GeoDesign INC

ENGINEERING DESIGN REPORT

Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington

For
Orchard Crossings, LLC
December 19, 2016

GeoDesign Project: Orchard-1-01

GeoDesign Inc

December 19, 2016

Washington State Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503

Attention: Panjini Balaraju

Engineering Design Report
Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington
GeoDesign Project: Orchard-1-01

On behalf of Orchard Crossing, LLC, GeoDesign, Inc. is pleased to submit this Engineering Design Report (EDR) for the proposed development at the former Turnbull Landfill located southeast of SR 500 and NE Fourth Plain Boulevard in Vancouver, Washington (project site). This EDR presents the engineering controls to help mitigate hazards associated with methane that is potentially present at the project site. In addition, the EDR includes a Contaminated Media Management Plan and site-specific Health and Safety Plan describing the means and methods to properly manage contaminated media that may be encountered at the project site and address worker safety during construction.

♦ ♦ ♦

We appreciate the Washington State Department of Ecology's support on this project. Please call if you have questions or comments concerning this submittal.

Sincerely,

GeoDesign, Inc.

Jason O'Donnell, L.G.
Principal Geologist

cc: Daniel Redmond, Redmond Geotechnical Services (via email only)
Dave Poulson, Pace Engineers, Inc. (via email only)
Bassel Ayoub (via email only)

MFC:JSO:kt
Attachments
One copy submitted (via email only)
Document ID: Orchard-1-01-121916-envr-EDR.docx
© 2016 GeoDesign, Inc. All rights reserved.

TABLE OF CONTENTS **PAGE NO.**

1.0 INTRODUCTION

On behalf of Orchard Crossings, LLC, GeoDesign, Inc. is pleased to submit this EDR for the proposed development at the former Turnbull Landfill located southeast of the intersection of SR 500 and NE Fourth Plain Boulevard in Vancouver, Washington (project site). The proposed development will include the construction of a one-story building, parking lot, and associated infrastructure. In 2000, DOE determined that the project site was eligible for an NFA determination, which included institutional controls in the form of a restrictive covenant. In general, the restrictive covenant placed limitations on future development at the project site unless approved by DOE. This EDR will present the planned development and measures that will be implemented to help ensure human health and the environment are protected during and after development.

Acronyms and abbreviations used herein are defined at the end of this document.

2.0 BACKGROUND

2.1 PROJECT SITE DESCRIPTION

The former Turnbull Landfill encompasses approximately 6.5 acres. The project site is currently undeveloped and comprised of approximately 2.55 acres of the western portion of the landfill. The project site is bound by NE Fourth Plain Boulevard to the north, SR 500 to the west, a commercial and light industrial development to the south, and undeveloped former landfill property to the east. The proposed development will include the construction of an approximately 11,100-square-foot, one-story structure on the project site with associated infrastructure, parking lot, and utilities.

Based on our review of available documentation, we understand the project site was operated as a gravel quarry from the early 1900s through the early to mid-1960s. Following cessation of gravel mining, the site operated as a permitted solid waste landfill beginning sometime in 1969 by the Turnbull Construction Company, the former property owner. The landfill accepted construction debris and demolition debris, as well as municipal solid waste. The solid waste disposal permit was reportedly revoked by the Southwest Washington Health District in 1973 due to permit non-compliance. Some non-permitted solid waste disposal occurred at the project site through at least 1974.

The former Turnbull Landfill is a listed cleanup site in DOE's cleanup site database. Sometime in the late 1990s surficial landfill refuse and debris were removed from the project site and an engineered protective soil cap was installed and graded to help minimize surface water infiltration and to help facilitate redevelopment of the project site. In 2000, DOE determined the project site was eligible for an NFA determination, which included institutional controls in the form of a restrictive covenant.

Between 1983 and 2006, a number of geotechnical and environmental investigations were completed to evaluate the content and extent of the solid waste. Prior site explorations completed by GeoDesign indicate the protective cap material consists of a 12- to 36-inch-thick layer of dense, brown sand with some gravel underlain by fill to depths varying between 8 and

18 feet BGS. The fill contains variable amounts of refuse, including concrete, lumber, and trash. Native sand and gravel deposits are present below the fill. Groundwater was reportedly encountered at depths varying between 15 and 20 feet BGS.

The project site relative to the surrounding area is shown on Figure 1. Current project site conditions are shown on Figure 2.

2.2 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed development includes the construction of an approximately 11,100-square-foot, one-story building. The building will be used as a restaurant. The foundation will be slab-on-grade supported by shallow footings and engineered aggregate piers. The remainder of the project site will consist of a parking lot and landscaping. Underground utilities will include water, sanitary, stormwater, and electrical. After development, the project site will be approximately 85 percent impervious. Stormwater runoff will be collected and piped to the existing lateral on the east side of the project site. As a result, infiltration and potential leachate generation will be reduced. The civil engineering plans are presented in Appendix A.

To address the potential presence of methane at the project site, a methane mitigation system is incorporated into the development plans. The system will include a passive venting system with low-permeable membrane placed below the slab of the building. Details of the methane mitigation system and other engineering design elements to protect human health and the environment are provided below.

2.3 METHANE INVESTIGATION

At the request of DOE, GeoDesign completed a methane investigation to provide site-specific methane data to assist DOE with their evaluation of the adequacy of the proposed methane mitigation system. On November 11, 2016 GeoDesign and their subcontractor Pacific Soil and Water of Tigard, Oregon, installed 11 soil gas sampling points at the project site. Five of the soil gas sampling points were located within the proposed building footprint. The remaining six points were installed in the proposed parking lot. Locations of the soil gas sampling points are shown on Figure 2. The soil gas sampling points were installed to a depth of 5 feet BGS with a screened interval of 4 to 5 feet BGS. A sand pack was placed from 3.5 to 5 feet BGS. A hydrated bentonite seal was placed from the top of the sand pack to the ground surface. Each soil gas sampling point was fitted with a valve and a barbed fitting and was allowed to stabilize with the valve closed for a minimum of 24 hours.

On November 14 and 15, 2016 GeoDesign returned to the project site to collect soil gas data from the soil gas sampling points. A calibrated Landtec GEM-2000 methane meter was connected to the soil gas sampling points. The valve was opened and pressure readings in the soil gas sampling points were measured with GEM-2000 and recorded. Using the GEM-2000, the soil gas sampling points were purged for approximately 2.5 minutes until soil gas concentrations stabilized. Peak methane and stabilized methane concentrations were measured and recorded. In addition, oxygen, carbon dioxide, and balance gases (nitrogen) were measured and recorded. Soil gas data is summarized in Table 1.

Within the proposed building footprint, detected concentrations of methane ranged between 0.7 and 1.7 pbv. Methane concentrations were less than the detection threshold of the GEM-2000 in two of the five soil gas sampling points within the proposed building footprint. Pressure readings ranged from -0.05 to 0.00 iow.

In the proposed parking lot area, concentrations of methane ranged between 0.1 and 3.4 pbv. Methane concentrations were less than the detection threshold of the GEM-2000 in three of the six soil gas sampling points in the proposed parking lot area. Pressure readings were zero in the soil gas sampling points in the parking lot area, except for SG-8. During the initial measurement on November 14, 2016, the pressure measurement was zero. On November 15, 2016, the pressure measurement was -0.65 iow.

In addition, GeoDesign collected two soil gas samples for analytical verification of the field-measured methane concentrations. Samples were collected from SG-1 and SG-8 based on the greatest detected field-measured methane concentrations within the proposed building footprint and in the proposed parking lot area. At each location, a decontaminated sampling train was connected to a dedicated summa canister and the respective soil gas sampling point. To check for leaks in the sampling train, a shroud was placed over the sampling train and summa canister and charged with helium. A GasCheck helium detector was used to measure the helium concentration under the shroud and within the sampling train. For both samples, helium concentrations measured in the sampling train were more than an order of magnitude less than the helium concentrations in the shroud. This indicated that the sampling train was reasonably leak free and the sample was collected. Samples were submitted to an analytical laboratory and analyzed for methane by EPA Method 8015M. Methane analytical results were 0.34 pbv for SG-1 and 1.04 pbv for SG-8. Results for both samples were less than field-measured concentrations.

Field documentation and the laboratory analytical report are presented in Appendix B.

According to ASTM E 2993-16[1], methane concentrations in shallow soil gas less than 5.0 pbv and pressures less than 2 iow (less than 500 Pa) do not warrant further action. Based on our methane investigation, site conditions meet the no further action criteria of the ASTM standard. However, the methane mitigation system design was prepared for the project site as described below.

3.0 ENGINEERING DESIGN

Engineering design details are provided in the following sections for proposed development activities.

3.1 ENGINEERED AGGREGATE PIERS

To help address potential settlement, the building will be supported on approximately 352 engineered aggregate piers spaced approximately 8 feet on-center unless noted otherwise on the engineered aggregate pier drawings presented in Appendix C. Each pier will be approximately 30 inches in diameter and drilled to a depth of at least 8 feet below the bottom of

[1]ASTM, *Standard Guide for Evaluating Potential Hazard as a Result of Methane in the Vadose Zone*. Published May 2016.

the footing as indicated on Note 14 on Drawing G1.00 prepared by GeoTech Foundation Company – West (Appendix C). Actual depths may be greater as determined by the engineered aggregate pier installer and the geotechnical engineer. The engineered aggregate piers are installed using an auger to drill a borehole to the depths and diameters specified. Aggregate is placed in the borehole in lifts and compacted until the borehole is filled to the ground surface. Additional details are provided on the engineered aggregate piers Drawings G1.00 and G2.00 presented in Appendix C. Spoils generated during pier installation will be managed in general accordance with the CMMP discussed in Section 3.3.3 and presented in Appendix D.

3.2 CIVIL

3.2.1 Grading

Grading plans are presented in Appendix A. Preliminary mass balance estimates indicate imported fill may be needed to achieve site grades. Fill screening will be completed in general accordance with the CMMP.

3.2.1.1 Excavation, Trenches, and Infrastructure

Civil drawings indicate excavations and trenches will be limited to approximately the top 5 to 6 feet. Based on this, the excavations and trenches may encounter buried solid waste. Provisions set forth in the CMMP (Appendix D) and the site-specific HSP (Appendix E) will be followed during excavation activities.

Site cuts shall be completed to elevations depicted on the grading and utility plans. Slopes will be limited to the recommendations provided by the geotechnical engineer.

3.3 ENVIRONMENTAL

To satisfy the requirements of the restrictive covenant, a methane mitigation system was incorporated into the development plans. In addition, solid waste and hazardous waste could be potentially encountered during development activities. Design details and measures to address methane accumulation, solid waste, and hazardous waste are provided in the following sections.

3.3.1 Methane Mitigation System

The methane mitigation system design incorporated into the development plans includes a sub-slab passive venting system and a low-permeable membrane. The methane mitigation system is based on the Los Angeles Department of Building and Safety, Standard Plan: Methane Hazard Mitigation. Based on our experience on similar projects, this standard has been accepted by regulatory agencies outside of Los Angeles and has effectively mitigated methane accumulation.

The sub-slab passive venting system will consist of a network of perforated pipes set within a gravel conveyance layer. The perforated pipe network will be connected to four 3-inch-diameter vent risers to allow gases to passively vent from underneath the building to the atmosphere. In the event the sub-slab passive venting system requires activation, in-line fans will be installed on the vent risers. Electrical power will be available on the rooftop to energize the fans.

The low-permeable membrane will consist of a 60-mil spray-applied membrane placed between the concrete floor slab and sub-slab passive venting system. The membrane is a two-part emulsion that when mixed with water forms a low-permeable membrane. The membrane cures

in approximately 24 hours and is seamless, creating a monolithic membrane. QA testing of the membrane will consist of smoke testing. Non-toxic smoke is blown under the membrane and the membrane surface is observed for evidence of leaks. The holes are marked and repaired by re-spraying the identified leaks. Additional QA procedures include periodic thickness tests using a micrometer or caliper.

The methane mitigation system design drawings are presented in Appendix F. In addition, specifications describing the materials, installation procedures, and QA testing protocols are presented in Appendix F.

3.3.2 Additional Mitigation Measures

In addition to the methane mitigation system, conduit seals and trench dams will be incorporated into the development plans. The conduit seals will be placed in the annular space of electrical conduits that run underground and prior to electrical boxes and panels where sparks could occur. In addition, penetrations on underground electrical vaults will be sealed to help prevent methane from migrating to and accumulating in the vaults.

Trench backfill creates preferential pathways for methane to migrate off site or under buildings. Therefore, trench dams will be placed along utility corridors where utilities run off site and pass underneath on-site structures. Trench dams are intended to create a barrier to help prevent migration along the utility corridors. Details for conduit seals and trench dams are presented in Appendix F.

3.3.3 Contaminated Media Management

The CMMP is presented in Appendix D. The objectives of the CMMP are to (1) outline standard procedures for the evaluation of imported fill soil, (2) outline procedures for the identification, management, and disposal of solid waste or hazardous waste that may be encountered during portions of site earthwork, (3) provide the earthwork contractor with guidance related to the identification, notification, and handling of solid waste or hazardous waste, (4) provide the earthwork contractor guidance related to the proper handling and disposal of groundwater, if encountered, and (5) establish a decision structure supporting the management of contaminated media.

3.3.4 Health and Safety

A site-specific HSP is presented in Appendix E and includes a description of identified hazards, directions to the nearest hospital, and appropriate personal protective equipment. Personnel working on site will be required to read and sign either the attached HSP or their employer's equivalent plan. All operations will be conducted in accordance with the site-specific HSP. The excavating and trenching activities will be monitored by a qualified environmental professional with 40-hour HAZWOPER and AHERA training.

4.0 REPORTING

4.1 DAILY SUPERINTENDENT'S REPORTS

The contractor will prepare a daily report describing the day's activities, personnel on site, and issues encountered. The daily report will include relevant photographs of the day's activities.

Daily reports will be submitted to the project team via email. The project team will retain the electronic daily reports in their respective project folders. The daily reports will be compiled in the Construction Completion Report (see Section 4.2).

4.2 CONSTRUCTION COMPLETION REPORT

Upon substantial completion of the project, a Construction Completion Report will be prepared and submitted to DOE. Each report will include, at a minimum, the following information where applicable to the completed stage:

- Compiled field documentation
- Documentation of the origin, quantity, and quality of imported soil, as applicable
- Copies of waste disposal receipts and manifests, as applicable
- Laboratory analysis results, if applicable, and associated QA/QC documentation
- Volumes of soil, debris, and water generated during construction activities and origin and final disposition locations of these materials
- Representative photographs showing the various development activities and elements, including the methane mitigation system, trench dams, and conduit seals
- A synopsis of the work conducted on the project site and certification by a Washington-registered Professional Engineer that the work was performed in accordance with the approved plans and specifications
- Explanation of modifications to the approved plans and specifications and details regarding the necessity of such modifications

5.0 LONG-TERM MAINTENANCE AND MONITORING

We anticipate long-term maintenance and monitoring will be necessary to document compliance with the restrictive covenant and to help ensure the project site remains protective of human health and the environment. The following describes the general maintenance and monitoring planned after construction is complete.

5.1 MAINTENANCE AND MONITORING

The methane mitigation system is intended to be protective of current and future occupants of the building. To evaluate the protectiveness in the long-term, methane monitoring of the installed passive venting system is proposed on a quarterly basis for one year following construction. After the one year of quarterly monitoring, conditions will be evaluated based on the methane monitoring data to establish future monitoring requirements. If data indicates stable conditions, methane concentrations are within allowable limits, and engineering controls remain protective, monitoring requirements may be discontinued with DOE concurrence.

Following the quarterly monitoring events, reports will be prepared and submitted to DOE documenting the monitoring activities.

Specifically, the monitoring program will consist of the following:

- Monitor the three sub-slab monitoring probes and the four vent risers using a GEM-2000 methane meter. In addition, static pressure will be monitored in the sub-slab probes using the GEM-2000. The pbv of methane, oxygen, carbon dioxide, and static pressure (sub-slab probes only) will be measured and recorded. In addition, date, time, and atmospheric barometric pressure will also be recorded during each monitoring event.

Quarterly monitoring data will be evaluated for potential methane accumulation or unsafe conditions. The following will discuss the decision-making process to enhance the monitoring program to help evaluate that the building and its occupants remain protected.

A methane concentration of 5 pbv or greater in the sub-slab probes will trigger additional monitoring. Under this condition, we propose monitoring the sub-slab probes and vent risers monthly for one quarter to evaluate if concentrations are sustained. If methane concentrations in the sub-slab probes continue to exceed 5 pbv, indoor confined space monitoring will be conducted with the GEM-2000. If methane is detected above 0.5 pbv (the detection limit of the GEM-2000) during indoor air monitoring, DOE and the designated project site contact person will be notified to discuss the possible remedial options. Initially, the source of the methane will be investigated using a flame ionization detector. If methane is entering through a breach in the methane mitigation system, the following options will be explored:

1. Locating the potential breach and repairing it
2. Activating the passive venting system
3. Adjusting the building HVAC system to increase the indoor air exchanges

Potential options will be discussed with DOE and implemented with DOE concurrence.

♦ ♦ ♦

We appreciate the opportunity to provide this EDR. Please contact us if you have questions or comments.

