.50
15+13.54	718,656.55	7,613,849.47
15+36.73	718,678.44	7,613,841.80
15+54.58	718,696.06	7,613,838.97

PI Station	Northing	Easting
15+71.69	718,712.87	7,613,835.75
15+88.00	718,729.03	7,613,833.60
16+05.37	718,745.53	7,613,828.16
16+26.87	718,764.50	7,613,818.06
16+48.10	718,781.46	7,613,805.27
16+78.93	718,804.01	7,613,784.25
17+01.84	718,820.66	7,613,768.52
17+22.31	718,834.75	7,613,753.67
17+76.94	718,872.54	7,613,714.22
18+39.07	718,914.77	7,613,668.64

REGISTERED PROFESSIONAL ENGINEER 19089PE OREGON MAY 15, 1997 DANIEL S. MILLER EXPIRES: 12/31/2020

NO.	BY	DATE	REVISION DESCRIPTION

RP, CP — DRAWN | DM,JG,CM — DESIGNED | DM,CM — CHECKED
APPROVED | DATE | 160218 — PROJECT

PORTLAND GENERAL ELECTRIC
HARBORTON RESTORATION PROJECT
PORTLAND, OREGON

inter·fluve
501 Portway Avenue, Suite 101
Hood River, OR 97031
541.386.9003
www.interfluve.com

MONITORING TRANSECTS - NORTH CHANNEL

FIGURE 2

Multnomah Channel

Multnomah River

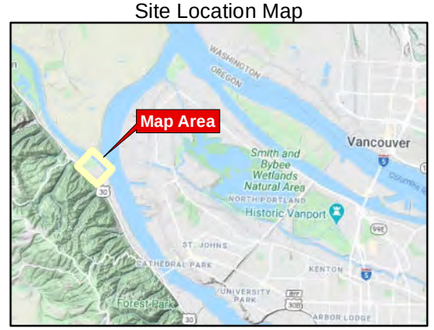
Olympic Pipeline (Existing)

Harborton Substation (Existing)

Marina Way

60
55
50
45
40
35

Site Location Map



Map Features

- Monitoring Point
- Survey Transect
- Habitat Area
- Non-Habitat Area
- Property Line
- Olympic Pipeline
- Extent of High Flow Inundation

0 115 230

Feet

PGE

N E S W

Portland General Electric

Portland, Oregon

Figure 3

Sample Line-intercept Vegetation Assessment Plots

Harborton Restoration Project

Date:	Drawn By:	Rev.:
7/4/2020	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Hab_Fig6.mxd

Multnomah Channel

Multnomah River

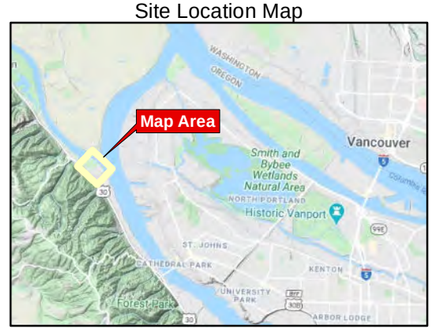
Olympic Pipeline (Existing)

Harborton Substation (Existing)

Marina Way

60
55
50
45
40
35

Site Location Map



Map Features

- Habitat Area
- Non-Habitat Area
- Survey Transect
- Property Line
- Olympic Pipeline
- Macroinvertebrate Monitoring Stations Wetland
- Surface Water Level / Water Quatlity Station
- Fish Passage Structure/Fish Accessibility
- Bald Eagle Monitoring Station
- Mink Scent Station/ Photmonitoring
- Mink Track and Scent Monitoring Routes
- Extent of High Flow Inundation
- S Water Level Staff Gauge

0 115 230
Feet

PGE

Portland General Electric
Portland, Oregon

Figure 5
Fixed Monitoring Stations

Harborton Restoration Project

Date:	Drawn By:	Rev.:
7/4/2020	J.B. Hoy	

Drawing File: J:\Env_Srvc\Harborton\Maps\Harborton_Hab_Fig5.mxd


Match Line
PP-04
TC-02
TC-01
PP-03
PP-06
TC-03
PP-05
Match Line
PP-08
TC-04
PP-02
PP-01
PP-07
KEY
TC - trail camera
PP - photomonitoring point
Harborton Drone Photography
Mission Date: 02/08/2021
0 35 70 140
Scale in Feet

FIGURE 5

Appendix B – Orthomosaic Images

June 25, 2020

June 26, 2020


Harrington Drone Photography
Mission Date: 7/2/2020
Scale is Feet
NW Marina Way

July 3, 2020


Harbinton Drone Photography
Mission Date: 7/20/2020
Scale in Feet
NW Marina Way

July 20, 2020

August 18, 2020

September 21, 2020

October 5, 2020

November 19, 2020

December 14, 2020

January 13, 2021

February 8, 2021

Appendix C - Ground-level Construction Time-lapse Photographs

Photomonitoring Point 1: Sub Area 3 Storm Water Monument

1. Photomonitoring Point 1 dewatering system and early excavation (July 7, 2020)

2. Storm water monument – topsoil application and early channel construction (Sept. 16, 2020)

Photomonitoring Point 2 – October 10, 2020

Photomonitoring Point 1 – December 12, 2020

Photomonitoring Point 1 – December 18, 2020

Photomonitoring Point 1 – January 8, 2021

Photomonitoring Point 1 – January 14, 2021

Photomonitoring Point 1 – February 16, 2021

Photomonitoring Point 2 – Sub Area 3 facing Southwest

Photomonitoring Point 2 – January 19, 2019

Photomonitoring Point 2 – August 31, 2020

Photomonitoring Point 2 – September 16, 2020

Photomonitoring Point 2 – October 9, 2020

Photomonitoring Point 2 – February 2, 2021

Appendix D - Construction Photolog

Photo 1 – Large woody material salvaged during clearing and grubbing

Photo 2 – Dewatering system. Shown are collection pipes (large diameter), discharge pipes (small diameter), and vacuum pump. Photo taken facing outlet of North Channel pre-breach.

Photo 3 – Dewatering vacuum pump, collection pipe, and vertical borings

Photo 4 – Close-up of vertical dewatering pipe coupled to collection pipe. Note bentonite seal at base.

Photo 5 – Sheepfoot roller compacting soil lifts in Sub Area 2

Photo 6 – Cement dust application equipment

Photo 7 – Cement dust/soil mixer being extracted from soft soils in Sub Area 2.

Photo 8 – a. Rock toe installation; b. exposed native soil; c. 3/4” minus gravel/topsoil mix; d. topsoil (Sept. 15, 2020)


Photo 9 – Closeup of rock toe installation in Sub Area 3. Photo facing NW Marina Way.

Photo 10 – Elevation spot check during construction (Oct 9, 2020)

Photo 11 – Jute mat installation in Sub Area 3.

Photo 12 – Sediment curtain at the North Channel outlet (Sept. 9, 2020)

Photo 13 – Willow cuttings stored in Sub Area 3 wetland prior to planting.

Photo 14 – Plant staging and equipment used to deliver and distribute material

Photo 15 – Rock ballast being attached to large woody material

Photo 16 – Sub Area 4 large woody material. Photo taken facing east.

Photo 17 – Sub Area 4: vertical snags and high-water during January 2021 event

Photo 18 – Mink rock pile in Sub Area 3. Photo facing northeast towards Willamette R.

Appendix E – Soils Sample Results

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Thursday, August 20, 2020

Connor Lamb
Dalton, Olmsted & Fuglevand
3121 SW Moody
Portland, OR 972239

RE: A0H0451 - Harborton - PGE Harborton PO

Thank you for using Apex Laboratories. We greatly appreciate your business and strive to provide the highest quality services to the environmental industry.