Sincerely,

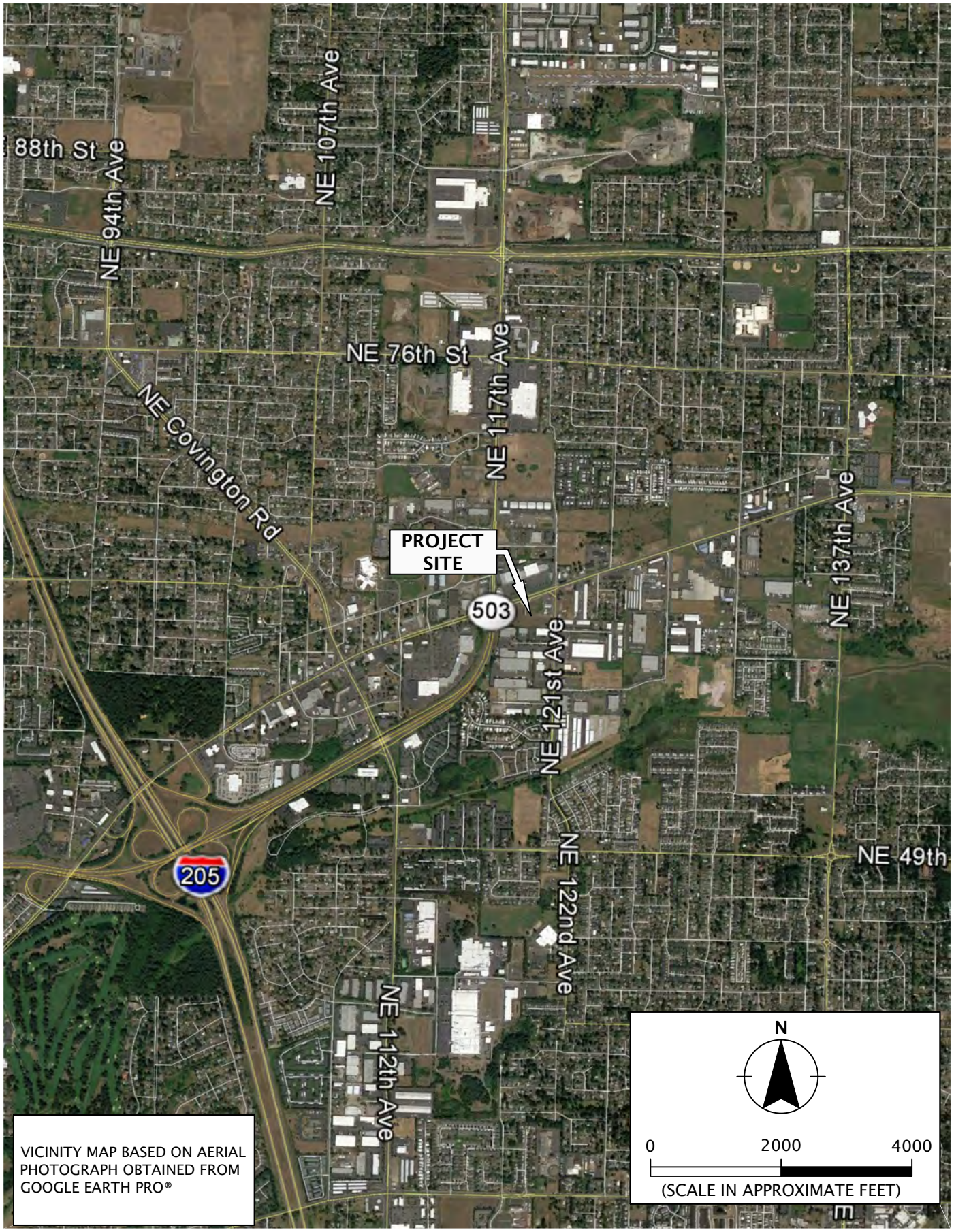
GeoDesign, Inc.

Mike F. Coenen, P.E.
Associate Engineer

Jason O'Donnell, L.G.
Principal Geologist

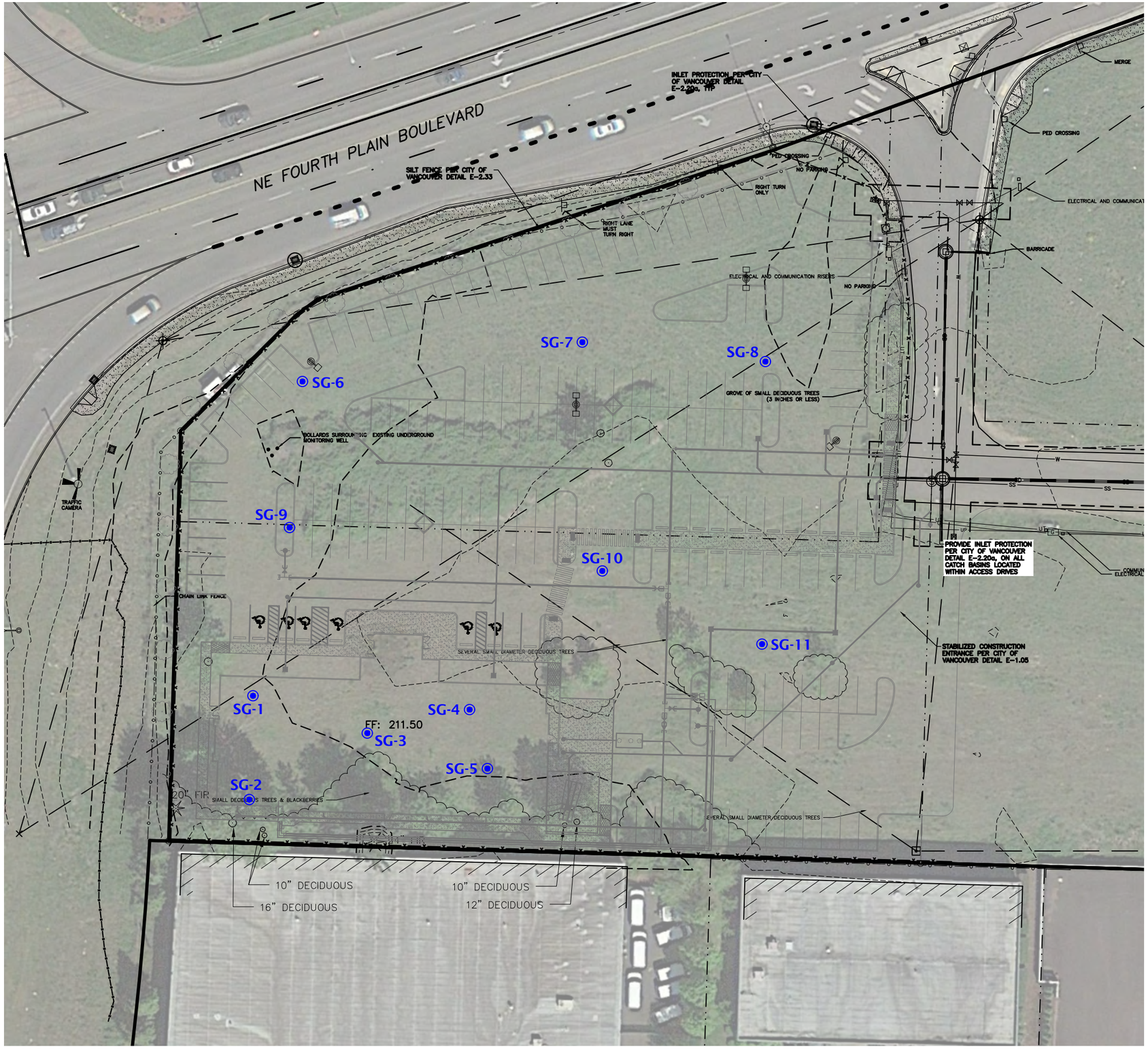
Signed 12/19/2016

FIGURES



GeoDesign Inc 9450 SW Commerce Circle - Suite 300 Wilsonville OR 97070 503.968.8787 www.geodesigninc.com	ORCHARD-1-01	**VICINITY MAP**	
	DECEMBER 2016	PROPOSED DEV. - FORMER TURNBULL LANDFILL VANCOUVER, WA	**FIGURE 1**

Printed By: mmiller | Print Date: 12/19/2016 8:32:07 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\HSP\Orchard-1-01-VM01.dwg | Layout: FIGURE 1



LEGEND:

SG-1◉ SOIL GAS SAMPLING POINT

N

0 50 100

(SCALE IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY PACE AND IMAGE OBTAINED FROM GOOGLE EARTH PRO ON AUGUST 24, 2016

SITE PLAN

PROPOSED DEV. - FORMER TURNBULL LANDFILL
VANCOUVER, WA

FIGURE 2

ORCHARD-1-01

DECEMBER 2016

GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

Printed By: mmiller | Print Date: 12/19/2016 8:32:09 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\HSP\Orchard-1-01-SP03.dwg | Layout: FIGURE 2

TABLES

TABLE 1
Summary of Methane Monitoring and Confirmation Soil-Gas Sample Chemical Analytical Results [1]
Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington

Soil Gas Sampling Point I.D.	Date	Time	Barometric Pressure (inHg)	Pressure (iow)	Methane (pbv)	Peak Methane (pbv)	Carbon Dioxide (pbv)	Oxygen (pbv)	Balance	Methane by EPA Method 8015M (ppmv [pbv])
Purge Time: 150 seconds										
SG-1	11/14/16	1107	29.99	0.00	1.7	1.7	13.3	0.0	85.0	**3,400 [0.34]**
SG-2	11/14/16	1100	29.99	0.00	0.0	0.0	6.5	10.0	83.6	--
SG-3	11/14/16	1055	29.99	-0.05	0.7	0.7	11.6	0.0	87.7	--
SG-4	11/14/16	1044	29.98	0.00	0.0	0.0	0.2	19.5	80.3	--
SG-5	11/14/16	1050	29.98	-0.02	0.8	0.8	9.6	0.0	89.7	--
SG-6	11/14/16	1118	29.98	0.00	0.0	0.0	3.0	11.8	85.2	--
SG-7	11/14/16	1124	29.98	0.00	0.0	0.0	9.7	0.0	90.3	--
SG-8	11/14/16	1130	29.98	0.00	2.3	2.3	9.4	0.8	87.3	--
	11/15/16	0930	29.81	-0.65	3.4 [2]	3.4	8.7	1.7	86.2	**10,400 [1.04]**
SG-9	11/14/16	1112	29.98	0.00	0.1	0.1	12.6	0.0	87.2	--
SG-10	11/14/16	1036	29.98	0.00	1.1	2.0	5.8	10.6	82.5	--
SG-11	11/14/16	1026	29.99	0.00	0.0	0.0	0.5	20.6	78.9	--

Notes:

1. Chemical analyses performed by ESC Lab Sciences of Mt. Juliet, Tennessee.
2. Purge time for this event was 200 seconds.

Bolding indicates analyte detected at or above the laboratory MRL.

--: not analyzed

APPENDIX A

GOLDEN CORRAL RESTAURANT
SR500 & NE FOURTH PLAIN

CASE# PRJ-147756/PIR-43335
LOCATED IN
THE SE 1/4 OF THE SW 1/4 OF SECTION 10, TOWNSHIP 2 N, RANGE 2 E WM, SHORT PLAT BOOK 3, PAGE 414 LOTS 3 &4, S/N 158347-010 & 015, CLARK COUNTY, WASHINGTON

GENERAL NOTES

ALL CONSTRUCTION, MATERIALS, AND WORKMANSHIP SHALL CONFORM TO THE LATEST STANDARDS AND PRACTICE OF THE CITY OF VANCOUVER AND THE 2008 EDITION OF THE "STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION" AS PREPARED BY WSDOT AND APWA.

CITY OF VANCOUVER TRANSPORTATION SERVICES STANDARD DETAILS DATED 8/15/08 SHALL BE UTILIZED IN THE CONSTRUCTION OF THE TRANSPORTATION ELEMENTS OF THESE PLANS.

STREET SIGNING AND STRIPING SHALL BE INSTALLED BY THE DEVELOPER. ALL STREET SIGNS AND STRIPING SHALL BE INSTALLED PER THE MUTCD.

ALL CONSTRUCTION WITHIN CITY OF VANCOUVER OR CLARK COUNTY RIGHT-OF-WAY SHALL HAVE AN APPROVED TRAFFIC CONTROL PLAN AND RIGHT-OF-WAY PERMIT PRIOR TO ANY ON-SITE CONSTRUCTION ACTIVITY.

STREET LIGHTING WILL BE INSTALLED BY THE DEVELOPER PER P.U.D. APPROVED STREET LIGHTING PLANS.

PRE-PAVING AS-BUILTS SHALL BE SUBMITTED TO THE CITY OF VANCOUVER CONSTRUCTION OFFICE AND CITY INSPECTOR FOR BOTH SANITARY SEWER AND STORM SEWER, PRIOR TO PAVING.

PAVING WILL NOT BE ALLOWED DURING WET OR COLD WEATHER, PER W.S.D.O.T. SPECIFICATIONS.

ANY SIGNIFICANT DEVIATIONS FROM THE PLANS WILL REQUIRE A REQUEST FROM THE APPLICANT'S ENGINEER AND APPROVAL FROM THE CITY'S ENGINEER AND CITY INSPECTOR.

ALL PAVEMENT SHALL BE STRAIGHT CUT PRIOR TO PAVING. EXISTING PAVEMENT SHALL BE REMOVED AS NECESSARY TO PROVIDE A SMOOTH TRANSITION FOR BOTH RIDE AND DRAINAGE.

ALL ADA PEDESTRIAN RAMPS SHOWN ON THE PLANS AND ON THE DETAIL SHEETS SHALL BE CONSTRUCTED WITH THE PROJECT. WHERE THE SIDEWALK ENDS AT THE PROPERTY LINE, A PEDESTRIAN RAMP SHALL BE PROVIDED TO ACCOMMODATE WHEEL CHAIR ACCESS. SIDEWALKS SHALL BE CONSTRUCTED WITH THE PROJECT WHERE THERE IS AN EXISTING HOUSE, DRAINAGE SWALE, ETC. OR ALONG AN ARTERIAL THAT DOES NOT ALLOW ACCESS FROM THE NEW LOTS.

SUBGRADE PREPARATION DURING WET OR WINTER TIME CONSTRUCTION IS USUALLY/OFTEN NOT FEASIBLE. A WET OR WINTER TIME PLAN SHALL BE SUBMITTED TO CITY OF VANCOUVER, DEVELOPMENT ENGINEERING STAFF FOR REVIEW AND APPROVAL IF THE CONTRACTOR PLANS TO COMMENCE WITH CONSTRUCTION DURING WET WEATHER CONDITIONS. IF PAVING FROM OCTOBER 15THT TO MARCH 30TH, A WET WEATHER SUBGRADE PREPARATION PLAN IS REQUIRED. THE SUBGRADE MUST BE OVER EXCAVATED AND A GEOTEXTILE LINER USED. THE INSPECTOR SHALL APPROVE A COMPLETE PROOF ROLL TEST ON BOTH SIDES OF THE STREET.

ALL TRAFFIC SIGNAL INTERCONNECT CONDUITS AND CABLES (COPPER OR FIBER OPTIC) SHALL BE PROTECTED DURING CONSTRUCTION ACTIVITIES. DUE TO THE IMPORTANCE OF MAINTAINING THESE COMMUNICATIONS, ANY DAMAGES TO THESE CABLES AND CONDUITS CAUSED BY THE CONTRACTOR OR ANY OF ITS AFFILIATES SHALL BE REPAIRED WITHIN 4 HOURS UNLESS OTHERWISE APPROVED BY ENGINEER. IF THIS REPAIR CAN NOT BE COMPLETED IN ALLOTTED TIME, WORK WILL BE DONE BY THE CITY OR ITS DESIGNEE AND ALL COSTS INCLUDING ANY OVERHEAD COSTS SHALL BE INVOICED TO THE CONTRACTOR.

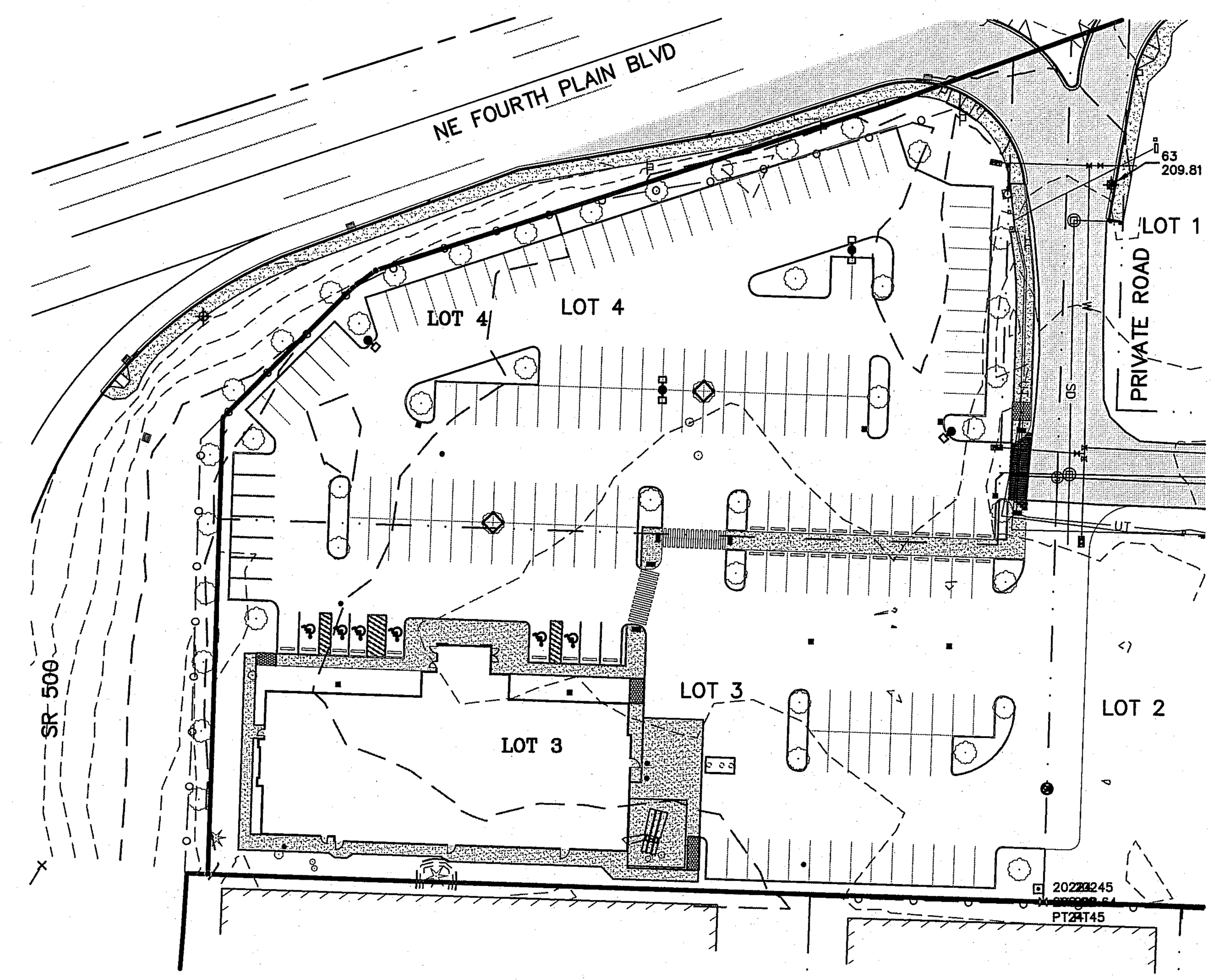
ALL TRAFFIC SIGNALS SHALL REMAIN IN OPERATION DURING CONSTRUCTION ACTIVITIES, EXCEPT AS INDICATED ON THE PLANS. ANY DAMAGES CAUSED BY THE CONTRACTOR OR ANY OF ITS AFFILIATES TO THE EXISTING TRAFFIC SIGNAL CONDUIT, WIRING, POLES, MAST ARMS, SIGNAL INDICATIONS, LOOP DETECTORS, AND OTHER RELATED COMPONENTS SHALL BE REPAIRED WITHIN 24 HOURS UNLESS OTHERWISE APPROVED BY ENGINEER. IF THIS REPAIR CAN NOT BE COMPLETED IN ALLOTTED TIME, WORK WILL BE DONE BY THE CITY OR ITS DESIGNEE AND ALL COSTS INCLUDING ANY OVERHEAD COSTS SHALL BE INVOICED TO THE CONTRACTOR.

CONTRACTOR SHALL REPORT ALL DAMAGES IMMEDIATELY TO THE CITY'S CONSTRUCTION SERVICES OFFICE AT (360)487-7750 OR CONTACT THE INSPECTOR ON THE JOB.