Enclosed are the results of analyses for work order A0H0451, which was received by the laboratory on 8/18/2020 at 3:17:00PM.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: ldomenighini@apex-labs.com, or by phone at 503-718-2323.

Please note: All samples will be disposed of within 30 days of sample reciept, unless prior arrangements have been made.

Cooler Receipt Information

(See Cooler Receipt Form for details)

Cooler #1	4.8 degC	Cooler #2	3.6 degC

This Final Report is the official version of the data results for this sample submission, unless superseded by a subsequent, labeled amended report.
All other deliverables derived from this data, including Electronic Data Deliverables (EDDs), CLP-like forms, client requested summary sheets, and all other products are considered secondary to this report.

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Client Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
HRB-20200818-S-02---As Received	A0H0451-01	Soil	08/18/20 12:30	08/18/20 15:17
HRB-20200818-S-02---After Processing	A0H0451-02	Soil	08/18/20 12:30	08/18/20 15:17
HRB-20200818-S-07---As Received	A0H0451-03	Soil	08/18/20 14:00	08/18/20 15:17
HRB-20200818-S-07---After Processing	A0H0451-04	Soil	08/18/20 14:00	08/18/20 15:17

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
HRB-20200818-S-02---After Processing (A0H0451-02)				**Matrix: Soil**		**Batch: 0080528**		
Acenaphthene	**128**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Acenaphthylene	**43.6**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Anthracene	**121**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Benz(a)anthracene	**344**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Benzo(a)pyrene	**447**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**Q-42**
Benzo(b)fluoranthene	**438**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**Q-42**
Benzo(k)fluoranthene	**138**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**409**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**Q-42**
Chrysene	**444**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Dibenz(a,h)anthracene	**53.4**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**Q-42**
Fluoranthene	**903**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Fluorene	**77.7**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**331**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**Q-42**
1-Methylnaphthalene	**41.7**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
2-Methylnaphthalene	**95.8**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Naphthalene	**337**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	**Q-42**
Phenanthrene	**686**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Pyrene	**1180**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Dibenzofuran	**17.1**	---	10.1	ug/kg dry	1	08/19/20 18:58	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)		*Recovery:*	*56 %*	*Limits: 44-120 %*	*1*	*08/19/20 18:58*	*EPA 8270E SIM*	
p-Terphenyl-d14 (Surr)			*71 %*	*54-127 %*	*1*	*08/19/20 18:58*	*EPA 8270E SIM*	
HRB-20200818-S-07---After Processing (A0H0451-04)				**Matrix: Soil**		**Batch: 0080528**		
Acenaphthene	**52.5**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Acenaphthylene	**60.5**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Anthracene	**76.2**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Benz(a)anthracene	**456**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Benzo(a)pyrene	**620**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Benzo(b)fluoranthene	**604**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Benzo(k)fluoranthene	**203**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	**M-05**
Benzo(g,h,i)perylene	**555**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Chrysene	**603**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Dibenz(a,h)anthracene	**75.5**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Fluoranthene	**935**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Fluorene	**26.8**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Indeno(1,2,3-cd)pyrene	**468**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
1-Methylnaphthalene	**12.6**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
2-Methylnaphthalene	**27.2**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

ANALYTICAL SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
HRB-20200818-S-07---After Processing (A0H0451-04)				**Matrix: Soil**		**Batch: 0080528**		
Naphthalene	**97.7**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Phenanthrene	**379**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Pyrene	**1220**	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Dibenzofuran	ND	---	10.1	ug/kg dry	1	08/19/20 21:07	EPA 8270E SIM	
Surrogate: 2-Fluorobiphenyl (Surr)		*Recovery:*	*69 %*	*Limits: 44-120 %*	*1*	*08/19/20 21:07*	*EPA 8270E SIM*	
p-Terphenyl-d14 (Surr)			*93 %*	*54-127 %*	*1*	*08/19/20 21:07*	*EPA 8270E SIM*	

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight

Analyte	Sample Result	Detection Limit	Reporting Limit	Units	Dilution	Date Analyzed	Method Ref.	Notes
HRB-20200818-S-02---After Processing (A0H0451-02)				**Matrix: Soil**		**Batch: 0080519**		
% Solids	**95.1**	---	1.00	%	1	08/20/20 09:01	EPA 8000D	
HRB-20200818-S-07---After Processing (A0H0451-04)				**Matrix: Soil**		**Batch: 0080519**		
% Solids	**95.7**	---	1.00	%	1	08/20/20 09:01	EPA 8000D	

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 0080528 - EPA 3546							**Soil**					
Blank (0080528-BLK1)		Prepared: 08/19/20 10:25		Analyzed: 08/19/20 15:32								
EPA 8270E SIM												
Acenaphthene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Acenaphthylene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Anthracene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Benz(a)anthracene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Benzo(a)pyrene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Chrysene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Fluoranthene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Fluorene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
1-Methylnaphthalene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
2-Methylnaphthalene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Naphthalene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Phenanthrene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Pyrene	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Dibenzofuran	ND	---	8.33	ug/kg wet	1	---	---	---	---	---	---	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery: 85 %*		*Limits: 44-120 %*			*Dilution: 1x*					
p-Terphenyl-d14 (Surr)		*107 %*		*54-127 %*			*"*					
LCS (0080528-BS1)		Prepared: 08/19/20 10:25		Analyzed: 08/19/20 15:58								
EPA 8270E SIM												
Acenaphthene	734	---	10.0	ug/kg wet	1	800	---	92	40 - 123%	---	---	
Acenaphthylene	752	---	10.0	ug/kg wet	1	800	---	94	32 - 132%	---	---	
Anthracene	777	---	10.0	ug/kg wet	1	800	---	97	47 - 123%	---	---	
Benz(a)anthracene	718	---	10.0	ug/kg wet	1	800	---	90	49 - 126%	---	---	
Benzo(a)pyrene	678	---	10.0	ug/kg wet	1	800	---	85	45 - 129%	---	---	
Benzo(b)fluoranthene	739	---	10.0	ug/kg wet	1	800	---	92	45 - 132%	---	---	
Benzo(k)fluoranthene	744	---	10.0	ug/kg wet	1	800	---	93	47 - 132%	---	---	
Benzo(g,h,i)perylene	745	---	10.0	ug/kg wet	1	800	---	93	43 - 134%	---	---	
Chrysene	726	---	10.0	ug/kg wet	1	800	---	91	50 - 124%	---	---	