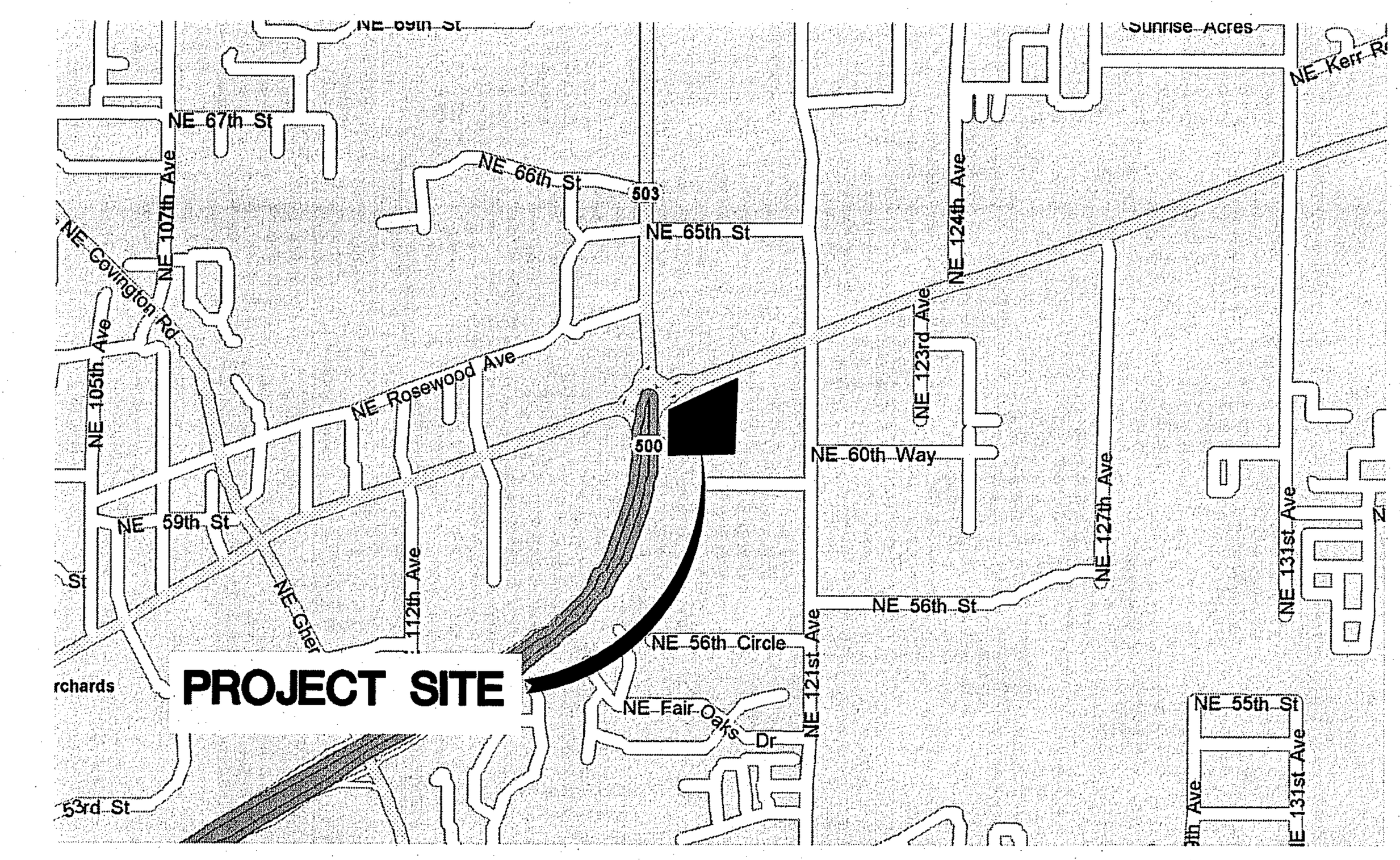
SHOULD ANY ITEM OF ARCHAEOLOGICAL INTEREST (VMC 20.710.090) BE FOUND DURING DEVELOPMENT, YOU ARE REQUIRED TO STOP WORK AND NOTIFY THE PLANNING CASE MANAGER IN DEVELOPMENT REVIEW SERVICES AT (360) 487-7800, AND THE WASHINGTON STATE OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION AT (360) 753-4011 IMMEDIATELY. FAILURE TO DO SO COULD RESULT IN A FELONY CONVICTION.

"ALL MATERIALS AND METHOD OF CONSTRUCTION AND INSTALLATION FOR WATER, SEWER AND STORM WATER FACILITIES SHALL CONFORM TO CITY OF VANCOUVER ENGINEERING SERVICES "GENERAL REQUIREMENTS AND DETAILS FOR THE DESIGN AND CONSTRUCTION OF WATER, SANITARY SEWER, SURFACE WATER SYSTEMS, GRADING AND EROSION CONTROL." CONSTRUCTION SHALL BE AS PER THE STANDARD DETAIL CONTAINED THEREIN."

THE EARTHWORK QUANTITIES SHOWN IN THIS PLAN SET ARE ESTIMATES ONLY FOR CITY REVIEW PURPOSES ONLY AND SHALL NOT BE USED BY THE CONTRACTOR FOR BIDDING. THE CONTRACTOR SHALL CALCULATE INDEPENDENT CUT, FILL, IMPORT AND EXPORT QUANTITIES BASED ON THE EXISTING GROUND SURFACE AND PROPOSED GRADES SHOWN HEREIN, THE PROJECT SPECIFICATIONS AND APPROPRIATE AND LEGAL MEANS AND METHODS.



A SITE MAP C1.0 1"=60'



B VICINITY MAP C1.0 N.T.S.

City of VANCOUVER WASHINGTON		
Plans reviewed for compliance with City Standards and Policies		
Case Number:	PRJ-147756/PIR-43335	
Recommended for Approval:		
Fire Review	Date	
Water Review	Date	
Sewer Review	Date	
Grading (Per Building Code)	Date	
Stormwater and Erosion Control	Date	
Transportation Review	Date	
Traffic Review	Date	
Planning Review	Date	
Improvement Summary:		
Street Improvements	0	LF
Water Main Footage	340	LF
Sewer Main Footage	0	LF
Septic System Decommissioned	N/A	EA
Trenching within City Right of Way	0	LF
Total Impervious Surface	92,347	SF
Private Impervious Surface	2.12	AC
Grading: Cut 4,336 CY	Fill 4,846	CY

ApprovalBlk CITY.dwg Revised: 11/23/2005 TLT

PROJECT TEAM

PROPERTY OWNER
ORCHARDS CROSSING, LLC.
8070 W HALL BLVD. SUITE 200
BEAVERTON, OREGON 97008
PH 503-538-1380

APPLICANT\DEVELOPER
BZ GROUP, LLC
RAMSEY ZAWIDEH
6950 SW HAMPTON ST, #101
TIGARD OR, 97223
PH 503-597-8050

CIVIL ENGINEER
PACE ENGINEERS, INC.
ANDREW REITER, PE, PLS
5000 MEADOWS ROAD, LAKE OSWEGO, OR 97035
PH 503-597-3222
FX 503-597-7655
ANDYR@PACEENGRS.COM

SURVEYOR
PACE ENGINEERS, INC
5000 MEADOWS ROAD, LAKE OSWEGO, OR 97035
PH 503-597-3222
FX 503-597-7655

PROJECT LEGEND

Symbol	Description
WV	INDICATES WATER VALVE
	INDICATES FIRE HYDRANT
S	INDICATES SANITARY SEWER MANHOLE
	INDICATES SANITARY LATERAL
E	INDICATES ELECTRIC PEDESTAL
T	INDICATES TRANSFORMER
CI	INDICATES CURB INLET
CB	INDICATES CATCH BASIN
T	INDICATES TELEPHONE PEDESTAL
TSB	INDICATES TRAFFIC SIGNAL BOX
WM	INDICATES WATER METER
ST	INDICATES STORM SEWER MANHOLE
TVP	INDICATES TELEVISION PEDESTAL
	INDICATES LIGHT POLE
JB	INDICATES JUNCTION BOX
CI	INDICATES COMBINATION CURB INLET
— — —	INDICATES EDGE OF PAVEMENT
———	INDICATES 5 FOOT INTERVAL CONTOUR
— — —	INDICATES 1 FOOT INTERVAL CONTOUR
—X—X—	INDICATES FENCE LINE
—UG—UG—	INDICATES TELEPHONE & POWER LOCATE
—W—W—	INDICATES WATER LOCATE
— · · —	INDICATES LOT LINE
━━━	INDICATES PROPERTY LINE

ABBREVIATIONS:

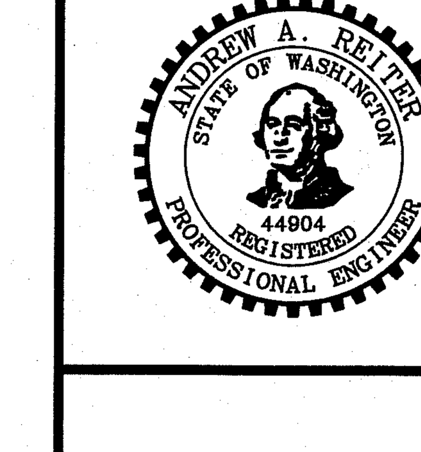
AC	ASPHALT CEMENT
AGGR	AGGREGATE
APPROX	APPROXIMATELY
BCR	BEGIN CURB RETURN
BVCE	BEGIN VERTICAL CURVE ELEV
BVCS	BEGIN VERTICAL CURVE STA
CDS	CUL DE SAC
CL	CENTERLINE
COMB	COMBINATION
CONC	CONCRETE
DI	DUCTILE IRON PIPE
DRAIN	DRAINAGE
DRWY	DRIVEWAY
DSGN	DESIGN
ECR	END CURB RETURN
EG	EXISTING GRADE
ELEV	ELEVATION
ENG	ENGINEERING
E/P	EEOP
ESMT	EASEMENT
EVCE	END VERTICAL CURVE ELEV
EVCS	END VERTICAL CURVE STA
EXTG	EXISTING
EX	EXISTING
EXIST	EXISTING
EYE	EYEBROW
FI	FIELD INLET
FG	FINISH GRADE
F/L	FLOW LINE
G/A	GUY ANCHOR
GUT	GUTTER
HORZ	HORIZONTAL
IE	INVERT ELEVATION
LAT	LATERAL
LT	LEFT
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
N.T.S.	NOT TO SCALE
PAV	PAVEMENT
PC	POINT OF CURVATURE
PED	PEDESTRIAN
PHS	PACIFIC HABITAT SERVICES
P/L	PROPERTY LINE
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVI	POINT OF VERTICAL INTERSECTION
PUB	PUBLIC
RED	REDUCER
RET	RETAINING WALL
RD	ROAD
RT	RIGHT
SAN	SANITARY SEWER
SEP	SEPARATE
ST/STR	STREET
STA	STATION
STD	STANDARD
STM	STORM
S/W	SIDEWALK
TEMP	TEMPORARY
TOC	TOP OF CURB
TYP	TYPICAL
VERT	VERTICAL

SHEET LIST TABLE

Sheet Number	Sheet Title
C1	COVER SHEET
C2	EXISTING CONDITIONS PLAN
C3	SITE PLAN
C4	GRADING AND EROSION CONTROL PLAN
C5	STORMWATER PLAN
C6	SEWER AND WATER PLAN
C7	SITE DETAILS
C8	SEWER DETAILS
C9	AUTO TURN EXHIBIT
LT1	LIGHTING PLAN
L1	LANDSCAPE PLAN
L2	LEVEL 5 TREE PLAN
L3	PLANTING DETAILS

SYM	REVISION	DATE

PACE An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
paceengrs.com

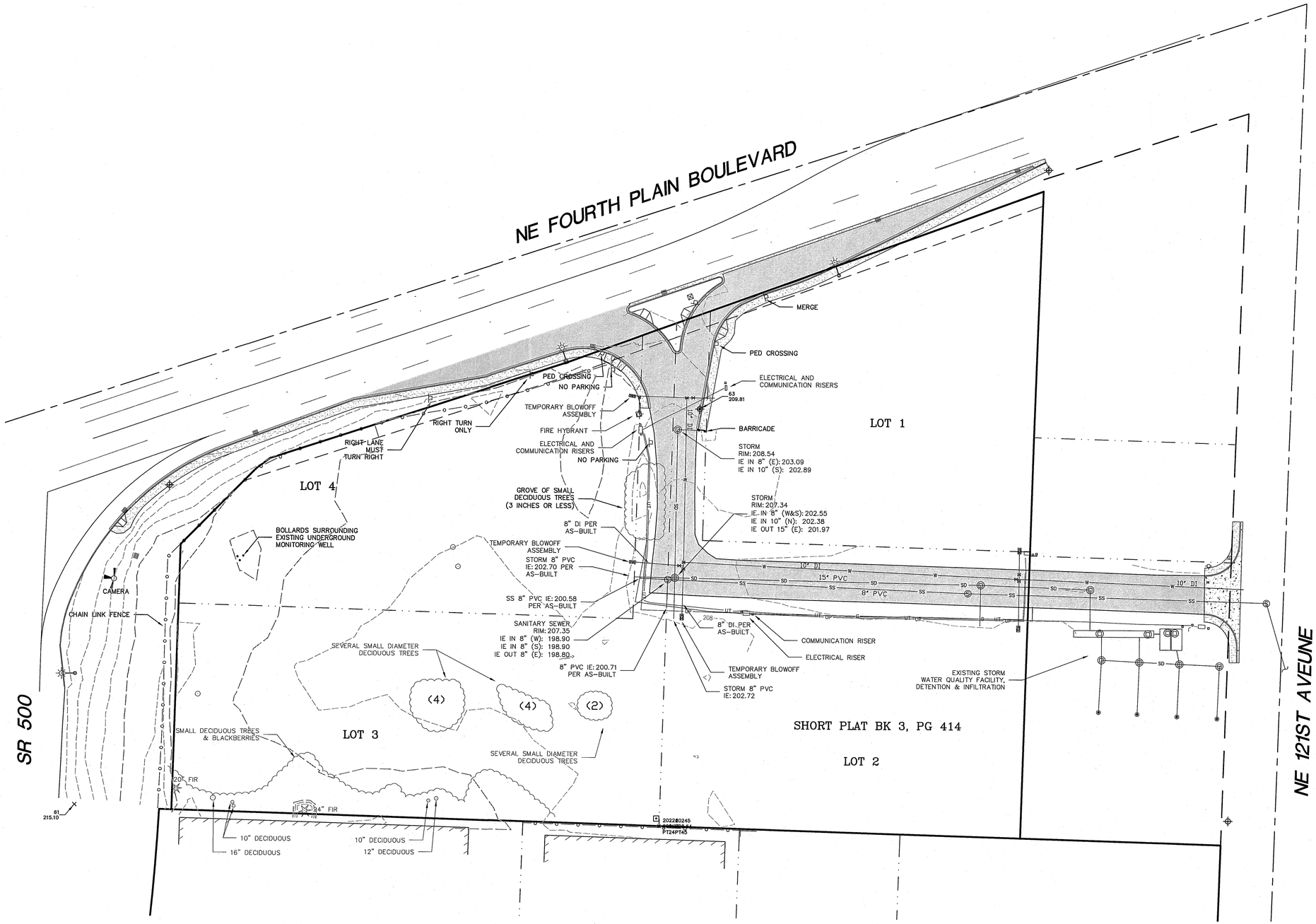


COVER SHEET

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500 AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"
PLOT DATE:
DESIGNED BY: MAA
CHECKED BY: BDL
JOB NUMBER 15843
DWG NAME: 15843 – C1 COVER
SHEET C1

FILE NAME: P:\P15\15843 - VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 - C1 COVER.DWG
SAVE TIME: 4/15/2016 2:56:50 PM
PLOT TIME: 4/15/2016 2:57 PM
USER NAME: MARK AASLAND
XREF FILES: X-06945-ENGR-BASE (FOR REF ONLY), X-06945-SURV-BASE (FOR REF ONLY), X-06945-TOPO-BASE (FOR REF ONLY), X-06945-ARCH BASE (FOR REF ONLY), X-60945-34X22 SITE BDR.



LEGEND

- WATER VALVE
- HYDRANT
- WATER METER
- MANHOLES (SS/SD)
- CB
- POWER/UTILITY POLE
- GUY ANCHOR
- POWER TRANSFORMER
- POWER/TELEPHONE VAULT
- POWER METER
- TELEPHONE/TV RISER
- GAS VALVE
- GAS METER
- STREET LIGHT
- LUMINAIRE
- SPOT ELEVATION
- SIGN
- MAILBOX
- ROCKERY
- CONIFEROUS TREE
- DECIDUOUS TREE
- FOUND CASED MONUMENT
- SET MAGNETIC NAIL W/ WASHER
- SET HUB & TACK

- CENTER LINES
- PROPERTY LINES
- RIGHT-OF-WAY LINES
- LOT LINES
- DITCH LINE
- FLOW LINE
- W — WATER LINE
- SS — SANITARY SEWER LINE
- SD — STORM DRAIN LINE
- G — GAS LINE
- UP — UNDERGROUND POWER LINES
- UT — UNDERGROUND TELEPHONE LINES
- UTV — UNDERGROUND CABLE TV LINES
- UFO — UNDERGROUND FIBER OPTIC LINES
- P — OVERHEAD POWER LINES
- OHL — OVERHEAD UTILITY LINES
- CHAIN LINK FENCE
- WIRE FENCE
- WOOD FENCE

N

HORIZ. 0 20 40 80
Scale In Feet

SYM.	REVISION	DATE

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
pacesengrs.com

ANDREW A. RETTIG
STATE OF WASHINGTON
14904
REGISTERED
PROFESSIONAL ENGINEER

EXISTING CONDITIONS PLAN

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 — 1"	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER 15843	
DWG NAME: 15843 – C2 EX COND	
SHEET C2	

FILE NAME: P:\P15\15843 – VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 – C2 EX COND.DWG
SAVE TIME: 4/15/2016 9:57:56 AM
PLOT TIME: 4/15/2016 3:36:16 PM
USER NAME:MARK AASLAND
XREF FILES: PACE34X22.

NE FOURTH PLAIN BOULEVARD

LOT 4

LOT 3

LOT 2

10' SETBACK

EXIST FH TO REMAIN

4/C7 CONCRETE CURB

ELECTRICAL AND COMMUNICATION RISERS TO REMAIN

TYPICAL PARKING LOT LIGHT

3/C7 TYP

PAINTED CROSSWALK

2/C7 TYP CONC WALK

1/C7 TYP PAVEMENT

5/C7 TYP (6 PLACES)

7/C7

B/C3

A/C3

CHAIN LINK FENCE

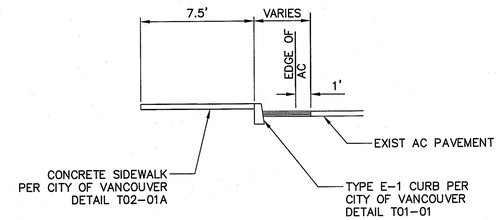
SAWCUT EXIST AC MATCH NEW AC

GC 11M.10.2 – LEFT HAND

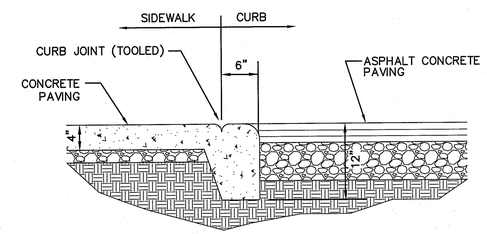
HERE.

63
209.81

20224 PT24 20245 PT45



A/C3 **SECTION**
SCALE 1"=5'



B/C3 **SECTION**
SCALE 1"= 1'

SITE PLAN DATA

SITE AREA	110,923 SQ. FT	2.55 ACRES
LANDSCAPE AREA	17,018 SQ. FT	0.39 ACRES
LANDSCAPE PERCENTAGE		15.3%
TOTAL NUMBER PARKING STALLS		181
HANDICAP STALLS		6
BUILDING SIZE		11,097 SQ. FT

GENERAL NOTES

1. ALL CURB RADIUS ARE 3' UNLESS NOTED OTHERWISE.

HORIZ. 0 10 20 40
Scale In Feet

DATE	REVISION	SYM

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.697.3222 | f. 503.697.7655
Civil | Structural | Planning | Survey
paceengrs.com

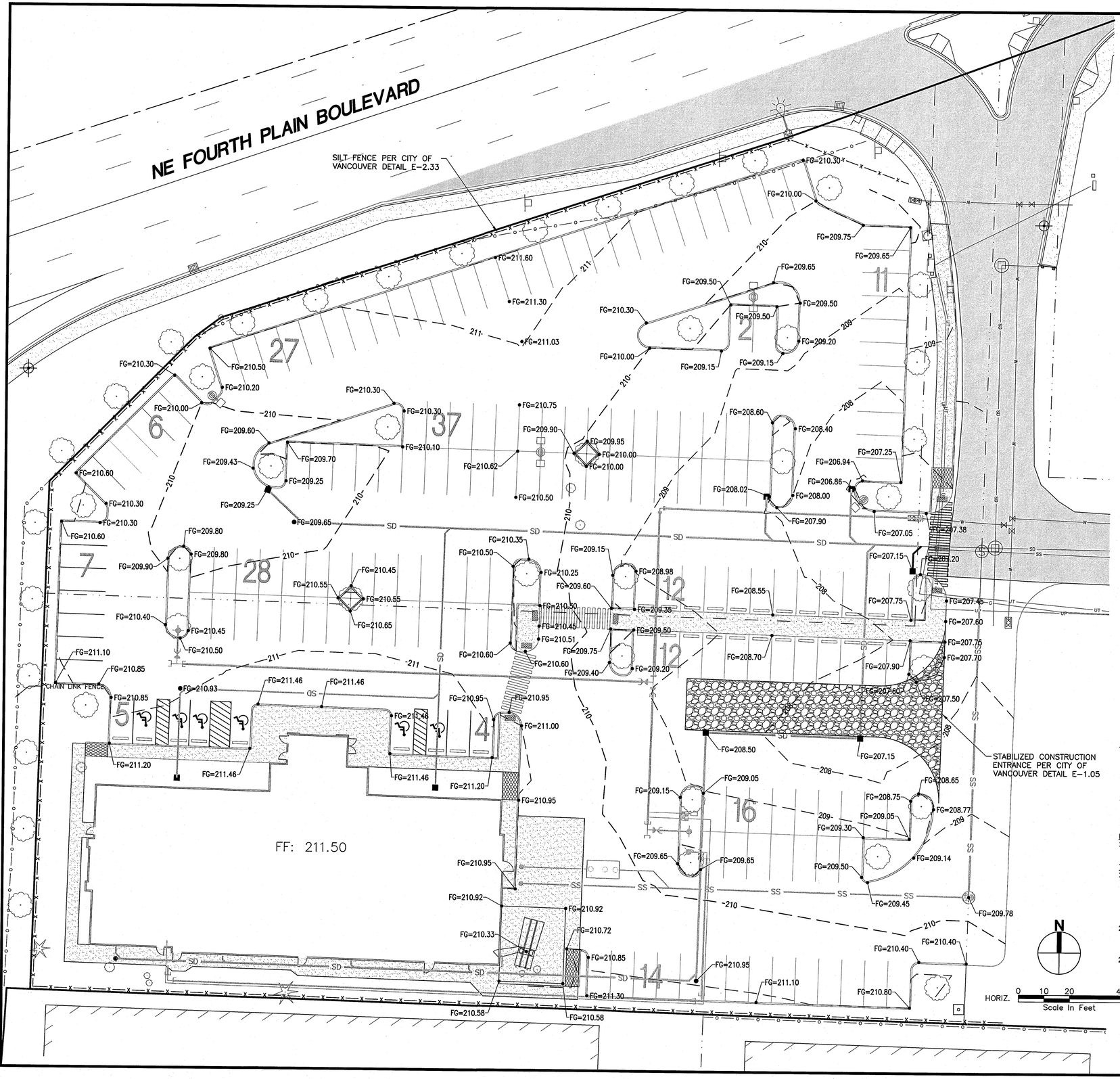
ANDREW A. REITER
STATE OF WASHINGTON
44904
REGISTERED
PROFESSIONAL ENGINEER

SITE PLAN

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 — 1"	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER: 15843	
DWG NAME: 15843 – C3 SITE PLAN	
SHEET C3	8

FILE NAME: P:\P15\15843 – VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 – C3 SITE PLAN.DWG
SAVE TIME: 4/15/2016 8:58:53 AM
PLOT TIME: 4/15/2016 3:12 PM
USER NAME:MARK AASLAND
XREF FILES: PACE34X22



GENERAL NOTES:

1. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN PLACE AND IN WORKING CONDITION PRIOR TO ANY LAND DISTURBING ACTIVITY INCLUDING CLEARING OR GRADING. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE APPROVED BY THE CITY EROSION SPECIALIST PRIOR TO THE COMMENCEMENT OF WORK. AN ON-SITE INSPECTION SHALL BE REQUESTED WHEN EROSION AND SEDIMENT CONTROL MEASURES ARE IN PLACE AND PRIOR TO COMMENCEMENT OF WORK. ONCE APPROVED, THE SITE MUST BE MAINTAINED THROUGH THE LIFE OF THE PROJECT, AS SHOWN ON THE PLANS. ADDITIONAL MEASURES MAY BE REQUIRED TO MEET THE PROVISIONS OF THE CITY EROSION PREVENTION AND SEDIMENT CONTROL ORDINANCE VMC 14.24.
2. EROSION AND SEDIMENT CONTROL BMPS SHALL BE SITED, DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS IN THE CITY O VANCOUVER'S LATEST VERSION OF GENERAL REQUIREMENTS AND STANDARD DETAILS MANUAL AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON, WHERE THE CITY OF VANCOUVER GENERAL REQUIREMENTS SHALL TAKE PRECEDENCE.
3. THE DEVELOPER AND/OR OWNER IS RESPONSIBLE FOR MAINTAINING EROSION PREVENTION AND SEDIMENT CONTROL BMPS DURING AND AFTER INSTALLATION OF ALL UTILITY WORK ASSOCIATED WITH UTILITY TRENCHES.
4. PRIOR TO ANY SITE EXCAVATION, ALL STORM DRAIN INLETS SHALL BE PROTECTED DOWN SLOPE FROM ANY DISTURBED OR CONSTRUCTION AREAS PER STANDARD DETAIL E-2.20 TO PREVENT SEDIMENT FROM ENTERING THE STORM DRAINAGE SYSTEM PRIOR TO PERMANENT STABILIZATION OF THE DISTURBED AREAS. CLEAN INLET FILTER AS NECESSARY TO MAINTAIN DRAINAGE. REMOVE FILTER AND CLEAN CATCH BASINS FOLLOWING COMPLETION OF SITE WORK.
5. NEWLY CONSTRUCTED OR MODIFIED INLETS AND CATCH BASINS SHALL BE PROTECTED FROM SEDIMENT IMMEDIATELY UPON INSTALLATION.
6. THE CONTRACTOR SHALL NOT ALLOW SEDIMENT OR DEBRIS TO ENTER NEW OR EXISTING PIPES, CATCH BASINS OR INFILTRATION SYSTEMS. IF THIS OCCURS, THE CONTRACTOR SHALL REMOVE ALL ACCUMULATED SEDIMENT FROM THE CATCH BASINS, DRYWELLS, AND STORM PIPES IMMEDIATELY. FINAL ACCEPTANCE WILL NOT BE ISSUED BY THE CITY UNTIL THIS OCCURS.
7. PRIOR TO LEAVING A CONSTRUCTION SITE OR PRIOR TO DISCHARGING INTO AN INFILTRATION SYSTEM, SEDIMENT-LADEN WATER SHALL PASS THROUGH A SEDIMENT POND, TRAP, OR OTHER APPROVED BMP SYSTEM.
8. ALL EXPOSED AND UNWORKED SOILS SHALL BE STABILIZED BY THE APPROPRIATE BEST MANAGEMENT PRACTICES (BMPS). FROM OCTOBER 1 TO APRIL 30, NO SOILS SHALL BE4 EXPOSED AND UNWORKED FOR MORE THAN TWO (2) DAYS. FROM MAY 1 TO SEPTEMBER 30, NO SOILS SHALL BE EXPOSED AND UNWORKED FOR MORE THAN SEVEN (7) DAYS.
9. SOIL STOCKPILES SHALL BE STABILIZED FROM EROSION, PROTECTED WITH SEDIMENT TRAPPING MEASURES, AND WHEN POSSIBLE, BE LOCATED AWAY FROM STORM DRAIN INLETS, WATER WAYS AND DRAINAGE CHANNELS.
10. CONSTRUCTION ROADS AND PARKING AREAS SHALL BE STABILIZED WHEREVER THEY ARE CONSTRUCTED, WHETHER PERMANENT OR TEMPORARY, FOR THE USE OF CONSTRUCTION TRAFFIC.
11. IF THE BMPS APPLIED TO A SITE ARE INSUFFICIENT TO PREVENT SEDIMENT FROM REACHING WATER BODIES, ADJACENT PROPERTIES, STORM FACILITIES OR PUBLIC RIGHT-OF-WAY, THEN THE CITY SHALL REQUIRE ADDITIONAL BMPS.
12. IF THE CITY INSPECTOR OR ENGINEER(S) HAS EVIDENCE OF POOR CONSTRUCTION PRACTICES OR IMPROPER EROSION PREVENTION BMPS, CITATIONS AND/OR STOP WORK ORDER SHALL BE ISSUED UNTIL PROPER MEASURES HAVE BEEN TAKEN AND APPROVED BY THE CITY OF VANCOUVER.

PROTECTION OF ADJACENT PROPERTIES, ROADS/STREETS AND PAVED SURFACES

13. PROVIDE A 12-INCH DEEP PAD OF CRUSHED ROCK FOR A DISTANCE OF 100 FEET INTO THE SITE FOR ALL ACCESS POINTS UTILIZED BY CONSTRUCTION EQUIPMENT AND TRUCKS. PAD WIDTH SHALL BE A MINIMUM OF 20 FEET. ALL VEHICLES LEAVING THE SITE SHALL EGRESS ACROSS THE PAD. ACCUMULATED SEDIMENT SHALL BE PERIODICALLY REMOVED, OR ADDITIONAL ROCK SHALL BE PLACED UPON THE PAD SURFACE. ROCK SHALL BE CLEAN 4-INCH TO 8-INCH QUARRY SPALLS. ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS SHALL BE REMOVED IMMEDIATELY. MECHANICAL BROOM SWEEPERS ARE NOT ALLOWED.
14. IF SEDIMENT, MUD OR DEBRIS IS TRANSPORTED ONTO A PAVED SURFACE OR ROADWAY, THE PAVED SURFACES SHALL BE THOROUGHLY CLEANED WITH HIGH EFFICIENCY STREET SWEEPERS AT THE END OF EACH WORKDAY, OR MORE OFTEN IF NECESSARY. PUBLICLY TRAVELED PAVED SURFACES NEED TO BE CLEANED IMMEDIATELY. SIGNIFICANT SOIL DEPOSITS SHALL BE REMOVED FROM ROADS BY SHOVELING AND SEEPING. STREET WASHING IS NOT ALLOWED UNLESS APPROVED BY THE DIRECTOR AND ONLY AFTER SEDIMENT IS REMOVED IN THE MANNER DESCRIBED ABOVE. MECHANICAL BROOM SWEEPERS ARE NOT ALLOWED.
15. SLURRY AND CUTTINGS SHALL BE VACUUMED DURING CUTTING AND SURFACING OPERATIONS. COLLECTED SLURRY AND CUTTINGS SHALL BE DISPOSED OF IN A MANNER THAT DOES NOT VIOLATE GROUNDWATER OR SURFACE WATER QUALITY STANDARDS.
16. A WHEEL WASH MAY BE REQUIRED IF CONSTRUCTION ENTRANCE IS NOT SUFFICIENT IN PREVENTING SEDIMENT FROM BEING TRACKED ONTO PAVEMENT. WHEEL WASH SHALL BE PER STANDARD PLAN E-1.06 AND THE STORMWATER MANUAL.
17. INSTALL SEDIMENT FENCE PER STANDARD PLAN E-2.33 PRIOR TO BUILDING CONSTRUCTION AND/OR EXCAVATION TO PREVENT SILT INTRUSION UPON ADJACENT LOTS. IF CONSTRUCTION OCCURS SIMULTANEOUSLY ON ADJACENT LOTS AND THE LOTS HAVE THE SAME OWNER DURING CONSTRUCTION, THE SILT FENCE ALONG THE COMMON LOT LINE MAY BE ELIMINATED.
18. PROPOSED PERMEABLE PAVEMENT AREAS SHALL BE SHOWN ON THE EROSION CONTROL PLAN. PERMEABLE PAVEMENT AREAS SHALL BE PROTECTED FROM SEDIMENT DURING AND AFTER INSTALLATION, UNTIL THE DEVELOPMENT CONSTRUCTION IS COMPLETED.

MAINTAINANCE OF EROSION PREVENTION AND SEDIMENT CONTROL BMPS

19. ALL EROSION PREVENTION AND SEDIMENT CONTROL BMPS SHALL BE REGULARLY INSPECTED AND MAINTAINED TO ENSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION.
20. THE CONTRACTOR/CESCL SHALL MAINTAIN AND HAVE ON-SITE A WRITTEN LOG OF EROSION PREVENTION AND SEDIMENT CONTROL BMP MAINTENANCE.
21. ALL TEMPORARY EROSION PREVENTION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER SITE STABILIZATION IS ACHIEVED OR AFTER TEMPORARY BMPS ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL AREAS RESULTING FROM REMOVAL SHALL BE PERMANENTLY STABILIZED PER THE STORMWATER MANUAL.

DUST CONTROL

22. IN AREAS SUBJECT TO SURFACE AND AIR MOVEMENT OF DUST, REFER TO THE STORMWATER MANUAL FOR DUST CONTROL BMPS.

TEMPORARY SEEDING

23. EXPOSED SURFACES THAT WILL NOT BE BROUGHT TO FINAL GRADE OR GIVEN A PERMANENT COVER TREATMENT WITHIN 30 DAYS OF THE EXPOSURE SHALL HAVE SEED MIX AND MULCH PLACED TO STABILIZE THE SOIL AND REDUCE EROSION SEDIMENTATION. SEEDED AREAS SHALL BE CHECKED REGULARLY TO ASSURE A GOOD STAND OF GRASS IS BEING MAINTAINED. AREAS THAT FAIL TO ESTABLISH VEGETATION COVER ADEQUATE TO PREVENT EROSION WILL BE RESEEDED AS SOON AS SUCH AREAS ARE IDENTIFIED.
24. AN APPROVED TEMPORARY SEEDING MIXTURE SHALL BE APPLIED TO THE PREPARED SEED BED AT A RATE OF 120LBS/ACRE. NOTE: "HYDROSEEDING" APPLICATIONS WITH APPROVED SEED-MULCH-FERTILIZER MIXTURES MAY ALSO BE USED.
25. PERMANENT STORM WATER FACILITIES SHALL BE ISOLATED AND PROTECTED FROM SEDIMENTATION WITH AN APPROVED BMP.

DATE	REVISION	SYM

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
paceengrs.com

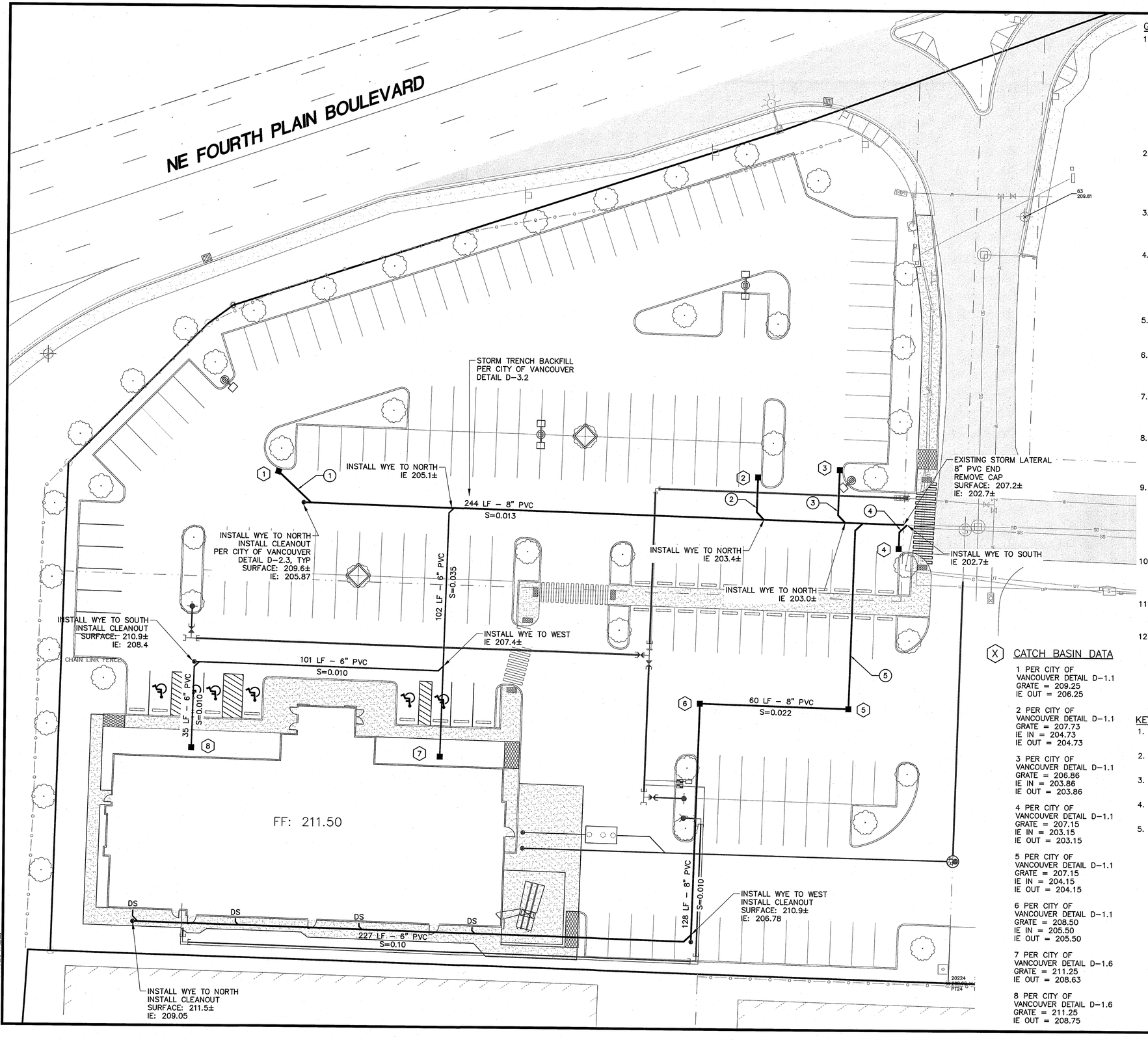
ANDREW A. KEITNER
STATE OF WASHINGTON
44904
REGISTERED
PROFESSIONAL ENGINEER

GRADING & EROSION CONTROL

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER 15843	
DWG NAME: 15843 – C4 GRADING	
SHEET C4	

FILE NAME: P:\P15\15843 – VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 – C4 GRADING.DWG
SAVE TIME: 4/15/2016 9:59:54 AM
PLOT TIME: 4/15/2016 10:16 PM
USER NAME: MARK ADAMS, LAND
XREF FILES: PACE34X22.