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 0080528 - EPA 3546							**Soil**					
LCS (0080528-BS1)		Prepared: 08/19/20 10:25		Analyzed: 08/19/20 15:58								
Dibenz(a,h)anthracene	760	---	10.0	ug/kg wet	1	800	---	95	45 - 134%	---	---	
Fluoranthene	678	---	10.0	ug/kg wet	1	800	---	85	50 - 127%	---	---	
Fluorene	745	---	10.0	ug/kg wet	1	800	---	93	43 - 125%	---	---	
Indeno(1,2,3-cd)pyrene	732	---	10.0	ug/kg wet	1	800	---	92	45 - 133%	---	---	
1-Methylnaphthalene	688	---	10.0	ug/kg wet	1	800	---	86	40 - 120%	---	---	
2-Methylnaphthalene	692	---	10.0	ug/kg wet	1	800	---	86	38 - 122%	---	---	
Naphthalene	674	---	10.0	ug/kg wet	1	800	---	84	35 - 123%	---	---	
Phenanthrene	762	---	10.0	ug/kg wet	1	800	---	95	50 - 121%	---	---	
Pyrene	674	---	10.0	ug/kg wet	1	800	---	84	47 - 127%	---	---	
Dibenzofuran	734	---	10.0	ug/kg wet	1	800	---	92	44 - 120%	---	---	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery: 84 %*		*Limits: 44-120 %*			*Dilution: 1x*					
p-Terphenyl-d14 (Surr)		*101 %*		*54-127 %*			*"*					
Duplicate (0080528-DUP2)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 19:24								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
EPA 8270E SIM												
Acenaphthene	**158**	---	10.1	ug/kg dry	1	---	128	---	---	21	30%	
Acenaphthylene	**55.3**	---	10.1	ug/kg dry	1	---	43.6	---	---	24	30%	
Anthracene	**134**	---	10.1	ug/kg dry	1	---	121	---	---	10	30%	
Benz(a)anthracene	**461**	---	10.1	ug/kg dry	1	---	344	---	---	29	30%	
Benzo(a)pyrene	**611**	---	10.1	ug/kg dry	1	---	447	---	---	**31**	**30%**	Q-17
Benzo(b)fluoranthene	**616**	---	10.1	ug/kg dry	1	---	438	---	---	**34**	**30%**	Q-17
Benzo(k)fluoranthene	**167**	---	10.1	ug/kg dry	1	---	138	---	---	19	30%	M-05
Benzo(g,h,i)perylene	**573**	---	10.1	ug/kg dry	1	---	409	---	---	**33**	**30%**	Q-17
Chrysene	**595**	---	10.1	ug/kg dry	1	---	444	---	---	29	30%	
Dibenz(a,h)anthracene	**74.6**	---	10.1	ug/kg dry	1	---	53.4	---	---	**33**	**30%**	Q-17
Fluoranthene	**1140**	---	10.1	ug/kg dry	1	---	903	---	---	24	30%	
Fluorene	**88.7**	---	10.1	ug/kg dry	1	---	77.7	---	---	13	30%	
Indeno(1,2,3-cd)pyrene	**464**	---	10.1	ug/kg dry	1	---	331	---	---	**33**	**30%**	Q-17
1-Methylnaphthalene	**41.9**	---	10.1	ug/kg dry	1	---	41.7	---	---	0.4	30%	
2-Methylnaphthalene	**92.7**	---	10.1	ug/kg dry	1	---	95.8	---	---	3	30%	
Naphthalene	**304**	---	10.1	ug/kg dry	1	---	337	---	---	10	30%	
Phenanthrene	**804**	---	10.1	ug/kg dry	1	---	686	---	---	16	30%	
Pyrene	**1440**	---	10.1	ug/kg dry	1	---	1180	---	---	20	30%	

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 0080528 - EPA 3546							**Soil**					
Duplicate (0080528-DUP2)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 19:24								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
Dibenzofuran	**19.6**	---	10.1	ug/kg dry	1	---	17.1	---	---	14	30%	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery: 70 %*		*Limits: 44-120 %*			*Dilution: 1x*					
p-Terphenyl-d14 (Surr)			*88 %*		*54-127 %*			*"*				
Duplicate (0080528-DUP3)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 19:50								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
EPA 8270E SIM												
Acenaphthene	**150**	---	10.2	ug/kg dry	1	---	128	---	---	16	30%	
Acenaphthylene	**51.7**	---	10.2	ug/kg dry	1	---	43.6	---	---	17	30%	
Anthracene	**128**	---	10.2	ug/kg dry	1	---	121	---	---	6	30%	
Benz(a)anthracene	**414**	---	10.2	ug/kg dry	1	---	344	---	---	18	30%	
Benzo(a)pyrene	**539**	---	10.2	ug/kg dry	1	---	447	---	---	19	30%	
Benzo(b)fluoranthene	**521**	---	10.2	ug/kg dry	1	---	438	---	---	17	30%	
Benzo(k)fluoranthene	**180**	---	10.2	ug/kg dry	1	---	138	---	---	26	30%	M-05
Benzo(g,h,i)perylene	**491**	---	10.2	ug/kg dry	1	---	409	---	---	18	30%	
Chrysene	**523**	---	10.2	ug/kg dry	1	---	444	---	---	16	30%	
Dibenz(a,h)anthracene	**67.3**	---	10.2	ug/kg dry	1	---	53.4	---	---	23	30%	
Fluoranthene	**1060**	---	10.2	ug/kg dry	1	---	903	---	---	16	30%	
Fluorene	**86.1**	---	10.2	ug/kg dry	1	---	77.7	---	---	10	30%	
Indeno(1,2,3-cd)pyrene	**404**	---	10.2	ug/kg dry	1	---	331	---	---	20	30%	
1-Methylnaphthalene	**46.6**	---	10.2	ug/kg dry	1	---	41.7	---	---	11	30%	
2-Methylnaphthalene	**103**	---	10.2	ug/kg dry	1	---	95.8	---	---	7	30%	
Naphthalene	**387**	---	10.2	ug/kg dry	1	---	337	---	---	14	30%	
Phenanthrene	**736**	---	10.2	ug/kg dry	1	---	686	---	---	7	30%	
Pyrene	**1360**	---	10.2	ug/kg dry	1	---	1180	---	---	14	30%	
Dibenzofuran	**19.3**	---	10.2	ug/kg dry	1	---	17.1	---	---	13	30%	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery: 67 %*		*Limits: 44-120 %*			*Dilution: 1x*					
p-Terphenyl-d14 (Surr)			*82 %*		*54-127 %*			*"*				
Matrix Spike (0080528-MS2)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 20:16								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
EPA 8270E SIM												

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 0080528 - EPA 3546							**Soil**					
Matrix Spike (0080528-MS2)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 20:16								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
Acenaphthene	614	---	10.1	ug/kg dry	1	804	128	60	40 - 123%	---	---	
Acenaphthylene	549	---	10.1	ug/kg dry	1	804	43.6	63	32 - 132%	---	---	
Anthracene	736	---	10.1	ug/kg dry	1	804	121	77	47 - 123%	---	---	
Benz(a)anthracene	1050	---	10.1	ug/kg dry	1	804	344	87	49 - 126%	---	---	
Benzo(a)pyrene	1130	---	10.1	ug/kg dry	1	804	447	84	45 - 129%	---	---	
Benzo(b)fluoranthene	1120	---	10.1	ug/kg dry	1	804	438	85	45 - 132%	---	---	
Benzo(k)fluoranthene	831	---	10.1	ug/kg dry	1	804	138	86	47 - 132%	---	---	
Benzo(g,h,i)perylene	1110	---	10.1	ug/kg dry	1	804	409	87	43 - 134%	---	---	
Chrysene	1130	---	10.1	ug/kg dry	1	804	444	85	50 - 124%	---	---	
Dibenz(a,h)anthracene	639	---	10.1	ug/kg dry	1	804	53.4	73	45 - 134%	---	---	
Fluoranthene	1680	---	10.1	ug/kg dry	1	804	903	97	50 - 127%	---	---	
Fluorene	602	---	10.1	ug/kg dry	1	804	77.7	65	43 - 125%	---	---	
Indeno(1,2,3-cd)pyrene	1130	---	10.1	ug/kg dry	1	804	331	99	45 - 133%	---	---	
1-Methylnaphthalene	457	---	10.1	ug/kg dry	1	804	41.7	52	40 - 120%	---	---	
2-Methylnaphthalene	488	---	10.1	ug/kg dry	1	804	95.8	49	38 - 122%	---	---	
Naphthalene	598	---	10.1	ug/kg dry	1	804	337	**32**	**35 - 123%**	---	---	Q-01
Phenanthrene	1340	---	10.1	ug/kg dry	1	804	686	82	50 - 121%	---	---	
Pyrene	1990	---	10.1	ug/kg dry	1	804	1180	100	47 - 127%	---	---	
Dibenzofuran	518	---	10.1	ug/kg dry	1	804	17.1	62	44 - 120%	---	---	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery: 53 %*		*Limits: 44-120 %*			*Dilution: 1x*					
p-Terphenyl-d14 (Surr)			*83 %*		*54-127 %*			*"*				
Matrix Spike Dup (0080528-MSD2)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 20:41								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
EPA 8270E SIM												
Acenaphthene	801	---	10.2	ug/kg dry	1	812	128	83	40 - 123%	26	30%	
Acenaphthylene	701	---	10.2	ug/kg dry	1	812	43.6	81	32 - 132%	24	30%	
Anthracene	840	---	10.2	ug/kg dry	1	812	121	89	47 - 123%	13	30%	
Benz(a)anthracene	1110	---	10.2	ug/kg dry	1	812	344	94	49 - 126%	6	30%	
Benzo(a)pyrene	1150	---	10.2	ug/kg dry	1	812	447	87	45 - 129%	2	30%	
Benzo(b)fluoranthene	1130	---	10.2	ug/kg dry	1	812	438	85	45 - 132%	0.6	30%	
Benzo(k)fluoranthene	853	---	10.2	ug/kg dry	1	812	138	88	47 - 132%	3	30%	
Benzo(g,h,i)perylene	1160	---	10.2	ug/kg dry	1	812	409	92	43 - 134%	4	30%	