GENERAL NOTES:

1. ALL MATERIALS AND INSTALLATION OF STORM SEWERS SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS IN THE CITY OF VANCOUVER'S LATEST VERSION OF "GENERAL REQUIREMENTS AND STANDARD DETAILS MANUAL" AND THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION CHAPTER OF THE AMERICAN PUBLIC WORKS ASSOCIATION (APWA) AND THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, WHERE THE CITY OF VANCOUVER GENERAL REQUIREMENTS SHALL TAKE PRECEDENCE. WHEREVER THE STANDARD SPECIFICATIONS REFER TO THE OWNER AS EITHER THE "STATE" OR "SECRETARY" OR WHEN REFERENCE IS MADE TO THE DEPARTMENT OF TRANSPORTATION IT SHALL BE UNDERSTOOD THAT THE STANDARD SPECIFICATIONS SHOULD READ THE "CITY".
2. ALL PUBLIC STORM SEWER AND DRAINAGE SYSTEM CONSTRUCTION IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY OF VANCOUVER'S DEPARTMENT OF PUBLIC WORKS. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION OFFICE (360-487-7750) AT LEAST 48 HOURS PRIOR TO THE START OF ANY CONSTRUCTION. THE CITY MAY REQUIRE THAT A PRECONSTRUCTION CONFERENCE BE HELD.
3. THE CONTRACTOR IS REQUIRED TO NOTIFY ALL UTILITIES 48 HOURS PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR MAY CONTACT THE NORTHWEST UTILITY NOTIFICATION CENTER AT 1-800-424-5555 IN LIEU OF CONTACTING INDIVIDUAL UTILITIES.
4. IT SHALL BE THE RESPONSIBILITY OF THE DEVELOPER AND/OR CONTRACTOR TO PROCURE AND COMPLY WITH THE PROVISIONS OF ALL APPLICABLE PERMITS, EASEMENTS, LICENSES AND CERTIFICATES IN CONJUNCTION WITH THE CONSTRUCTION OF STORM SEWERS AND DRAINAGE SYSTEMS. COMPLIANCE SHALL BE AT ALL LEVELS; FEDERAL, STATE, AND CITY, RELATING TO THE PERFORMANCE OF THIS WORK. THE CONTRACTOR SHALL OBTAIN A STREET CUT PERMIT FOR WORK WITHIN THE PUBLIC RIGHT OF WAY.
5. THE CONTRACTOR SHALL OBTAIN AND SUBMIT AN APPROVED TRAFFIC CONTROL PLAN PRIOR TO BEGINNING CONSTRUCTION. THE PLAN SHALL BE APPROVED BY THE CITY TRANSPORTATION DIVISION (360)-487-7735.
6. ALL EROSION CONTROL BEST MANAGEMENT PRACTICES (BMPs) SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE EROSION CONTROL PLAN AND EROSION CONTROL DETAILS, PRIOR TO START OF ANY CONSTRUCTION OR LAND DISTURBING ACTIVITY.
7. THE CONTRACTOR SHALL OBTAIN ALL OFFSITE CONSTRUCTION EASEMENTS PRIOR TO THE START OF CONSTRUCTION. THE CONTRACTOR SHALL VERIFY THAT ALL OFFSITE UTILITY EASEMENTS HAVE BEEN OBTAINED BY THE OWNER PRIOR TO THE COMMENCEMENT OF ANY OFFSITE CONSTRUCTION.
8. THE CONTRACTOR IS TO VERIFY AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER. ITEMS TO VERIFY INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING:
   - -INVERT AND TOP ELEVATIONS OF EXITING STORM SEWERS
   - -CENTERLINE AND TOP OF CURB ELEVATIONS
9. WATER QUALITY DEVICES WILL BE INSTALLED AND FUNCTIONING PRIOR TO COMMENCING WITH INSTALLATION OF PAVEMENT FOR ALL AREAS DRAINING INTO THE WATER QUALITY SYSTEM. VEGETATION IN BIO-FILTRATION SWALE AND POND SYSTEMS SHALL BE ESTABLISHED AND MECHANICAL DEVISES AND FILTER MEDIA SHALL BE INSTALLED. SWALES AND FILTER STRIPS WILL BE SEEDED WITH AN APPROVED SEED MIX, PER THE WESTERN WASHINGTON MANUAL. TURF IS ALLOWED FOR VEGETATD FILTERS PROVIDED THE TURF AREA IS OVERSEEDED WITH THE EQUIVALENT GRASS SEED MIX.
10. ALL NEW CATCH BASINS SHALL BE STENCILED WITH APPROPRIATE STENCIL DEPENDING ON STORMWATER DISCHARGE FROM SITE. CONTACT (360)487-7130 TO DETERMINE THE PROPER STENCIL FOR YOUR SITE. CONTACT (360)487-7800 TO PURCHASE STENCIL KITS.
11. ROOF DOWNSPOUT RUNOFF MUST BE RETAINED ON EACH SPECIFIC SITE. DOWNSPOUTS SHALL NOT DRAIN TO THE STREET OR ANY ADJACENT OR ANY ADJACENT PROPERTIES UNLESS SPECIFIC APPROVAL HAS BEEN OBTAINED.
12. THE CONTRACTOR SHALL PROVIDE A TELEVISION REPORT, TAPE, AND TABULAR AS-BUILT OF ALL PUBLIC STORM MAINS AND LATERALS PRIOR TO PAVING. THIS TV INFORMATION SHALL BE SUBMITTED TO THE CITY INSPECTOR FOR REVIEW. TV INSPECTION SHALL DEMONSTRATE NO MANUFACTURING OR INSTALLATION DEFECTS, OR ANY DEBRIS IN THE LINES, FOR APPROVAL AND ACCEPTANCE BY THE CITY. FINAL ACCEPTANCE AND CONSTRUCTION OF STORM SEWERS ARE SUBJECT TO SECTIONS 1-05.12, AND 7-04.3 OF THE STANDARD SPECIFICATIONS.

(X) CATCH BASIN DATA

1 PER CITY OF VANCOUVER DETAIL D-1.1
GRATE = 209.25
IE OUT = 206.25

2 PER CITY OF VANCOUVER DETAIL D-1.1
GRATE = 207.73
IE IN = 204.73
IE OUT = 204.73

3 PER CITY OF VANCOUVER DETAIL D-1.1
GRATE = 206.86
IE IN = 203.86
IE OUT = 203.86

4 PER CITY OF VANCOUVER DETAIL D-1.1
GRATE = 207.15
IE IN = 203.15
IE OUT = 203.15

5 PER CITY OF VANCOUVER DETAIL D-1.1
GRATE = 207.15
IE IN = 204.15
IE OUT = 204.15

6 PER CITY OF VANCOUVER DETAIL D-1.1
GRATE = 208.50
IE IN = 205.50
IE OUT = 205.50

7 PER CITY OF VANCOUVER DETAIL D-1.6
GRATE = 211.25
IE OUT = 208.63

8 PER CITY OF VANCOUVER DETAIL D-1.6
GRATE = 211.25
IE OUT = 208.75

KEYED NOTES:

1. 18 LF 8" PVC
   S=0.023
2. 17 LF - 8" PVC
   S=0.076
3. 21 LF - 8" PVC
   S=0.040
4. 10 LF - 8" PVC
   S=0.045
5. 76 LF - 8" PVC
   S=0.016

N

HORIZ. 0 10 20 40
Scale In Feet

NO.	REVISION	DATE

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
paceengrs.com

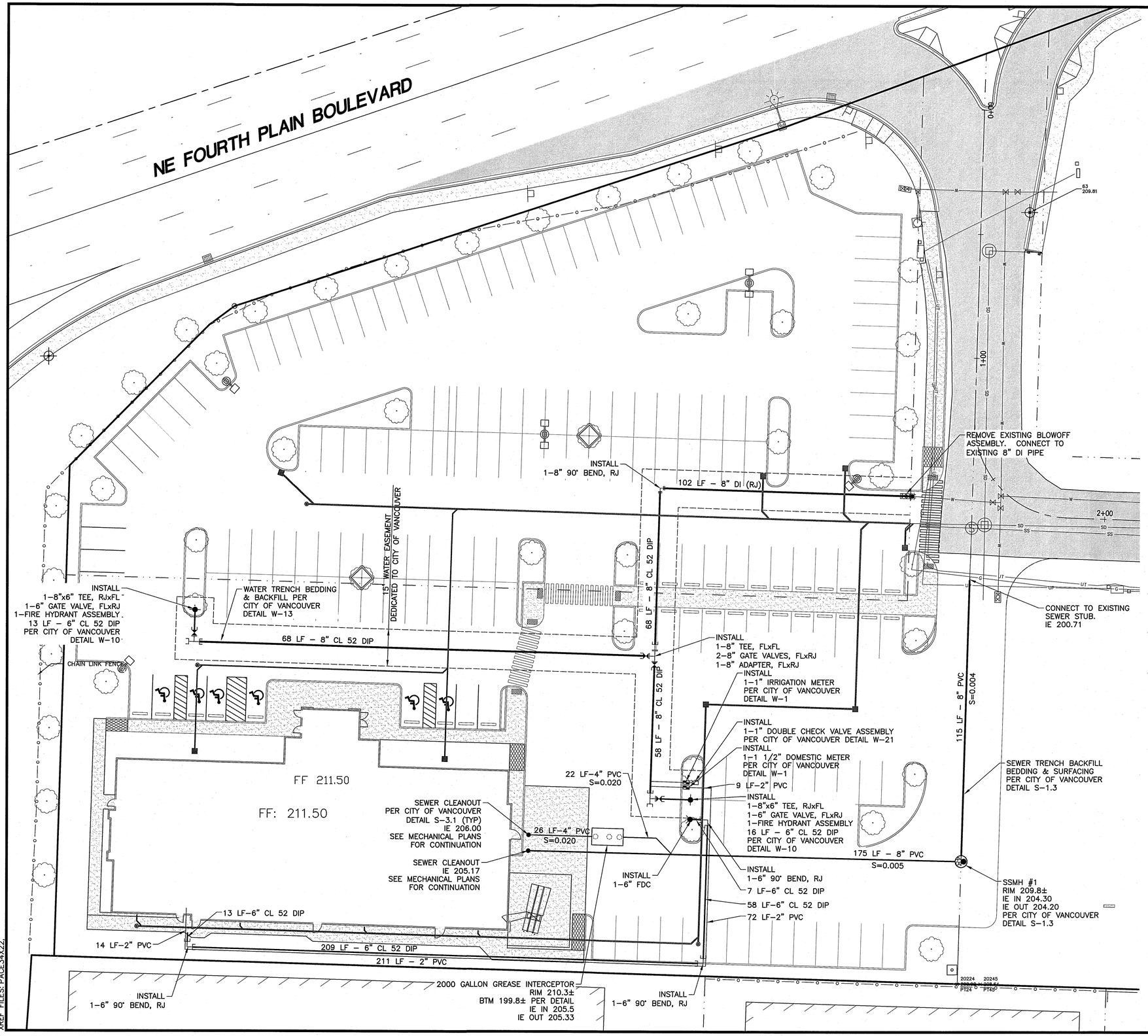
ANDREW A. REITER
STATE OF WASHINGTON
44904
REGISTERED
PROFESSIONAL ENGINEER

STORMWATER PLAN

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER 15843	
DWG NAME: 15843 - C5 STORM	
SHEET C5	

FILE NAME: P:\P15\15843 - VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 - C5 STORM.DWG
SAVE TIME: 4/15/2016 10:00:41 AM
PLOT TIME: 4/15/2016 3:17 PM
PLOTTED BY: ANDREW REITER
PLOT NAME: ARCH C AA SAND
XREF FILES: PAGE3-A22.



GENERAL NOTES:

1. ALL MATERIALS AND INSTALLATION OF PUBLIC SANITARY SEWERS SHALL BE IN CONFORMANCE WITH THE MOST CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION, HEREINAFTER REFERRED TO AS THE "STANDARD SPECIFICATIONS", PREPARED BY THE WASHINGTON STATE CHAPTER OF THE AMERICAN PUBLIC WORKS ASSOCIATION (APWA) AND THE WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, EXCEPT AS NOTED HEREIN OR ON THE STANDARD PLANS. WHEREVER THE STANDARD SPECIFICATION REFER TO THE OWNER AS EITHER THE "STATE" OR "SECRETARY" OR WHEN REFERENCE IS MADE TO THE DEPARTMENT OF TRANSPORTATION. IT SHALL BE UNDERSTOOD THAT THE STANDARD SPECIFICATIONS SHOULD READ THE "CITY".

2. ALL PUBLIC SANITARY SEWER CONSTRUCTION IS SUBJECT TO INSPECTION AND APPROVAL BY THE CITY OF VANCOUVER'S DEPARTMENT OF PUBLIC WORKS. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION OFFICE (360–487–7750) AT LEAST 48 HOURS PRIOR TO THE START OF CONSTRUCTION. THE CITY MAY REQUIRE THAT A PRECONSTRUCTION CONFERENCE BE HELD.

3. THE CONTRACTOR IS REQUIRED TO NOTIFY ALL UTILITIES 48 HOURS PRIOR TO COMMENCEMENT OF WORK. THE CONTRACTOR MAY CONTACT THE NORTHWEST UTILITY NOTIFICATION CENTER AT 1–800–424–5555 IN LIEU OF CONTACTING INDIVIDUAL UTILITIES.

4. FINAL ACCEPTANCE OF PUBLIC SANITARY SEWERS ARE SUBJECT TO SECTIONS 1–05.11, 1–05.12, 7–17.3(2)E, 7–17.3(2)F, 7–17.3(2)G AND 7–17.3(2)H OF THE STANDARD SPECIFICATIONS. TELEVISION INSPECTION SHALL INCLUDE VIDEO OF ALL MANHOLES IN ADDITION TO THE PIPE. THIS MAY BE DONE WITH EIHER A HAND HELD VIDEO CAMERA OR USE OF A PAN AND TILT VIDEO CAMERA. THE CONTRACTOR SHALL GUARANTEE ALL WORK DONE FOR A PERIOD OF TWO (2) YEARS AS PER THE CITY OF VANCOUVER GENERAL REQUIREMENTS FOR MUNICIPAL CONSTRUCTION. THE VIDEO SHALL INCLUDE VIDEO OF PIPE SEGMENTS FROM THE NEAREST DOWNSTREAM EXISTING MANHOLES TO THE MANHOLES CONSTRUCTED BY THE PROJECT.

5. LOCAL VARIATIONS IN SLOPE (I.E. "BELLIES") MUST BE NO MORE THAN 1/2 OF AN INCH IN ALL SIZES OF PIPE. VARIATIONS IN EXCESS OF THESE TOLERANCES MUST BE REPAIRED AT THE CONTRACTOR'S EXPENSE TO THE SATISFACTION OF THE CITY.

6. ALL PIPE AND FITTINGS SHALL CONFORM TO THE FOLLOWING:
   A. CONCRETE PIPE, NON–REINFORCED, SHALL CONFORM TO ASTM C 14, CLASS 2, EXCEPT AS OTHERWISE NOTED. CONCRETE PIPE, REINFORCED, SHALL CONFORM TO ASTM C 76, AND SHALL BE OF THE CLASS NOTED ON THE PLNAS OR IN THE SPECIAL PROVISIONS.
   B. POLYVINYL CHLORIDE (PVC) SEWER PIPE 15" DIAMETER OR LESS SHALL CONFORM TO ASTM D3034, SDR 35. IT SHALL HAVE A MINIMUM PIPE STIFFNESS OF 46 PSI. PVC PIPE 18" DIAMETER SHALL CONFORM TO ASTM F 679. ALL PVC PIPE SHALL HAVE AN INTREGRAL BELL GASKETED JOINT WITH ELASTOMERIC GASKET AND SHALL BE FURNISHED IN 12–1/2 FOOT LAYING LENGTHS. HIGH STRENGTH PVC PIPE SHALL CONFORM TO AWWA C900 OR C905.
   C. DUCTILE IRON (DI) PIPE SHALL CONFORM TO ANSI A21.51 OR AWWA C151, WITH PUSH–ON JOINTS, CLASS 52, UNLESS OTHERWISE NOTED. DUCTILE IRON PIPE WILL ONLY BE ALLOWED WITH EXPLICIT CITY ENGINEERING APPROVAL.

7. INSTALLATION OF PIPE AND MANHOLES SHALL CONFORM TO THE FOLLOWING:
   A. CONCRETE PIPE SHALL BE INSTALLED IN CONFORMANCE WITH STANDARD PLANS S–1.1 (CLASS C, UNLESS OTHERWISE NOTED) AND S–1.3.
   B. PVC PIPE SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND SHALL CONFORM TO STANDARD PLANS S–1.2 AND S–1.3.
   C. MANHOLES SHALL CONFORM WITH STANDARD PLANS S–2.1 THROUGH S–2.9.

8. MANHOLES, CLEANOUTS, SERVICE LATERAL CONNECTIONS, TRENCH EXCAVATION, PIPE BEDDING AND STREET RESTORATION, AND APPURTENANCES SHALL CONFORM TO THE DETAILS SHOWN ON THE STANDARD PLANS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.

9. THE CONTRACTOR SHALL COMPLY WITH THE PROVISIONS OF ALL PERMITS ISSUED, OR EASEMENTS GRANTED TO THE CITY IN CONJUNCTION WITH THE CONSTRUCTION OF SANITARY SEWERS. THE CONTRACTOR SHALL OBTAIN A STREET CUT PERMIT FOR WORK WITHIN THE PUBLIC RIGHT–OF–WAY.