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALITY CONTROL (QC) SAMPLE RESULTS

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 0080528 - EPA 3546							**Soil**					
Matrix Spike Dup (0080528-MSD2)		Prepared: 08/19/20 12:41		Analyzed: 08/19/20 20:41								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
Chrysene	1200	---	10.2	ug/kg dry	1	812	444	93	50 - 124%	6	30%	
Dibenz(a,h)anthracene	688	---	10.2	ug/kg dry	1	812	53.4	78	45 - 134%	7	30%	
Fluoranthene	1710	---	10.2	ug/kg dry	1	812	903	99	50 - 127%	1	30%	
Fluorene	752	---	10.2	ug/kg dry	1	812	77.7	83	43 - 125%	22	30%	
Indeno(1,2,3-cd)pyrene	1190	---	10.2	ug/kg dry	1	812	331	106	45 - 133%	5	30%	
1-Methylnaphthalene	648	---	10.2	ug/kg dry	1	812	41.7	75	40 - 120%	**35**	**30%**	Q-24
2-Methylnaphthalene	712	---	10.2	ug/kg dry	1	812	95.8	76	38 - 122%	**37**	**30%**	Q-24
Naphthalene	973	---	10.2	ug/kg dry	1	812	337	78	35 - 123%	**48**	**30%**	Q-01
Phenanthrene	1500	---	10.2	ug/kg dry	1	812	686	100	50 - 121%	11	30%	
Pyrene	2000	---	10.2	ug/kg dry	1	812	1180	101	47 - 127%	0.7	30%	
Dibenzofuran	665	---	10.2	ug/kg dry	1	812	17.1	80	44 - 120%	25	30%	
Surr: 2-Fluorobiphenyl (Surr)		*Recovery: 72 %*		*Limits: 44-120 %*			*Dilution: 1x*					
p-Terphenyl-d14 (Surr)			*91 %*		*54-127 %*			*"*				

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight

Analyte	Result	Detection Limit	Reporting Limit	Units	Dilution	Spike Amount	Source Result	% REC	% REC Limits	RPD	RPD Limit	Notes
Batch 0080519 - Total Solids (Dry Weight)												**Soil**
Duplicate (0080519-DUP4)		Prepared: 08/19/20 19:14		Analyzed: 08/20/20 09:01								
QC Source Sample: HRB-20200818-S-02---After Processing (A0H0451-02)												
EPA 8000D												
% Solids	**95.1**	---	1.00	%	1	---	95.1	---	---	0.02	10%	

No Client related Batch QC samples analyzed for this batch. See notes page for more information.

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

SAMPLE PREPARATION INFORMATION

Polyaromatic Hydrocarbons (PAHs) by EPA 8270E SIM

Prep: EPA 3546

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 0080528							
A0H0451-02	Soil	EPA 8270E SIM	08/18/20 12:30	08/19/20 12:40	10.39g/5mL	10g/5mL	0.96
A0H0451-04	Soil	EPA 8270E SIM	08/18/20 14:00	08/19/20 12:40	10.36g/5mL	10g/5mL	0.97

Percent Dry Weight

Prep: Total Solids (Dry Weight)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 0080519							
A0H0451-02	Soil	EPA 8000D	08/18/20 12:30	08/19/20 19:14			NA
A0H0451-04	Soil	EPA 8000D	08/18/20 14:00	08/19/20 19:14			NA

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

QUALIFIER DEFINITIONS

Client Sample and Quality Control (QC) Sample Qualifier Definitions:

Apex Laboratories

M-05	Estimated results. Peak separation for structural isomers is insufficient for accurate quantification.
Q-01	Spike recovery and/or RPD is outside acceptance limits.
Q-17	RPD between original and duplicate sample is outside of established control limits.
Q-24	The RPD for this spike and spike duplicate is above established control limits. Recoveries for both the spike and spike duplicate are within control limits.
Q-42	Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits. (Refer to the QC Section of Analytical Report.)

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

REPORTING NOTES AND CONVENTIONS:

Abbreviations:

DET Analyte DETECTED at or above the detection or reporting limit.

ND Analyte NOT DETECTED at or above the detection or reporting limit.

NR Result Not Reported.

RPD Relative Percent Difference. RPDs for Matrix Spikes and Matrix Spike Duplicates are based on concentration, not recovery.

Detection Limits: Limit of Detection (LOD)

Limits of Detection (LODs) are normally set at a level of one half the validated Limit of Quantitation (LOQ).
If no value is listed ('-----'), then the data has not been evaluated below the Reporting Limit.

Reporting Limits: Limit of Quantitation (LOQ)

Validated Limits of Quantitation (LOQs) are reported as the Reporting Limits for all analyses where the LOQ, MRL, PQL or CRL are requested. The LOQ represents a level at or above the low point of the calibration curve, that has been validated according to Apex Laboratories' comprehensive LOQ policies and procedures.

Reporting Conventions:

Basis: Results for soil samples are generally reported on a 100% dry weight basis.
The Result Basis is listed following the units as " dry", " wet", or " " (blank) designation.

" dry" Sample results and Reporting Limits are reported on a dry weight basis. (i.e. "ug/kg dry")
See Percent Solids section for details of dry weight analysis.

" wet" Sample results and Reporting Limits for this analysis are normally dry weight corrected, but have not been modified in this case.

" " Results without 'wet' or 'dry' designation are not normally dry weight corrected. These results are considered 'As Received'.

QC Source:

In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) may be analyzed to demonstrate accuracy and precision of the extraction batch.

Non-Client Batch QC Samples (Duplicates and Matrix Spike/Duplicates) are not included in this report. Please request a Full QC report if this data is required.

Miscellaneous Notes:

" --- " QC results are not applicable. For example, % Recoveries for Blanks and Duplicates, % RPD for Blanks, Blank Spikes and Matrix Spikes, etc.

" *** " Used to indicate a possible discrepancy with the Sample and Sample Duplicate results when the %RPD is not available. In this case, either the Sample or the Sample Duplicate has a reportable result for this analyte, while the other is Non Detect (ND).

Blanks:

Standard practice is to evaluate the results from Blank QC Samples down to a level equal to ½ the Reporting Limit (RL).
-For Blank hits falling between ½ the RL and the RL (J flagged hits), the associated sample and QC data will receive a 'B-02' qualifier.
-For Blank hits above the RL, the associated sample and QC data will receive a 'B' qualifier, per Apex Laboratories' Blank Policy.
For further details, please request a copy of this document.

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

REPORTING NOTES AND CONVENTIONS (Cont.):

Blanks (Cont.):

Sample results flagged with a 'B' or 'B-02' qualifier are potentially biased high if the sample results are less than ten times the level found in the blank for inorganic analyses, or less than five times the level found in the blank for organic analyses.

'B' and 'B-02' qualifications are only applied to sample results detected above the Reporting Level.

Preparation Notes:

Mixed Matrix Samples:

Water Samples:

Water samples containing significant amounts of sediment are decanted or separated prior to extraction, and only the water portion analyzed, unless otherwise directed by the client.

Soil and Sediment Samples:

Soil and Sediment samples containing significant amounts of water are decanted prior to extraction, and only the solid portion analyzed, unless otherwise directed by the client.

Sampling and Preservation Notes:

Certain regulatory programs, such as National Pollutant Discharge Elimination System (NPDES), require that activities such as sample filtration (for dissolved metals, orthophosphate, hexavalent chromium, etc.) and testing of short hold analytes (pH, Dissolved Oxygen, etc.) be performed in the field (on-site) within a short time window. In addition, sample matrix spikes are required for some analyses, and sufficient volume must be provided, and billable site specific QC requested, if this is required. All regulatory permits should be reviewed to ensure that these requirements are being met.

Data users should be aware of which regulations pertain to the samples they submit for testing. If related sample collection activities are not approved for a particular regulatory program, results should be considered estimates. Apex Laboratories will qualify these analytes according to the most stringent requirements, however results for samples that are for non-regulatory purposes may be acceptable.

Samples that have been filtered and preserved at Apex Laboratories per client request are listed in the preparation section of the report with the date and time of filtration listed.

Apex Laboratories maintains detailed records on sample receipt, including client label verification, cooler temperature, sample preservation, hold time compliance and field filtration. Data is qualified as necessary, and the lack of qualification indicates compliance with required parameters.

Apex Laboratories

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

LABORATORY ACCREDITATION INFORMATION

ORELAP Certification ID: OR100062 (Primary Accreditation)
EPA ID: OR01039

All methods and analytes reported from work performed at Apex Laboratories are included on Apex Laboratories' ORELAP Scope of Certification, with the exception of any analyte(s) listed below:

Apex Laboratories

Matrix	Analysis	TNI_ID	Analyte	TNI_ID	Accreditation

All reported analytes are included in Apex Laboratories' current ORELAP scope.

Secondary Accreditations

Apex Laboratories also maintains reciprocal accreditation with non-TNI states (Washington DOE), as well as other state specific accreditations not listed here.

Subcontract Laboratory Accreditations

Subcontracted data falls outside of Apex Laboratories' Scope of Accreditation.
Please see the Subcontract Laboratory report for full details, or contact your Project Manager for more information.

Field Testing Parameters

Results for Field Tested data are provded by the client or sampler, and fall outside of Apex Laboratories' Scope of Accreditation.

Apex Laboratories

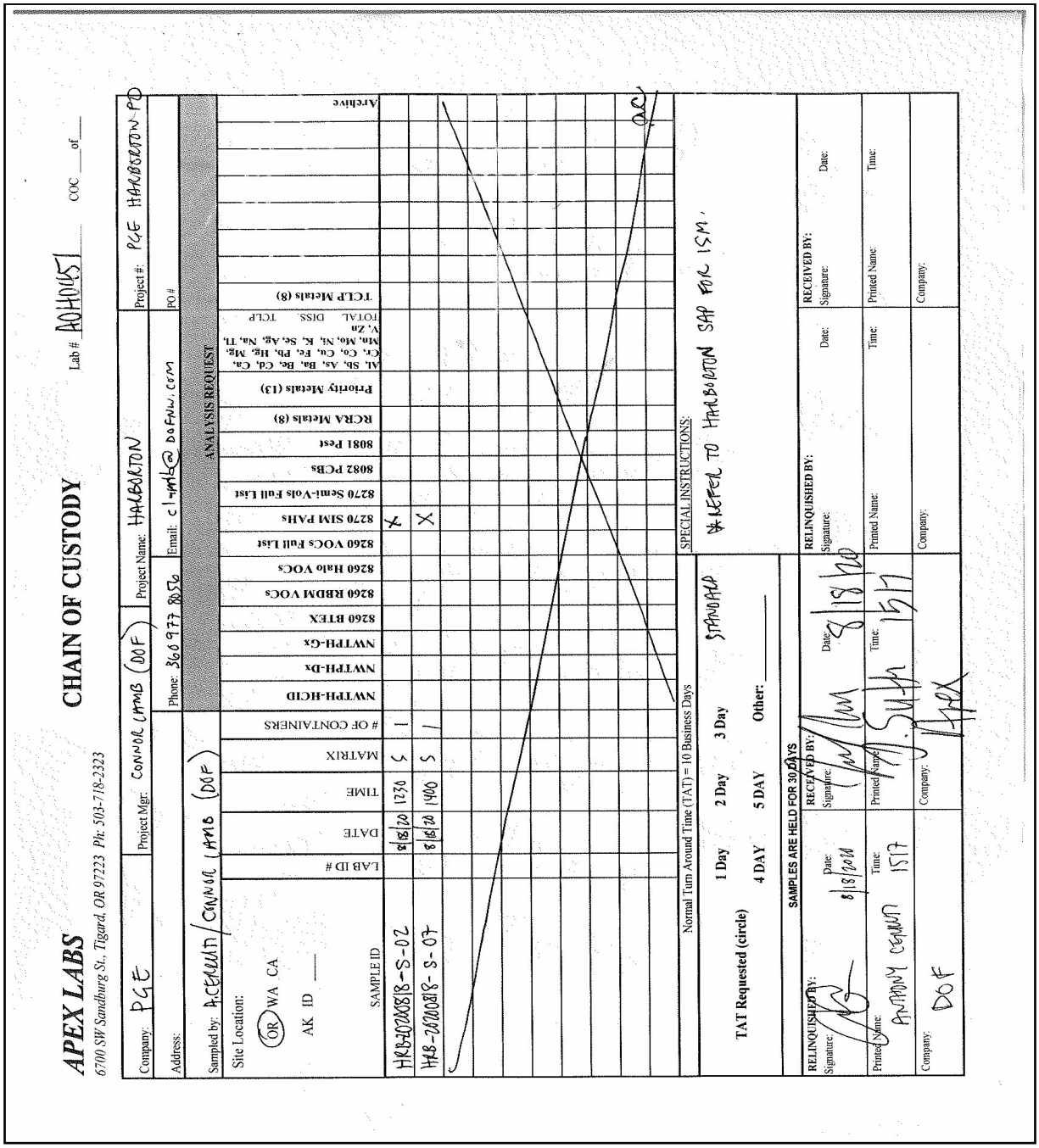
Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Apex Laboratories, LLC

6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**



APEX LABS
6700 SW Sandburg St., Tigard, OR 97223 Ph: 503-718-2323

CHAIN OF CUSTODY

Lab # A0H0451 COC ___ of ___

Company: PGE | Project Mgr: Connor Lamb (DOF) | Project Name: Harborton | Project #: PGE Harborton PO
Address: | Phone: 360 977 8050 | Email: clamb@dofnw.com | PO #
Sampled by: Hayden/Connor Lamb (DOF)

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	8260 BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs Full List	8270 SIM PAHs	8270 Semi-Vols Full List	8082 PCBs	8081 Pest	RCRA Metals (8)	Priority Metals (13)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn TOTAL DISS. TCLP	TCLP Metals (8)	Archive
HARBORBORE-S-02		8/18/20	1230	S	1								X							
HAB-HARBORE-S-07		8/18/20	1400	S	1								X							

Site Location: (OR) WA CA AK ID ___

Normal Turn Around Time (TAT) = 10 Business Days

TAT Requested (circle): 1 Day 2 Day 3 Day STANDARD 4 DAY 5 DAY Other: ___

SPECIAL INSTRUCTIONS:
* HOLD TO HARBORTON SAP FOR ISM.