10. THE CONTRACTOR SHALL SUBMIT AN APPROVE TRAFFIC CONTROL PLAN. INSIDE THE CITY THIS PLAN SHALL BE APPROVED BY THE TRANSPORTATION DIVISION (360–487–7700) AND OUTSIDE THE CITY IT SHALL BE APPROVED BY THE CLARK COUNTY TRAFFIC ENGINEER (360–397–2446). VERIFICATION OF APPROVAL SHALL BE OBTAINED PRIOR TO BEGINNING CONSTRUCTION.

SYM	REVISION	DATE

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
pacesengrs.com

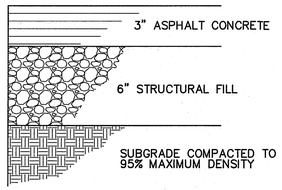
ANDREW A. REITER
STATE OF WASHINGTON
44904
REGISTERED
PROFESSIONAL ENGINEER

SEWER & WATER PLAN

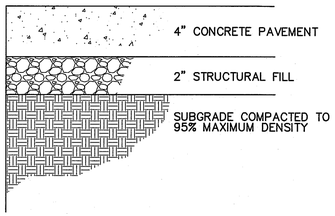
GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING (0 — 1")	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER 15843	
DWG NAME: 15843 – C6 SEWER & WATER	
SHEET C6	

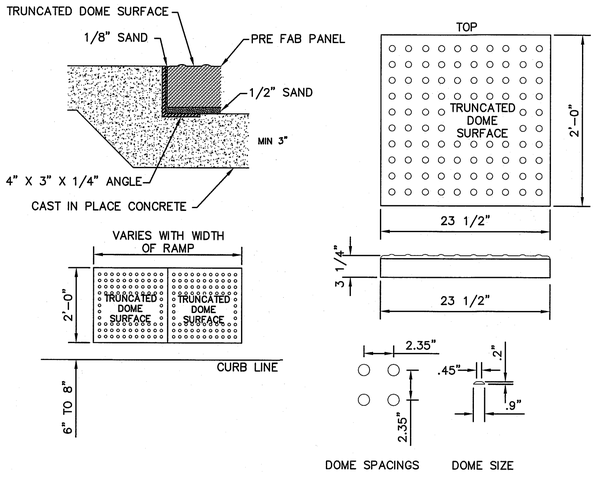
FILE NAME: P:\P15\15843 – VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 – C6 SEWER & WATER.DWG
SAVE TIME: 4/15/2016 10:02:16 AM
PLOT TIME: 4/15/2016 10:18 PM
USER NAME: ANDREW MAA
XREF FILES: PACE34X22



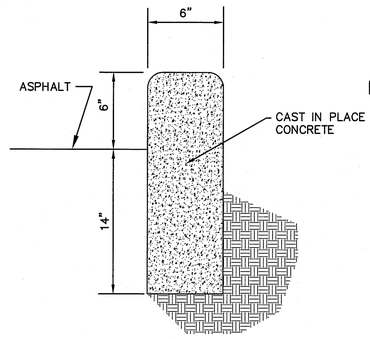
1/C7 **PAVEMENT SECTION**
NTS



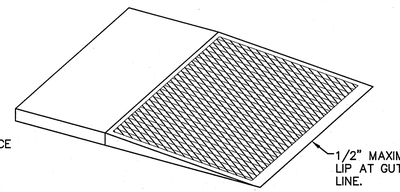
2/C7 **CONCRETE WALK**
NTS

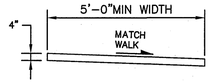


3/C7 **TRUNCATED DOMES**
NTS

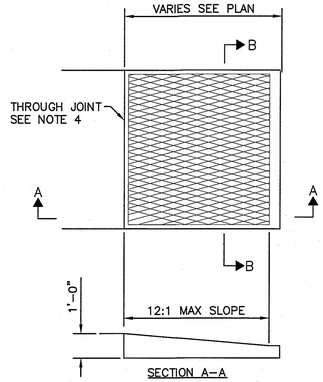


4/C7 **CONCRETE CURB**
NTS





SECTION B–B

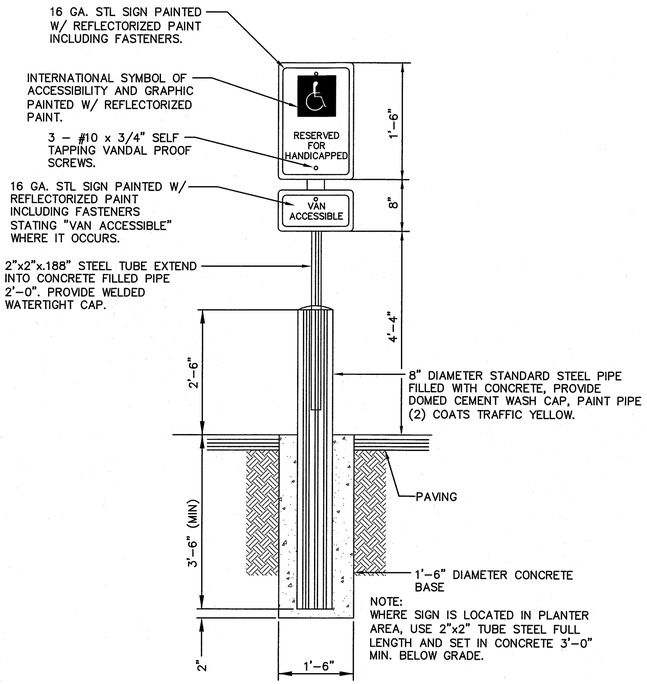


SECTION A–A

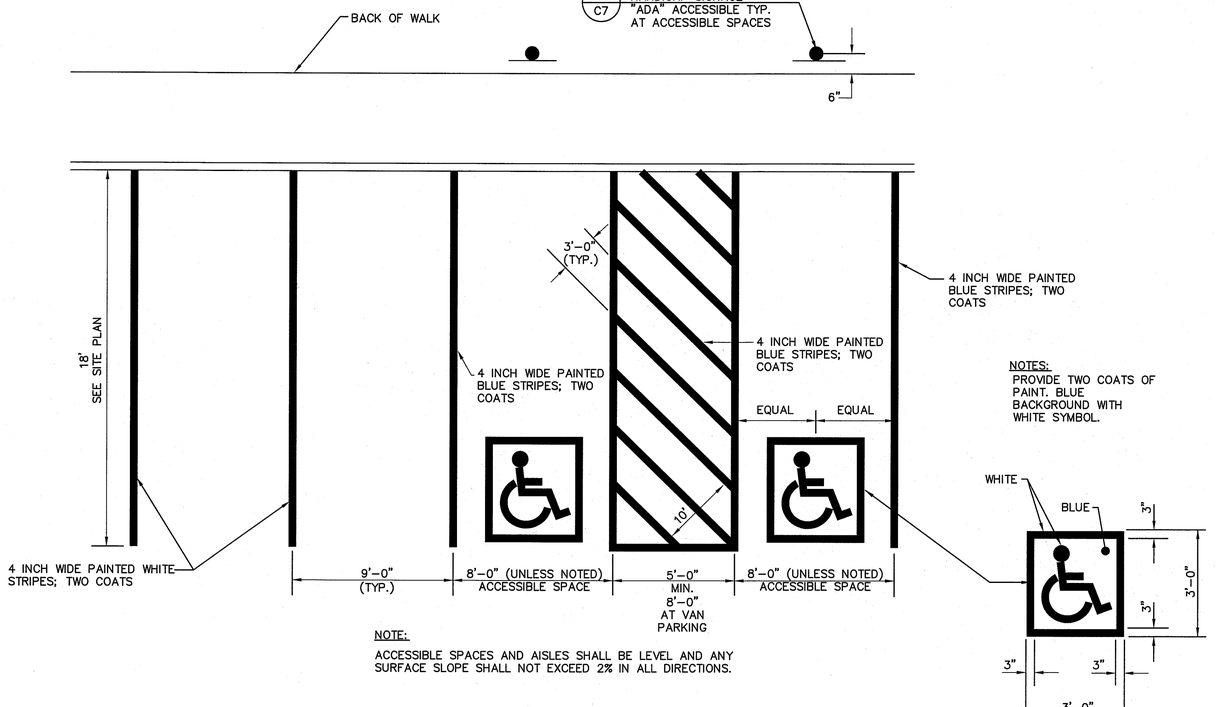
NOTES:

1. RAMP TEXTURE IS TO BE DONE WITH AN EXPANDED METAL GRATE PLACED AND REMOVED FROM WET CONCRETE TO LEAVE A DIAMOND PATTERN. THE LONG AXIS OF THE DIAMOND SHALL BE PERPENDICULAR TO CURB. GROOVES SHALL BE 1/8" DEEP AND 1/4" WIDE.
2. 1/2" MAXIMUM LIP AT GUTTER LINE
3. IF LANDING AREA IS LESS THAN 4', DECREASE SIDE RAMP SLOPE TO 12:1 (HORIZONTAL–VERTICAL)
4. CURB RAMPS WILL NOT BE POURED INTEGRAL WITH SIDEWALK AND SHALL BE ISOLATED BY EXPANSION JOINT MATERIAL ON ALL SIDES, BUT NOT AT END OF RAMP ADJACENT TO ROADWAY.
5. CEMENT CONCRETE SIDEWALK, SEE STD. DETAIL 2, SHEET C7.

7/C7 **ONSITE RAMP**
NTS



5/C7 **HANDICAP SINAGE DETAIL**
NTS



NOTE:
ACCESSIBLE SPACES AND AISLES SHALL BE LEVEL AND ANY SURFACE SLOPE SHALL NOT EXCEED 2% IN ALL DIRECTIONS.

6/C7 **TYPICAL ACCESSIBLE PARKING STALLS**
NTS

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
pacenrgs.com

ANDREW A. RHEAULT
STATE OF WASHINGTON
14804
REGISTERED
PROFESSIONAL ENGINEER

SYM	REVISION	DATE

SITE DETAILS

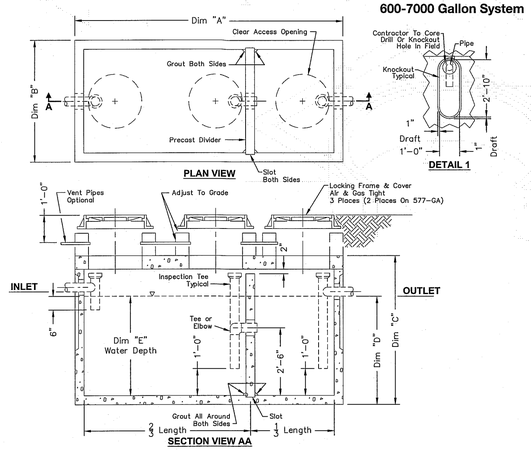
GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER 15843	
DWG NAME: 15843 – C7 SITE DETAILS	
SHEET C7	

FILE NAME: P:\P15\15843 – VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 – C7 SITE DETAILS.DWG
SAVE TIME: 4/15/2016 10:03:04 AM
PLOT TIME: 4/15/2016 3:19 PM
USER NAME: MAA, MAA
XREF FILES: PACE34X22

GREASE INTERCEPTOR SINGLE VAULT SYSTEM

600-7000 Gallon System



Gallon Capacity	600	800	1000	1500	2000	2500	3000	4000	5000	6000	7000
Model No.	577-GA	577-GA	4484-GA	5106-GA	612-GA	612-GA	712-GA	712-GA	814-GA	818-GA	818-GA
Dim "A"	7'-0"	7'-0"	9'-0"	11'-2"	12'-8"	12'-8"	13'-1"	13'-1"	15'-7"	19'-11"	19'-11"
Dim "B"	4'-8"	4'-8"	5'-0"	5'-8"	6'-8"	6'-8"	8'-0"	8'-0"	9'-7"	9'-11"	9'-11"
Dim "C"	7'-0"	7'-0"	7'-2"	7'-2"	8'-0"	8'-0"	8'-7"	8'-7"	10'-0 1/2"	10'-5"	10'-5"
Dim "D"	3'-7"	4'-8"	4'-2"	4'-3"	4'-7"	5'-6 1/2"	5'-1"	6'-8"	7'-4"	7'-1"	8'-0"
Water Depth Dim "E"	3'-3"	4'-4"	3'-10"	3'-11"	3'-9 1/2"	4'-9"	4'-8"	6'-3"	6'-1"	5'-8"	6'-7"

Design Criteria:

Number Of Meals Per Peak Hours x Waste Flow Rate x Retention Time x Storage Factor = Capacity In Gallons

Uniform Plumbing Code – Appendix H

Notes:

1. Concrete: 28 Day Compressive Strength f'c = 7000 psi
2. Rebar: ASTM A-615 Grade 60
3. Mesh: ASTM A-185 Grade 65
4. Design: ACI-318-02 Building Code
   ASTM C-857 "Minimum Structural Design Loading For Underground Precast Concrete Utility Structures"
5. Loads: H-20 Truck Wheel w/ 30% Impact Per AASHTO
6. Fill w/ Clean Water Prior To Start-Up Of System
7. Contractor To Supply & Install All Piping & Sampling Tees
8. Gray Water Only, Black Water Shall Be Carried By Separate Side Sewer

SCALE: 3/8 = 1'-0"

Items Shown Are Subject To Change Without Notice
Issue Date: August 2012

©1992-2012 Oldcastle Precast, Inc.

1/C8 **GREASE INTERCEPTOR**
NTS

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
pacengrs.com

ANDREW A. REITER
STATE OF WASHINGTON
44904
REGISTERED
PROFESSIONAL ENGINEER

SYM	REVISION	DATE

SEWER DETAILS

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" | PLOT DATE: 4/15/16
DESIGNED BY: MAA | CHECKED BY: BDL
JOB NUMBER 15843
DWG NAME: 15843 – C8 SEWER DETAILS
SHEET C8

FILE NAME: P:\P15\15843 – VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 – C8 SEWER DETAILS.DWG
SAVE TIME: 4/15/2016 10:03:52 AM
PLOT TIME: 4/15/2016 3:20 PM
USER NAME: MARK AND
XREF FILES: PAGES.DWG

NE FOURTH PLAIN BOULEVARD

LOT 4

LOT 3

WB-62
AASHTO 2004 (US)

WB-67
AASHTO 2004 (US)

63
209.81

61
215.10

20224
PT24

20245
PT45

N

HORIZ. 0 10 20 40
Scale In Feet

FILE NAME: P:\P15\15843 - VANCOUVER GOLDEN CORRAL\CAD\ENGINEERING\SHEETS\15843 - C9 AUTO TURN.DWG
SAVE TIME: 4/15/2016 10:04:57 AM
PLOT TIME: 4/15/2016 3:22 PM
USER NAME: MARK ASLAND
XREF FILES: PAGES.MZD

SYM	REVISION	DATE

PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
pacesengrs.com

ANDREW A. REITER
STATE OF WASHINGTON
44904
REGISTERED
PROFESSIONAL ENGINEER

AUTO TURN EXHIBIT

GOLDEN CORRAL RESTAURANT

INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

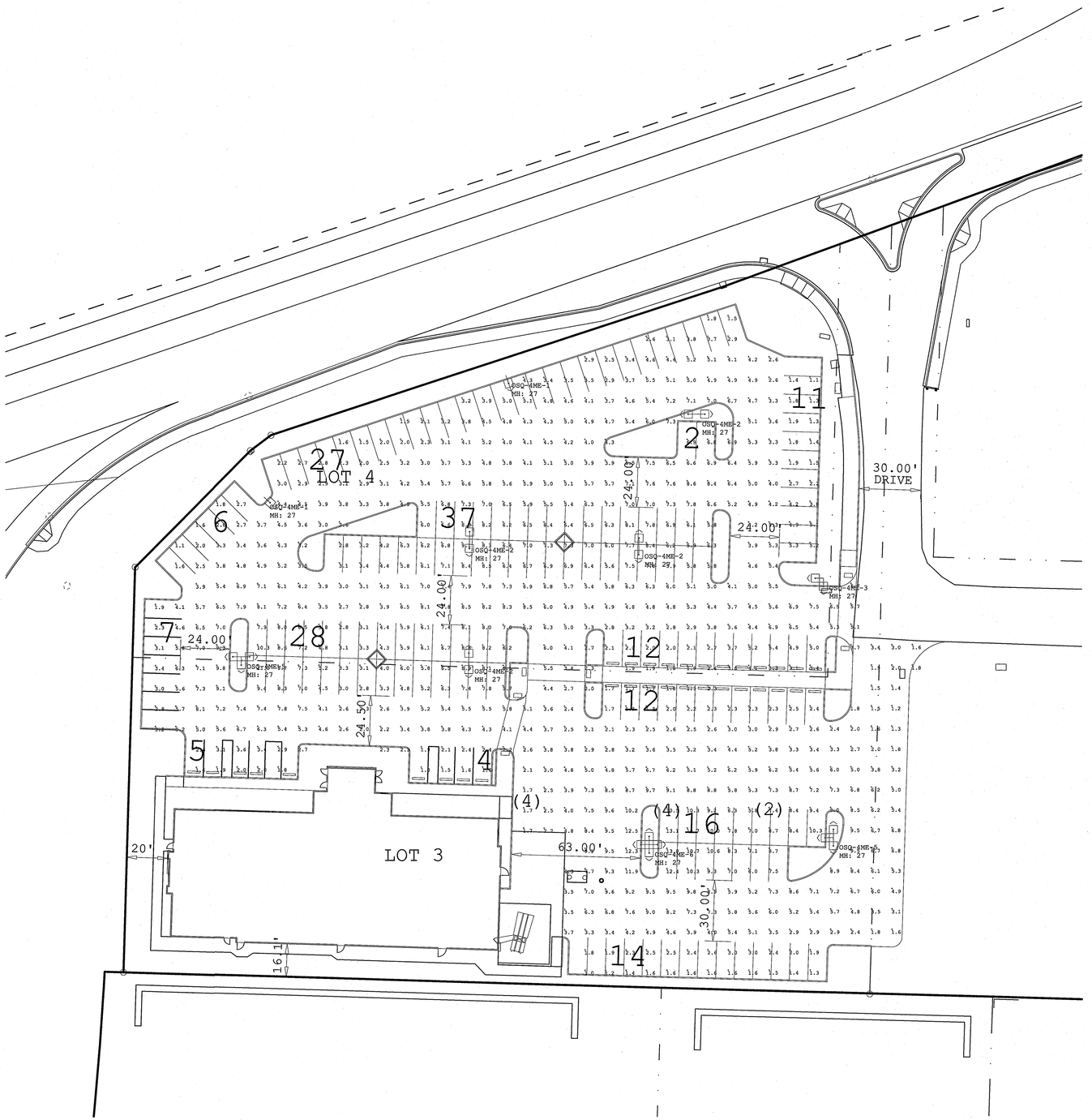
BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"	PLOT DATE: 4/15/16
DESIGNED BY: MAA	CHECKED BY: BDL
JOB NUMBER **15843**	
DWG NAME: 15843 - C9 AUTO TURN	
SHEET C9	

Luminaire Schedule							
Symbol	Qty	Label	Arrangement	Lumens/Lamp	LLF	Total Watts	Description
	2	OSQ-4ME-1	SINGLE	22705	0.930	446	OSQ-A-NM-4ME-S-57K-UL-BZ
	4	OSQ-4ME-2	BACK-BACK	22705	0.930	1784	OSQ-A-NM-4ME-S-57K-UL-BZ
	1	OSQ-4ME-3	2 @ 90 DEGREES	22705	0.930	446	OSQ-A-NM-4ME-S-57K-UL-BZ
	2	OSQ-4ME-5	3 @ 90 DEGREES	22705	0.930	1338	OSQ-A-NM-4ME-S-57K-UL-BZ
	1	OSQ-4ME-6	4 @ 90 DEGREES	22705	0.930	892	OSQ-A-NM-4ME-S-57K-UL-BZ

Footcandles calculated using predicted lumen values after 50K hours of operation					
Label	Avg	Max	Min	Avg/Min	Max/Min
PAVEMENT	4.94	13.8	1.0	4.94	13.80

Pole Schedule
(2) CL-SSP-5011-25-D1-BZ (25' X " STEEL SQUARE POLE)
(4) CL-SSP-5011-25-D2-BZ (25' X " STEEL SQUARE POLE)
(1) CL-SSP-5011-25-D3-BZ (25' X " STEEL SQUARE POLE)
(2) CL-SSP-5011-25-D5-BZ (25' X " STEEL SQUARE POLE)
(1) CL-SSP-5011-25-D6-BZ (25' X " STEEL SQUARE POLE)
Proposed poles meet 120 MPH sustained winds.