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature:	Signature:	Signature:	Signature:
Date: 8/18/2020	Date:	Date: 8/18/20	Date:
Printed Name:	Printed Name:	Printed Name:	Printed Name:
Time: 1517	Time:	Time: 1517	Time:
Company: DOF	Company:	Company:	Company:

Apex Laboratories

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Lisa Domenighini, Client Services Manager

Apex Laboratories, LLC
6700 S.W. Sandburg Street
Tigard, OR 97223
503-718-2323
ORELAP ID: **OR100062**

Dalton, Olmsted & Fuglevand	Project: **Harborton**	
3121 SW Moody	Project Number: **PGE Harborton PO**	**Report ID:**
Portland, OR 972239	Project Manager: **Connor Lamb**	**A0H0451 - 08 20 20 1137**

APEX LABS COOLER RECEIPT FORM

Client: PGE Element WO#: A0 H0451

Project/Project #: Harborton PGE Harborton PO

Delivery Info:

Date/time received: 8/18/20 @ 1517 By: JS

Delivered by: Apex ___ Client X ESS ___ FedEx ___ UPS ___ Swift ___ Senvoy ___ SDS ___ Other ___

Cooler Inspection Date/time inspected: 8/18/20 @ 1517 By: JD

Chain of Custody included? Yes X No ___ Custody seals? Yes ___ No X

Signed/dated by client? Yes X No ___

Signed/dated by Apex? Yes X No ___

	Cooler #1	Cooler #2	Cooler #3	Cooler #4	Cooler #5	Cooler #6	Cooler #7
Temperature (°C)	4.8	3.6					
Received on ice? (Y/N)	Y	Y					
Temp. blanks? (Y/N)	N	N					
Ice type: (Gel/Real/Other)	real	real					
Condition:	good	good					

Cooler out of temp? (Y)N Possible reason why: ___

If some coolers are in temp and some out, were green dots applied to out of temperature samples? Yes/No/NA

Out of temperature samples form initiated? Yes/No/NA

Samples Inspection: Date/time inspected: 8/18/20 @ 1534 By: SO

All samples intact? Yes X No ___ Comments: ___

Bottle labels/COCs agree? Yes X No ___ Comments: ___

COC/container discrepancies form initiated? Yes ___ No X

Containers/volumes received appropriate for analysis? Yes X No ___ Comments: ___

Do VOA vials have visible headspace? Yes ___ No ___ NA X

Comments ___

Water samples: pH checked: Yes ___ No ___ NA X pH appropriate? Yes ___ No ___ NA X

Comments: ___

Additional information: ___

Labeled by: SO Witness: JS Cooler Inspected by: SO See Project Contact Form: Y

Apex Laboratories

Lisa A Domenighini

Lisa Domenighini, Client Services Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

A & L WESTERN AGRICULTURAL LABORATORIES

10220 S.W. NIMBUS AVE I BUILDING K-9 I PORTLAND, OREGON 97223 I (503) 968-9225 I FAX (503) 598-7702

REPORT NUMBER: 20-210-012 **CLIENT NO:** 99999

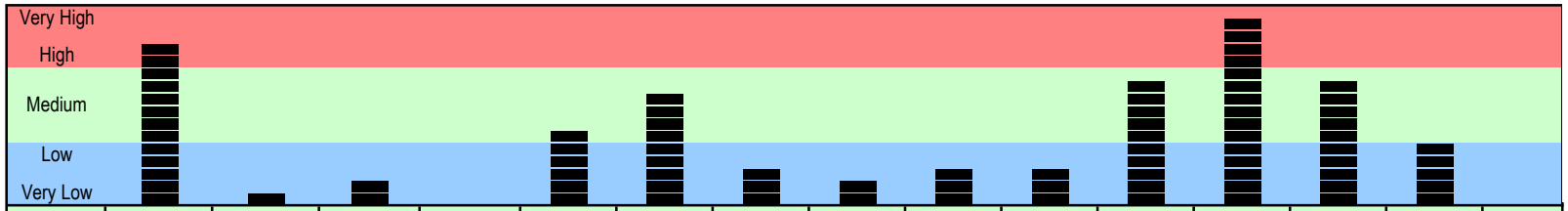
SEND TO: PORTLAND GENERAL ELECTRIC
121 SW SALMON STREET
PORTLAND, OR 97204-

GROWER: COLIN MACLAREN

SUBMITTED BY:

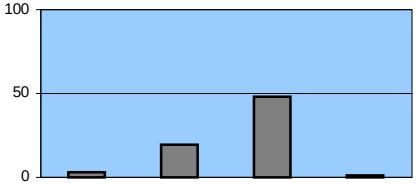
Graphical Soil Analysis Report

DATE OF REPORT: 07/30/20 **LAB NO:** 59714 **SAMPLE ID:** A1 **PAGE:** 1



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	6.8	1	7	55	144	301	1221	33	7	0.8	12	161	1.6	0.5	
		LOW	AVERAGE		HIGH										

Percent Cation Saturation (computed)



Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
2.9	19.5	48.0	1.1
ACIDIC		BASIC	

ECe dS/m	CEC meq/100g	Ex. Lime	pH
0.4	12.7	L	5.4

INCREASING SALINITY →

← INCREASING NEED FOR LIME

Buffer pH: 6.2

NaHCO3-P unreliable at this soil pH

Soil Fertility Guidelines

CROP: WETLAND **RATE:** lb/acre **NOTES:**

Dolomite (100 score)	Lime (100 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	7000			120	200	150		25	10					

COMMENTS

You may want to split high lime requirements over more than one year if you are unable to adequately incorporate the material.

LIME REQUIREMENT: Liming may be necessary if buffer index is less than 6.9. Guidelines are based upon common agricultural lime (100-score) per six-inch depth to raise SOIL pH to about 6.5.

NITROGEN: Use local conditions and experience with variety to determine rates and timing. Allow for nitrate levels in your water source also (ppm NO3 X 0.61 = lb N/ac-ft water). Monitor tissue-N.

PHOSPHATE: Band 6 to 8 inches INTO soil prior to growing season for maximum response. Alternatively, broadcast or include in irrigation water if precipitation is not a factor.

Rogell Rogers, CCA, PCA
A & L WESTERN LABORATORIES, INC

A & L WESTERN AGRICULTURAL LABORATORIES

10220 S.W. NIMBUS AVE I BUILDING K-9 I PORTLAND, OREGON 97223 I (503) 968-9225 I FAX (503) 598-7702

REPORT NUMBER: 20-210-012 **CLIENT NO:** 99999

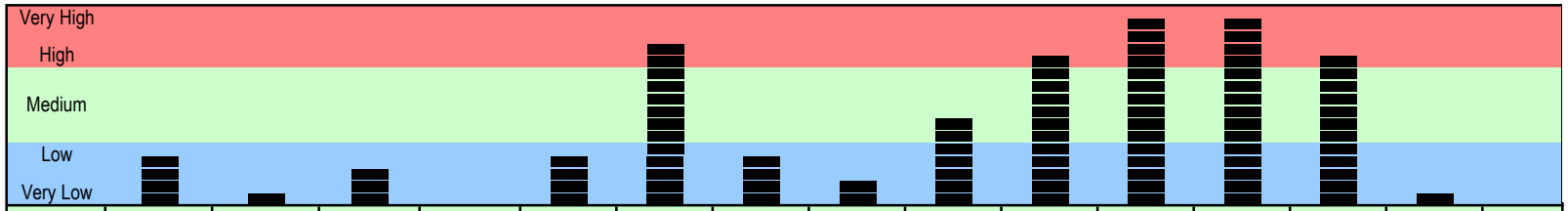
SEND TO: PORTLAND GENERAL ELECTRIC
121 SW SALMON STREET
PORTLAND, OR 97204-

GROWER: COLIN MACLAREN

SUBMITTED BY:

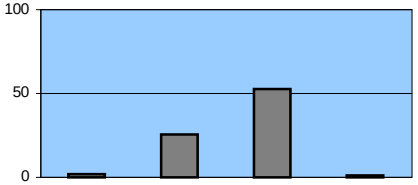
Graphical Soil Analysis Report

DATE OF REPORT: 07/30/20 **LAB NO:** 59715 **SAMPLE ID:** A2 **PAGE:** 2



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	2.0	1	13	35	89	365	1242	26	16	5.0	45	111	2.3	0.1	
		LOW	AVERAGE		HIGH										

Percent Cation Saturation (computed)



Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
1.9	25.5	52.6	1.0

ACIDIC BASIC

ECe dS/m	CEC meq/100g	Ex. Lime	pH
0.3	11.8	L	5.8

INCREASING SALINITY →

← INCREASING NEED FOR LIME

Buffer pH: 6.7

NaHCO3-P unreliable at this soil pH

Soil Fertility Guidelines

CROP: WETLAND **RATE:** lb/acre **NOTES:**

Dolomite (100 score)	Lime (100 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	2000			140	140	180		20					2.0	

COMMENTS

MAGNESIUM: If levels are very high, one may encounter drainage problems and potassium uptake may be hindered. Extra calcium may provide some benefit, but source should depend on soil pH.

SULFATE-SULFUR: Low soil levels may cause yellowing and lack of vigor. Maintain above 15 to 20 ppm to guard against deficiencies. Although, sulfates may have leached below sampling depth.

MICRONUTRIENTS: Where levels are low, apply according to label instructions, or refer to a tissue analysis to determine necessity. Maintain organic matter and pH at a satisfactory level.

WETLAND VEGETATION may include willow, cottonwood, swamp privet, green ash, rushes and sedges. Many species of oak, maple, hickory and rose, may also withstand long wet periods in certain areas.

Rogell Rogers, CCA, PCA
A & L WESTERN LABORATORIES, INC

A & L WESTERN AGRICULTURAL LABORATORIES

10220 S.W. NIMBUS AVE I BUILDING K-9 I PORTLAND, OREGON 97223 I (503) 968-9225 I FAX (503) 598-7702

REPORT NUMBER: 20-210-012 **CLIENT NO:** 99999

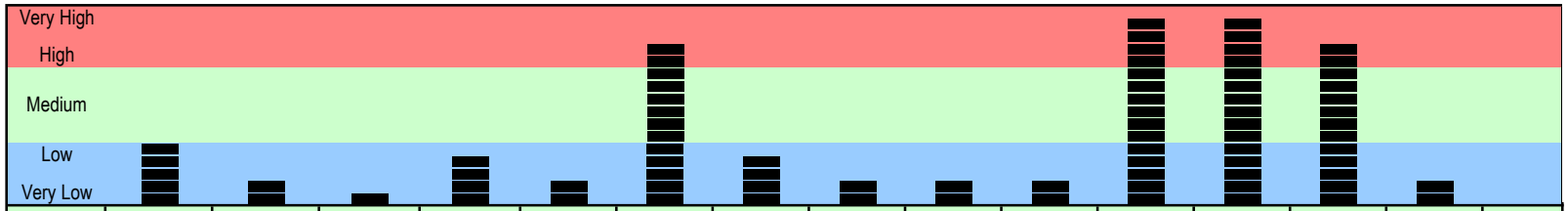
SEND TO: PORTLAND GENERAL ELECTRIC
121 SW SALMON STREET
PORTLAND, OR 97204-

GROWER: COLIN MACLAREN

SUBMITTED BY:

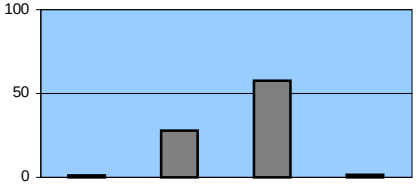
Graphical Soil Analysis Report

DATE OF REPORT: 07/30/20 **LAB NO:** 59716 **SAMPLE ID:** A3 **PAGE:** 3



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	2.3	2	3	19	63	551	1871	58	5	0.6	56	68	2.8	0.2	
		LOW	AVERAGE		HIGH										

Percent Cation Saturation (computed)



Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
1.0	27.9	57.5	1.6
ACIDIC		BASIC	

ECe dS/m	CEC meq/100g	Ex. Lime	pH
0.2	16.2	L	6.2

INCREASING SALINITY →

← INCREASING NEED FOR LIME

Buffer pH: 6.8

Soil Fertility Guidelines

CROP: WETLAND **RATE:** lb/acre **NOTES:**

Dolomite (100 score)	Lime (100 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	1000			130	80	210		25	10				2.0	

COMMENTS

HIGH levels of organic matter should have a beneficial effect on growth and "soil" pH may not be as critical. However, watch carefully as amendments may still be necessary!
BORON: Aim for soil levels above 0.5 ppm to avoid a deficiency. A tissue analysis at the appropriate tim will determine more accurately, plant availability. ADD BORON WITH CAUTION.
PLEASE REFER to previous comments for remaining report.

Rogell Rogers, CCA, PCA
A & L WESTERN LABORATORIES, INC

A & L WESTERN AGRICULTURAL LABORATORIES

10220 S.W. NIMBUS AVE I BUILDING K-9 I PORTLAND, OREGON 97223 I (503) 968-9225 I FAX (503) 598-7702

REPORT NUMBER: 20-210-012 **CLIENT NO:** 99999

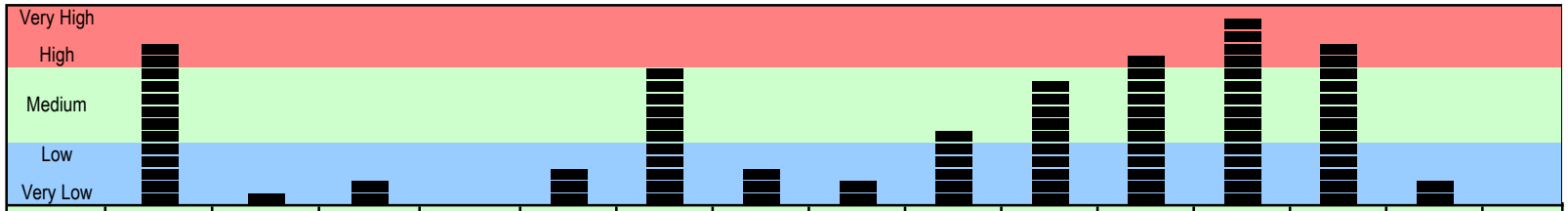
SEND TO: PORTLAND GENERAL ELECTRIC
121 SW SALMON STREET
PORTLAND, OR 97204-

GROWER: COLIN MACLAREN

SUBMITTED BY:

Graphical Soil Analysis Report

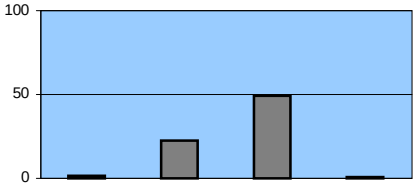
DATE OF REPORT: 07/30/20 **LAB NO:** 59717 **SAMPLE ID:** A4 **PAGE:** 4