ADDITIONAL EQUIPMENT
(22) OSQ-DABZ (DIRECT ARM BRACKET)



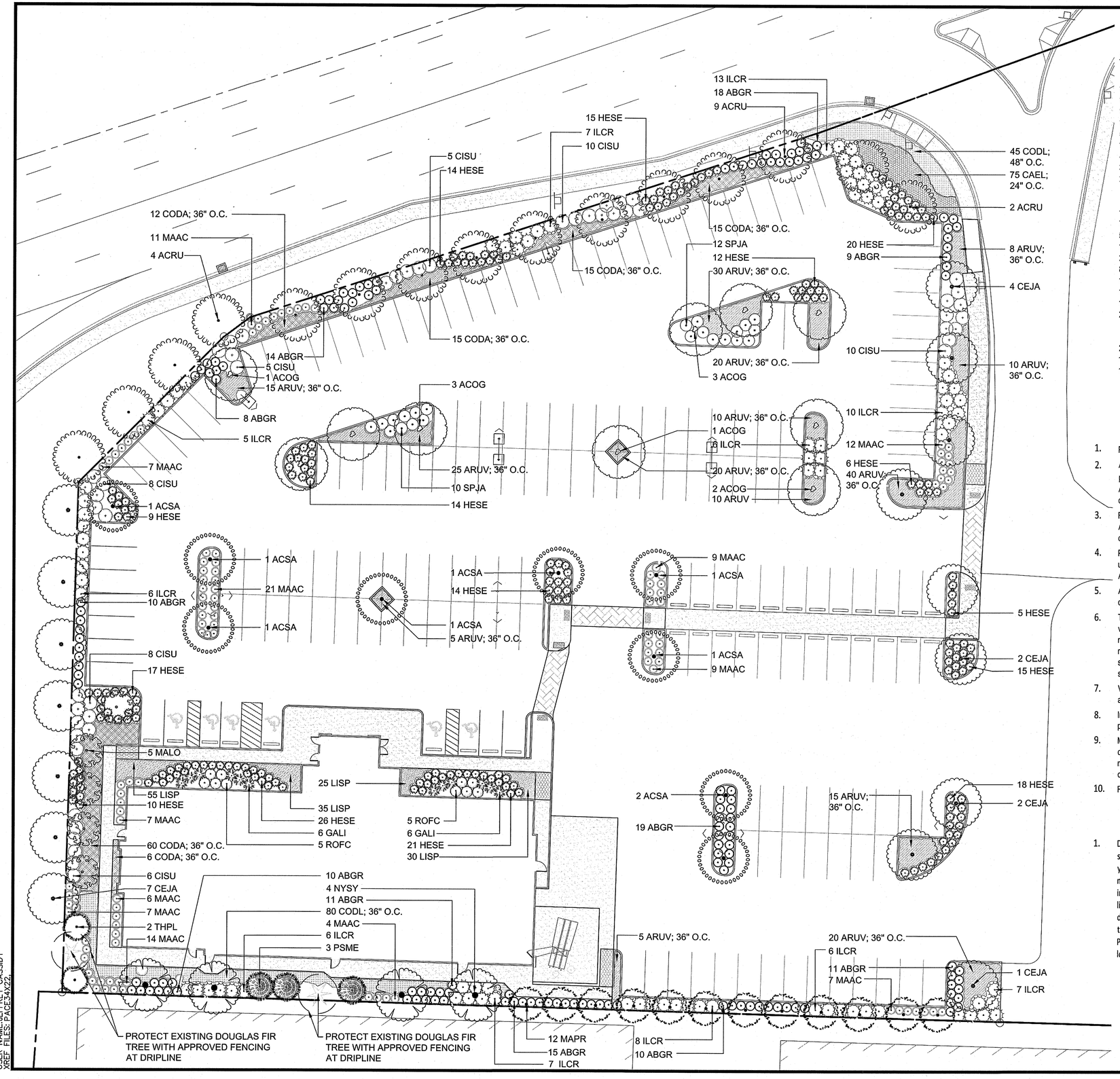
0 60 120

CREE™

1200 92nd Street - Sturtevant, WI 53177
www.cree.com - (800) 236-6800

Project Name: GOLDEN CORRAL - VANCOUVER, WA		SR-13461
Date:3/29/2016	Scale: 1"=30'	Footcandles calculated at grade
Filename: V:\Common\AppEng\NAT\GC-160329\VCWACJB.AGI		Layout by: CHRIS BOSANEC

Illumination results shown on this lighting design are based on project parameters provided to Cree, Inc. used in conjunction with luminaire test procedures conducted under laboratory conditions. Actual project conditions differing from these design parameters may affect field results. The customer is responsible for verifying dimensional accuracy along with compliance with any applicable electrical, lighting, or energy code.



PLANT LIST:

Qty	Symbol	Botanical Name	Common Name	Size	Spacing
	TREES				
15	ACRU	Acer rubrum 'Frank Jr'	Redpoint Maple	2" cal	
10	ACOG	Acer rubrum 'October Glory'	October Glory Red Maple	2" cal	
9	ACSA	Acer saccharum	Green Mountain Maple	2" cal	
16	CEJA	Cercidiphyllum japonicum	Katsura Tree	2" cal	
5	MALO	Magnolia loebneri 'Dr. Merrill'	Dr. Merrill Magnolia	2" cal	
12	MAPR	Malus spp. 'Prairiefire'	Prairiefire Crabapple	2" cal	
4	NYSY	Nyssa sylvatica 'Red Rage'	Red Rage Tupelo	2" cal	
3	PSME	Pseudotsuga menziesii	Douglas Fir	6' B&B	
2	THPL	Thuja plicata	Western Red Cedar	6' B&B	
	SHRUBS & GRASSES				
135	ABGR	Abelia grandiflora 'Edward Goucher'	Edward Gourcher Abelia	2 gal	36" O.C.
75	CAEL	Carex elata 'Bowles Golden'	Bowles Golden Sedge	1 gal	18-24" O.C.
52	CISU	Cistus sp	Sunset Rockrose	2 gal	48" O.C.
12	GALI	Gaura lindheimeri	Whirling Butterflies	1 gal	36" O.C.
217	HESE	Helictotrichon sempervirens	Blue Oat Grass	1 gal	36" O.C.
81	ILCR	Ilex crenata 'Green Island'	Green Island Japanese Holly	2 gal	48" O.C.
146	LISP	Liriope spicata	Creeping Lilyturf	1 gal	18" O.C.
114	MAAC	Mahonia aquifolium 'Compacta'	Compact Oregongrape	2 gal	36" O.C.
10	ROFC	Rosa sp	Red Flowering Carpet Rose	3 gal	48" O.C.
22	SPJA	Spiraea japonica	Goldmound Spirea	1 gal	48" O.C.
	GROUNDCOVER				
218	ARUV	Arctostaphylos uva-ursi 'Woods'	Woods Kinnikinnick	1 gal	36" O.C.
123	CODA	Cotoneaster dammeri 'Coral Beauty'	Coral Beauty Bearberry Cotoneater	1 gal	36" O.C.
125	CODL	Cotoneaster dammeri 'Lowfast'	Lowfast Bearberry Cotoneater	1 gal	36-48" O.C.

PLANTING NOTES:

1. Plant material to be installed and maintained by a qualified and experienced landscape installer.
2. All materials are subject to the approval of the Landscape Architect and Owner at any time. Landscape Architect to inspect all plant locations and plant bed conditions prior to installation. Stake all plant locations for review and approval by the Landscape Architect before planting. On-site adjustments may be required. Plants are to be freshly dug. Transporting of plants shall be done in a manner as to not destroy the natural shape, compromise the health, or alter the characteristics of plant materials.
3. Rootballs shall meet or exceed size standards as set forth in 'American Standards for Nursery Stock'. MAIN LEADERS OF ALL TREES SHALL REMAIN INTACT. Remove from the site any plant material that turns brown or defoliates within five (5) days after planting. Replace immediately with approved, specified material.
4. Plant counts indicated on drawings are for Landscape Architect's use only. Contractor shall make own plant quantity takeoffs using drawings, specifications, and plant schedule requirements (i.e., spacing), unless otherwise directed by Landscape Architect. Contractor to verify bed measurements and install appropriate quantities as governed by plant spacing per schedule.
5. All plant beds shall receive 3" minimum of shredded cedar mulch (unless otherwise noted). Apply pre-emergent herbicide as directed by the manufacturer prior to installing mulch.
6. The Contractor shall install and/or amend topsoil in all proposed bed areas to meet ASTM D5268 standards. Contractor shall verify depth and quality of topsoil prior to plant installation. A minimum 12" for plant beds. Topsoil sources shall include the reuse of surface soil stockpiled on site, clean of roots, plants, sod, stones, clay lumps, and other extraneous or foreign materials larger than 1". Amended topsoil to be 50% loamy topsoil, 25% peat moss, and 25% existing topsoil. Do not obtain supplemental topsoil from agricultural land, bogs, or marshes. Inorganic amendments, organic amendments, and fertilizers shall be used to amend topsoil as needed for long-term plant health.
7. Verify all utility locations in the field prior to beginning work. Repair all damaged utilities to satisfaction of the Owner/Engineer at no additional cost.
8. Install all plant material in accordance with all local codes and ordinances. Coordinate with the Engineer to obtain any required permits necessary to complete work.
9. Maintain all plant material for a three (3) month period from date of Substantial Completion. Maintenance shall include pruning, cultivating, watering, weeding, fertilizing, restoring plant saucers, spraying for disease and insects. All workmanship and materials shall be guaranteed by the Contractor for a period of one (1) calendar year after Final Acceptance (warranty shall cover 100% replacement cost).
10. Required landscape area of 15% is met. **Landscape area on proposed plans is 15,950 sf.**

IRRIGATION NOTES:

1. Design / Build Irrigation Note: Landscape Contractor shall provide a 100% head to head coverage automatic irrigation system as a design/build deliverable. All workmanship and materials hereunder shall be under warranty in writing for one year, from the date of final acceptance, against defective workmanship and materials. Contractor shall be responsible for maintaining system and protecting it from all damage (at no cost to Owner) until date of final acceptance. This shall include damage caused by vandalism or adverse weather conditions. Irrigation system shall be designed and installed by a licensed and bonded landscape or irrigation contracting firm that specializes and has at least five years experience in the design and installation of irrigation systems for commercial and public works projects. Submit to Project Representative two copies of Irrigation Design Plans drafted in AutoCAD format. Plans to show head layout (head to head coverage), Piping diagram (with sizes), Zone schedule (with GPM per zone), Design PSI, Controller (type, size and location), sleeve locations and size, backflow protection, deduct meter, and point of connection details.

N

HORIZ. 0 10 20 40
Scale In Feet

DATE
REVISION
SYM

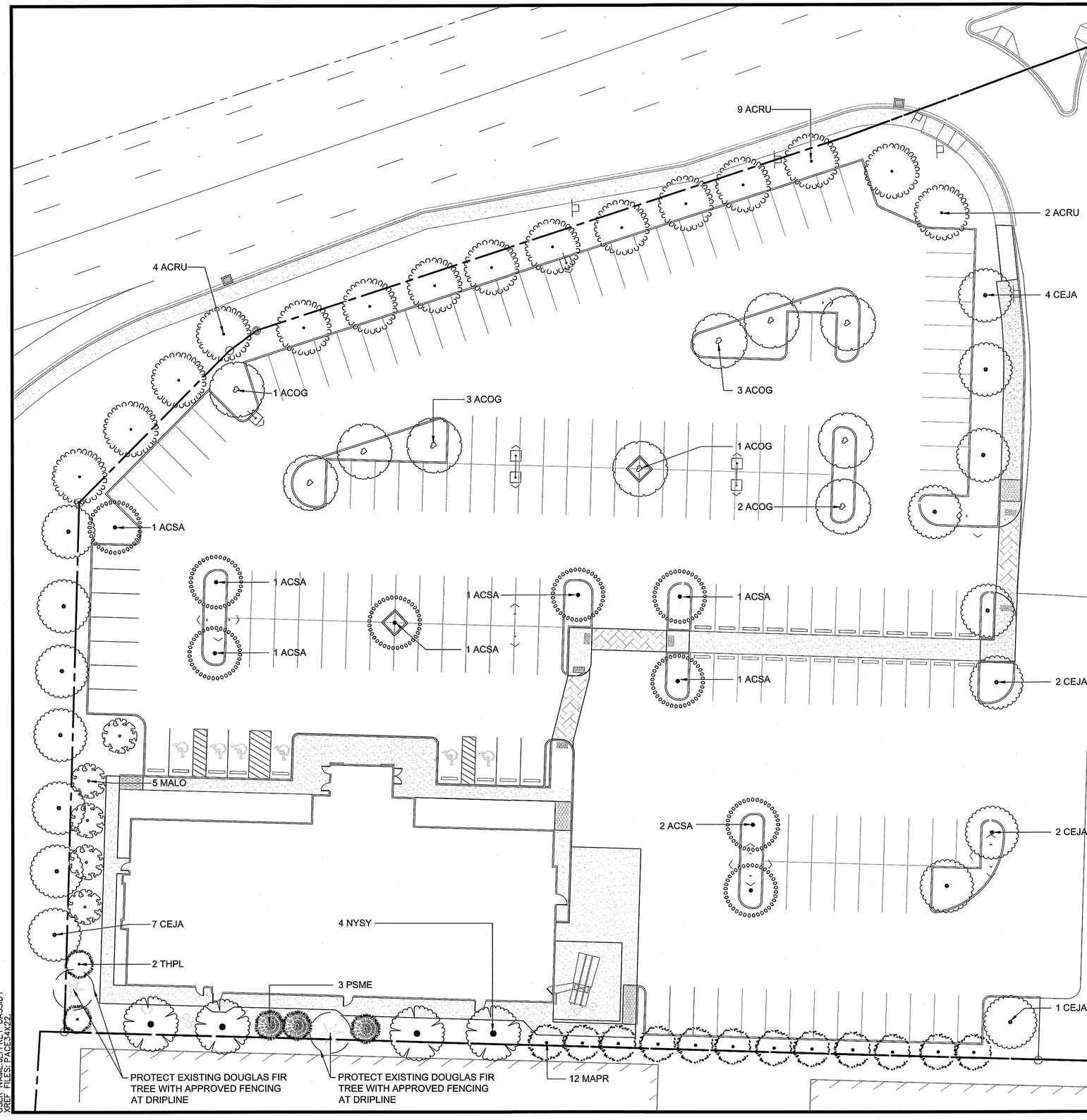
PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
paceengrs.com

LANDSCAPE PLAN

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING 0 1"	PLOT DATE: 4/14/16
DESIGNED BY: JS	CHECKED BY: BP
JOB NUMBER 15843	
DWG NAME: 15843 – LANDSCAPE	
SHEET L1	8

FILE NAME: C:\USERS\JEFFREY\DESKTOP\!!!!!!!!!!!!\CLIENT POWERS LA\CAD\15843 – LANDSCAPE.DWG
SAVE TIME: 4/14/2016 10:21:04 AM
PLOT TIME: 4/14/2016 10:21 AM
USER NAME: JEFFREY CASSIDY
XREF FILES: PACE34x22



TREE LIST:

Qty	Symbol	Botanical Name	Common Name	Size
15	ACRU	Acer rubrum 'Frank Jr'	Redpoint Maple	2" cal
10	ACOG	Acer rubrum 'October Glory'	October Glory Red Maple	2" cal
9	ACSA	Acer saccharum	Green Mountain Maple	2" cal
16	CEJA	Cercidiphyllum japonicum	Katsura Tree	2" cal
5	MALO	Magnolia loebneri 'Dr. Merrill'	Dr. Merrill Magnolia	2" cal
12	MAPR	Malus spp. 'Prairiefire'	Prairiefire Crabapple	2" cal
4	NYSY	Nyssa sylvatica 'Red Rage'	Red Rage Tupelo	2" cal
3	PSME	Pseudotsuga menziesii	Douglas Fir	6' B&B
2	THPL	Thuja plicata	Western Red Cedar	6' B&B

NOTES - LEVEL 5 TREE PLAN:

The site is a former construction landfill closed in the 1970's and capped in the 1990's. The site is a level grass covered parcel with a few popular volunteers and blackberry clumps. The native soil is Sifton gravelly loam, 0 to 3 percent slopes (SvA). In a typical profile the surface layer is gravelly loam about 16 inches thick. It is black in the upper part and very dark brown in the lower part. The layer below is very friable, dark-brown very gravelly loamy coarse sand about 8 inches thick. The underlying material, to a depth of 60 inches, is very dark grayish-brown very gravelly coarse sand. However, since this was a construction landfill the majority of the soil on site has been disturbed and capped with imported topsoil ranging from 1 to 8 feet on the landfill cap.

On the south property line there are five (5) larger caliper poplar trees ranging from 10" to 16" dbh and two (2) Douglas fir trees, 20" and 24" dbh.

Based on normal growth characteristics the poplars on the site are 15 to 30 years old. Poplar trees have short life spans and a propensity for disease and wind throw. Because of this and their close proximity to buildings the popular trees are to be removed and replaced with plantings per L2 buffer requirements.

The Douglas fir trees on the property line will be protected with temporary fencing and monitored during construction.

As a part of the L2 buffer on the south property line three Douglas fir and two Western Red Cedar trees will be planted along with four Red Rage Tupelos and 12 Prairiefire Crabapples.

No off site trees will be impacted by the development.