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	5.5	1	9	46	94	453	1632	27	15	3.9	29	122	3.0	0.3	

LOW AVERAGE HIGH

Percent Cation Saturation (computed)



Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
1.5	22.5	49.3	0.7

ACIDIC BASIC

ECe dS/m	CEC meq/100g	Ex. Lime	pH
0.3	16.5	L	5.5

INCREASING SALINITY →

← INCREASING NEED FOR LIME

Buffer pH: 6.3

NaHCO3-P unreliable at this soil pH

Soil Fertility Guidelines

CROP: WETLAND **RATE:** lb/acre **NOTES:**

Dolomite (100 score)	Lime (100 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
	6000			120	180	180		20					1.0	

COMMENTS

Rogell Rogers, CCA, PCA
A & L WESTERN LABORATORIES, INC

A & L WESTERN AGRICULTURAL LABORATORIES

10220 S.W. NIMBUS AVE I BUILDING K-9 I PORTLAND, OREGON 97223 I (503) 968-9225 I FAX (503) 598-7702

REPORT NUMBER: 20-210-012 **CLIENT NO:** 99999

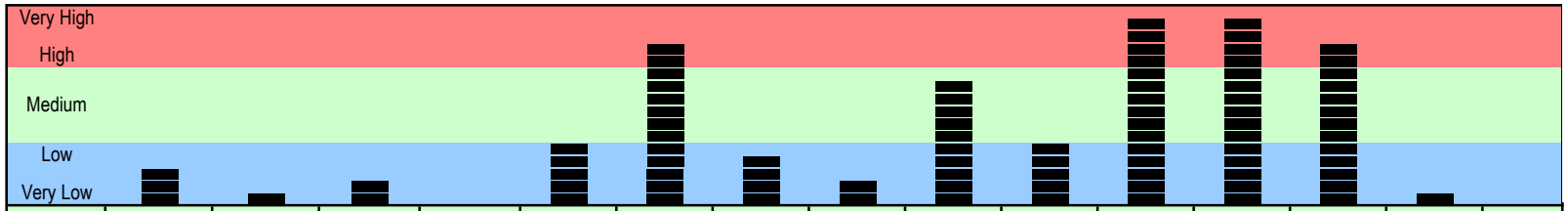
SEND TO: PORTLAND GENERAL ELECTRIC
121 SW SALMON STREET
PORTLAND, OR 97204-

GROWER: COLIN MACLAREN

SUBMITTED BY:

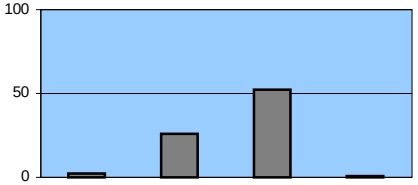
Graphical Soil Analysis Report

DATE OF REPORT: 07/30/20 **LAB NO:** 59718 **SAMPLE ID:** A5 **PAGE:** 5



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	1.2	1	4	15	122	458	1509	22	28	1.2	68	75	3.3	0.1	
		LOW	AVERAGE		HIGH										

Percent Cation Saturation (computed)



Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
2.2	26.1	52.1	0.7
		ACIDIC	BASIC

ECe dS/m	CEC meq/100g	Ex. Lime	pH
0.3	14.5	L	5.8

INCREASING SALINITY →

← INCREASING NEED FOR LIME

Buffer pH: 7.0

NaHCO3-P unreliable at this soil pH

Soil Fertility Guidelines

CROP: WETLAND **RATE:** lb/acre **NOTES:**

Dolomite (100 score)	Lime (100 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
				140	300	150			5				2.0	

COMMENTS

Rogell Rogers, CCA, PCA
A & L WESTERN LABORATORIES, INC

A & L WESTERN AGRICULTURAL LABORATORIES

10220 S.W. NIMBUS AVE I BUILDING K-9 I PORTLAND, OREGON 97223 I (503) 968-9225 I FAX (503) 598-7702

REPORT NUMBER: 20-210-012 **CLIENT NO:** 99999

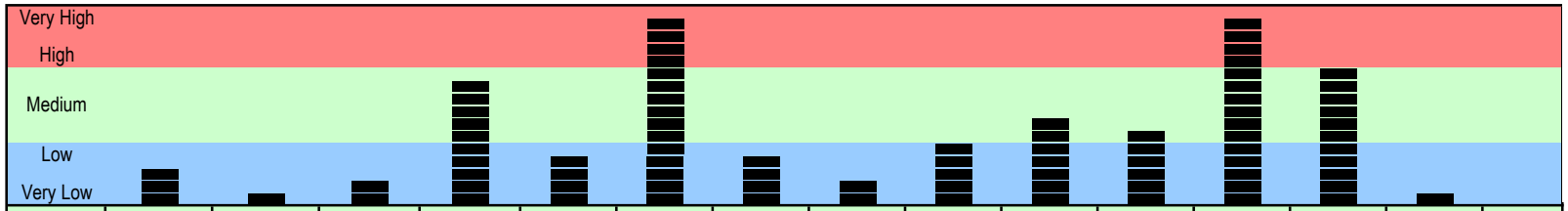
SEND TO: PORTLAND GENERAL ELECTRIC
121 SW SALMON STREET
PORTLAND, OR 97204-

GROWER: COLIN MACLAREN

SUBMITTED BY:

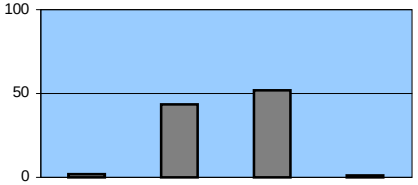
Graphical Soil Analysis Report

DATE OF REPORT: 07/30/20 **LAB NO:** 59719 **SAMPLE ID:** A6 **PAGE:** 6



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	1.5	1	5	13	85	654	1284	33	10	1.9	5	78	2.0	0.1	

Percent Cation Saturation (computed)



Potassium K %	Magnesium Mg %	Calcium Ca %	Sodium Na %
1.8	43.6	52.0	1.2

ACIDIC — BASIC

LOW AVERAGE HIGH

ECe dS/m	CEC meq/100g	Ex. Lime	pH
0.2	12.3	L	6.9

INCREASING SALINITY →

← INCREASING NEED FOR LIME

Buffer pH: 7.3

Soil Fertility Guidelines

CROP: WETLAND **RATE:** lb/acre **NOTES:**

Dolomite (100 score)	Lime (100 score)	Gypsum	Elemental Sulfur	Nitrogen N	Phosphate P_2O_5	Potash K_2O	Magnesium Mg	Sulfur SO_4-S	Zinc Zn	Manganese Mn	Iron Fe	Copper Cu	Boron B	
		1600		140	80	180			5				2.0	

COMMENTS

Rogell Rogers, CCA, PCA
A & L WESTERN LABORATORIES, INC

Appendix F – Permanent Photomonitoring Points

Photomonitoring Point 1 – Storm Water Monument, Sub Area 3 (January 8, 2021)

Photomonitoring Point 2 – North Channel Inlet, Sub Areas 3 and 4 (February 3, 2021)

Photomonitoring Point 3 – Sub Area 3 facing southeast (February 3, 2021)

Photomonitoring Point 4 – Sub Area 3, North Channel Outlet facing northeast (Nov. 11, 2020)

Photomonitoring Point 5 – Sub Area 2 Berm, facing north (Oct. 30, 2020)

Photomonitoring Point 5 – Sub Area 2 Berm, facing northwest (Oct. 30, 2020)

Photomonitoring Point 5 – Sub Area 2 Berm, facing west (Oct. 30, 2021)

Photomonitoring Point 6 – Sub Area 2 Berm, facing southeast (Aug. 13, 2020)

Photomonitoring Point 7 – Sub Area 4 wetlands