All planting areas for the proposed trees will be excavated per standard details and backfilled with amended planting mix. Irrigation will be provided for all proposed planting areas

Tree density of the existing Douglas fir trees totals 12 tree units. There are 71 (2" caliper trees) and 5 (6' high) evergreen trees proposed for the site. At one tree unit per 2" caliper tree and one tree unit for each 6 foot high evergreen, there will be an additional 76 tree units. Total proposed and existing tree density for the site will be 88 tree units.

N

HORIZ. 0 10 20 40
Scale In Feet

DATE | REVISION | SYM

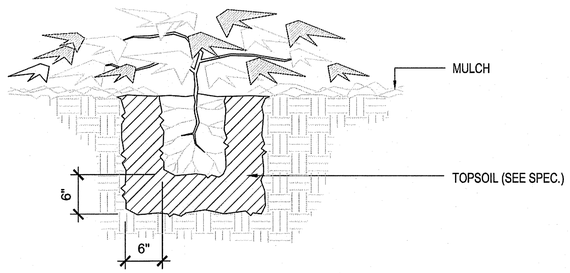
PACE
An Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
paceengrs.com

LEVEL 5 TREE PLAN

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

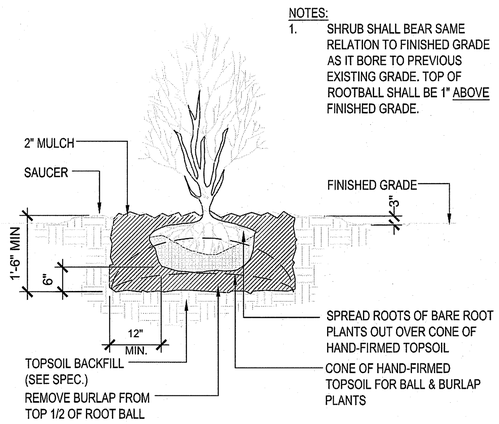
BAR IS ONE INCH ON ORIGINAL DRAWING 0 1" | PLOT DATE: 4/14/16
DESIGNED BY: JS | CHECKED BY: BP
JOB NUMBER 15843
DWG NAME: 15843 – LANDSCAPE
SHEET L2 8

FILE NAME: C:\USERS\JEFFREY\DESKTOP\!!!!!!!!!!!\CLIENT POWERS LA\CAD\15843 - LANDSCAPE.DWG
SAVE TIME: 4/14/2016 10:21:04 AM
PLOT TIME: 4/14/2016 10:21:22 AM
USER NAME: JEFFREY.OSBY
XREF FILES: PACE34X22,



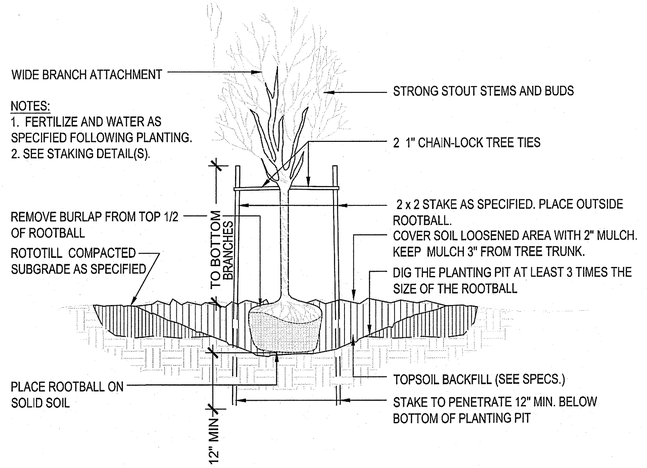
1 GROUND COVER PLANTING

SCALE: NTS



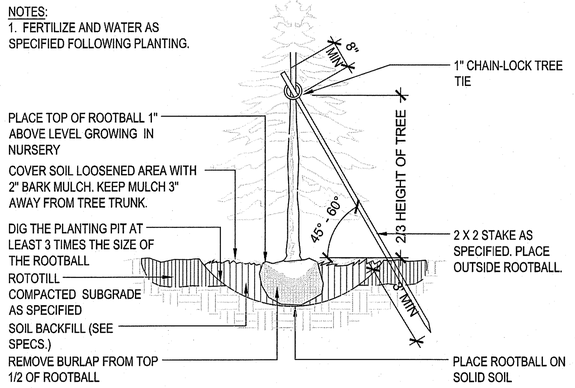
2 SHRUB PLANTING

SCALE: NTS



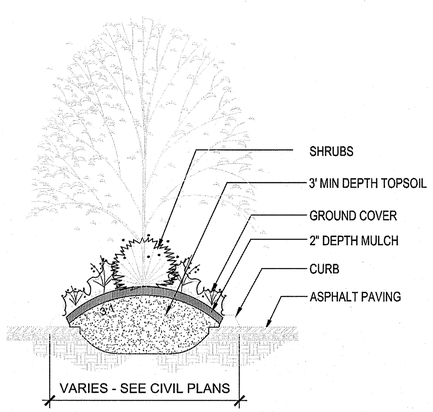
3 DECIDUOUS TREE PLANTING W/ STAKING

SCALE: NTS



4 EVERGREEN TREE PLANTING W/ TREE STAKING

SCALE: NTS



5 PARKING LOT ISLAND SECTION

SCALE: NTS

SYM	REVISION	DATE

PACE
Art Engineering Services Company
5000 Meadows, Suite 345
Lake Oswego, OR 97035
p. 503.597.3222 | f. 503.597.7655
Civil | Structural | Planning | Survey
pacengrs.com

PLANTING DETAILS

GOLDEN CORRAL RESTAURANT
INTERSECTION OF SR 500
AND NE FOURTH PLAIN BLVD
VANCOUVER, WASHINGTON

BAR IS ONE INCH ON ORIGINAL DRAWING
0 1"

PLOT DATE: 4/14/16

DESIGNED BY: JS

CHECKED BY: BP

JOB NUMBER 15843

DWG NAME: 15843 – LANDSCAPE

SHEET L3

FILE NAME: C:\USERS\JEFFREY\DESKTOP\!!!!!!!!!!\CLIENT POWERS LA\CAD\15843 – LANDSCAPE.DWG
SAVE TIME: 4/14/2016 10:23:59 AM
PLOT TIME: 4/14/2016 10:24 AM
USER NAME: JEFFREY CASSIDY
XREF FILES: PACE34X22.

APPENDIX B

GDI Project:	Orchard-1-01	Prepared By:	AJB
Project Name:	Former Turnbull Landfill	Date:	11/11/16
Location:	SR 500 & NE 4th Plain Intersection	Report #:	1
Arrival:	0745	Departure:	1200
Weather:	Mostly cloudy (50s)	Permit #:	
Site Visit Requested By:		Met With (on site):	Collin Watson (driller), James (helper)
Purpose:	Soil-gas probes installation		
Outstanding Issues:			

0800 Met with Collin (driller) and James (helper) with Pacific Soil & Water (PS&W) to go over site-safety tailgate procedure (STP).

0815 Collin and James unload the track-mounted AMS 9500-VTR direct-push PowerProbe and positioned the drill rig at boring location SG-8. Boring locations are shown on the attached site plan.

0845 Installed soil-gas sampling point SG-8. The sampler was driven to a depth of 60 inches. Sample recovery was 48 inches; the top 36 inches represented the soil cap material, and the bottom 12 inches represented the solid waste material. The cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-7.

0900 PS&W attempted to install soil-gas sampling point SG-7 but encountered refusal at approximately 4 feet below ground surface (BGS). The sample point location was moved approximately 5 feet to the southwest where the soil gas sampling point was successfully installed. The sampler was driven to a depth of 60 inches. Sample recovery was 48 inches; the top 18 inches represented the cap material, and the bottom 30 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-6.

0915 Installed soil-gas sampling point SG-6. The sampler was driven to a depth of 60 inches. Sample recovery was 32 inches; the top 12 inches represented the cap material, and the bottom 20 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-9.

0930 Installed soil-gas sampling point SG-9. The sampler was driven to a depth of 60 inches. Sample recovery was 48 inches; the top 24 inches represented the cap material, and the bottom 24 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material consisted of dark gray soil with fragments of wood and plastic. PS&W moved to boring location SG-1.

0940 Installed soil-gas sampling point SG-1. The sampler was driven to a depth of 60 inches. Sample recovery was 33 inches; the top 18 inches represented the cap material, and the bottom 15 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM);

moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-2.

0950 Installed soil-gas sampling point SG-2. The sampler was driven to a depth of 60 inches. Sample recovery was 46 inches; the top 12 inches represented the cap material, and the bottom 34 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-3.

1030 Installed soil-gas sampling point SG-3. The sampler was driven to a depth of 60 inches. Sample recovery was 33 inches; the top 18 inches represented the cap material, and the bottom 15 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-5.

1100 Installed soil-gas sampling point SG-5. The sampler was driven to a depth of 60 inches. Sample recovery was 39 inches; the top 22 inches represented the cap material, and the bottom 17 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-4.

1110 Installed soil-gas sampling point SG-4. The sampler was driven to a depth of 60 inches. Sample recovery was 25 inches; 25 inches represented the cap material. Solid waste was not observed in this boring. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. PS&W moved to boring location SG-10.

1125 Installed soil-gas sampling point SG-10. The sampler was driven to a depth of 60 inches. Sample recovery was 40 inches; the top 26 inches represented the cap material, and the bottom 14 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock. PS&W moved to boring location SG-11.

1135 Installed soil-gas sampling point SG-11. The sampler was driven to a depth of 60 inches. Sample recovery was 38 inches; the top 29 inches represented the cap material, and the bottom 9 inches represented the solid waste material. Based on visual observations, the cap material consisted of brown sand with silt and gravel (SM); moist, sand is coarse-grained. The solid waste material generally consisted of dark gray to gray and black soil with rock.

1145 Collin and James loaded up the PowerProbe, and I reviewed and signed the PS&W daily report (see attached report).

The soil-gas sampling points were installed to a depth of 5 feet, BGS with a screened interval of 4- to 5-feet, BGS. A sand pack was placed from 3.5- to 5-feet, BGS. Bentonite was poured downhole over the sand pack from approximately 3.5 feet, BGS to the ground surface. The bentonite was hydrated with water for the required seal. Each soil-gas sampling point was fitted with a valve and a barbed fitting and allowed to stabilize with the valve closed for a minimum of 24 hours.

1200 AJB off site.

Distribution:

Attachments: PS&W Daily Report

Reviewed by: MLC

This report presents opinions formed as a result of our observation of activities relating to geotechnical engineering or environmental services. We rely on the contractor to comply with the plans and specifications throughout the duration of the project irrespective of the presence of our representative. Our work does not include supervision or direction of the contractor, the contractor's employees or agents. Our firm is not responsible for site safety. This field report is a **DRAFT** representation of our field observations, testing, and preliminary recommendations. The report can only be considered final upon review of the GeoDesign project manager, as indicated by initials in the "Reviewed By" section.

Signature: MLC FOR ANDREW BISBEE

Pacific Soil & Water – Daily Report

9790 SW Pembrook St. Tigard, OR 97224 (503)995-4463 Fax (503)486-5589

Date: 11/11/2016 Friday	**Client:** GeoDesign
Project #: Orchard-1-01	**Project Mgr:** Mike Coenen
Site Address: SR 500 + Fourth Plain Vancouver	**On Site:** 8:00
	Off Site: 12:00

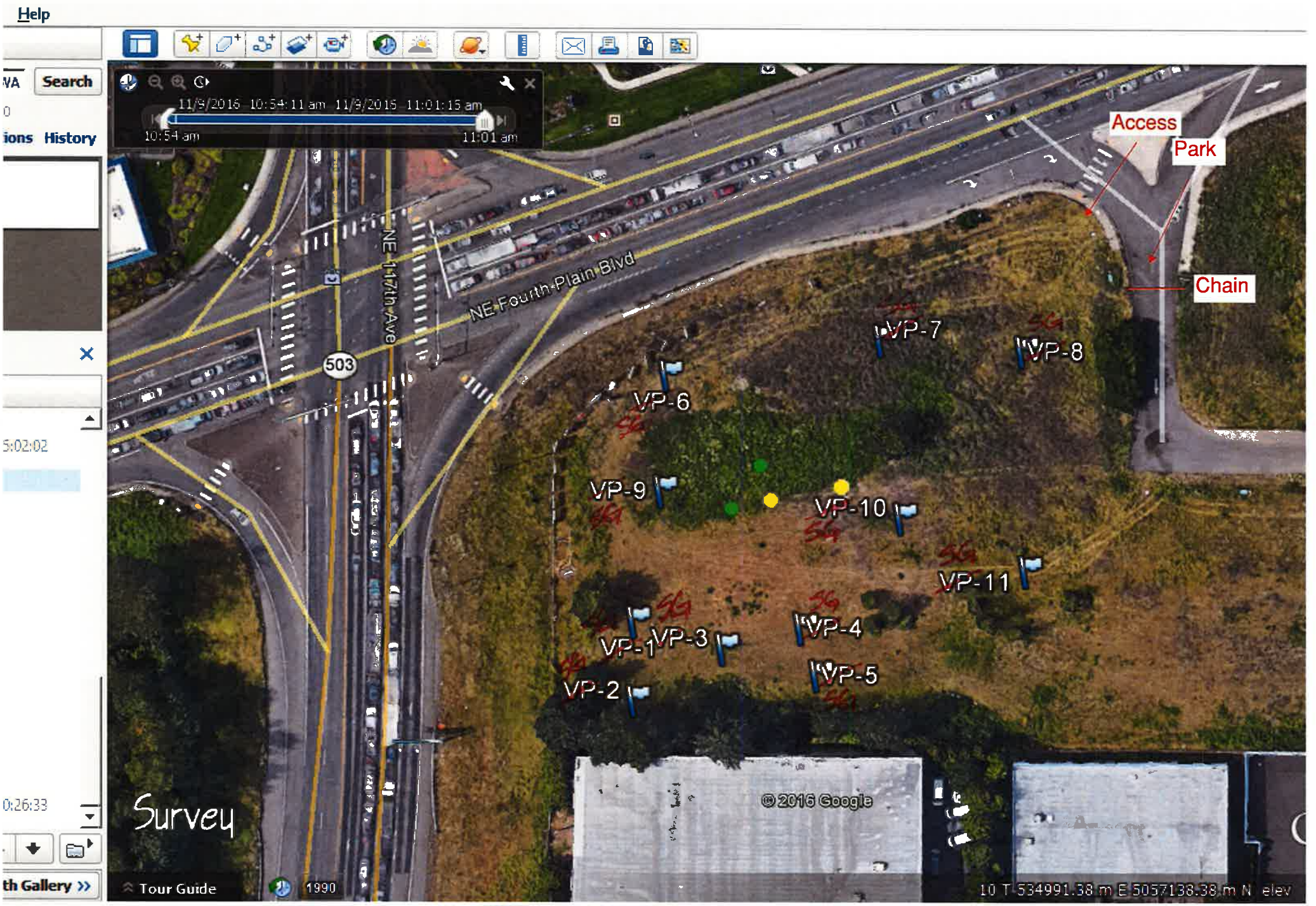
Boring/ Well ID	Total Depth	Description of Work
SG VP-8	5'	MC 0-5', install 3/4" sch 40 pvc well screen 4-5' sand to 3.5' granular to surface
SG VP-7	5'	
SG VP-6	5'	
SG VP-9	5	
SG VP-1	5'	
SG VP-2	5'	
SG VP-3	5'	
SG VP-5	5'	
SG VP-4	5'	
SG VP-10	5'	
SG VP-11	5'	

Well Materials	**3/4"**		**1"**		**2"**		**IDW Drums**	0	**Standby**		**Crew**	Colin
Riser	110'						**Concrete Core**		**Overnight**			James
Screen / Pre-pack	20						**Hand Sampling**		**Weekend**			

Additional Materials / Comments:

Driller Signature:

Client Signature:


Help
Search
ions History
11/3/2016 10:54:11 am 11/3/2016 11:01:15 am
10:54 am
11:01 am
Access
Park
Chain
NE 117th Ave
NE Fourth Plain Blvd
503
VP-1
VP-2
VP-3
VP-4
VP-5
VP-6
VP-7
VP-8
VP-9
VP-10
VP-11
Survey
© 2016 Google
Tour Guide
1990
10 T 534991.38 m E 5057138.38 m N elev

GEODESIGN INC

FIELD REPORT

GDI Project:	Orchard-1-01	Prepared By:	AJB
Project Name:	Former Turnbull Landfill	Date:	11/14/16
Location:	SR 500 & NE 4th Plain Intersection	Report #:	2
Arrival:	1000	Departure:	1400
Weather:	Rain	Permit #:	
Site Visit Requested By:		Met With (on site):	
Purpose:	Methane monitoring and soil gas sampling		
Outstanding Issues:			

1000 Andrew Bisbee (AJB) and Kyle Haggart (KTH) arrive on-site and begin methane monitoring at soil gas sampling point SG-11. A calibrated GEM2000 methane meter was connected to soil-gas sampling point SG-11. During the purge, water entered the sampling tube. As a result, the GEM2000 filter was replaced. During the methane monitoring, the barometric pressure ranged between 29.98 and 29.99 inches Hg. For each soil-gas sampling point, the points were purged using the GEM2000 for approximately 2.5 minutes until soil-gas concentrations stabilized. Soil-gas data were recorded on the attached methane monitoring data sheet.

1130 Methane monitoring complete. The greatest detected concentrations of methane were recorded in SG-1, SG-8, and SG-10 (1.7 percent by volume pbv, 2.3 pbv, and 2.0 pbv respectively). Prepare to collect confirmation Summa canister samples from the soil-gas sampling points with the greatest detected methane concentrations within the building footprint (SG-1) and in the parking lot area (SG-8).

1230 AJB and KTH prepare to collect a soil-gas sample from soil-gas sampling point SG-1 using SUMMA canister ESC# 2237. After connecting the regulator, it was discovered that the SUMMA canister was unusable due to insufficient vacuum.

1300 AJB and KTH prepare to collect a soil-gas sample from soil-gas sampling point SG-1using SUMMA canister ESC# 1862. The sampling train was set up using decontaminated fittings and checked for tightness before placing the helium shroud over the soil-gas sampling point and sampling train. The shroud was charged with helium and SG-1 was purged for approximately 2.5 minutes. During the purge, methane concentrations up to 1.7 pbv were measured using the GEM2000. Additionally, helium concentrations of 99,999 parts per million (ppm) were measured in the shroud using a GasCheck helium detector.

1325 Soil-gas sample SG-1 was collected from soil-gas sampling point SG-1. The initial vacuum in the SUMMA canister was 28.25 inches Hg. Helium in the sampling train was detected at a concentration of 3,000 ppm using the the GasCheck helium detector indicating the sampling train was reasonably tight. The final vacuum in the SUMMA canister was 7 inches Hg.

1345 GeoDesign was unable to collect the second sample because two SUMMA canisters were ordered and one was defective as noted above. Another SUMMA canister will be delivered by the lab. Equipment cleaned and decontaminated.

1400 AJB and KTH off site.

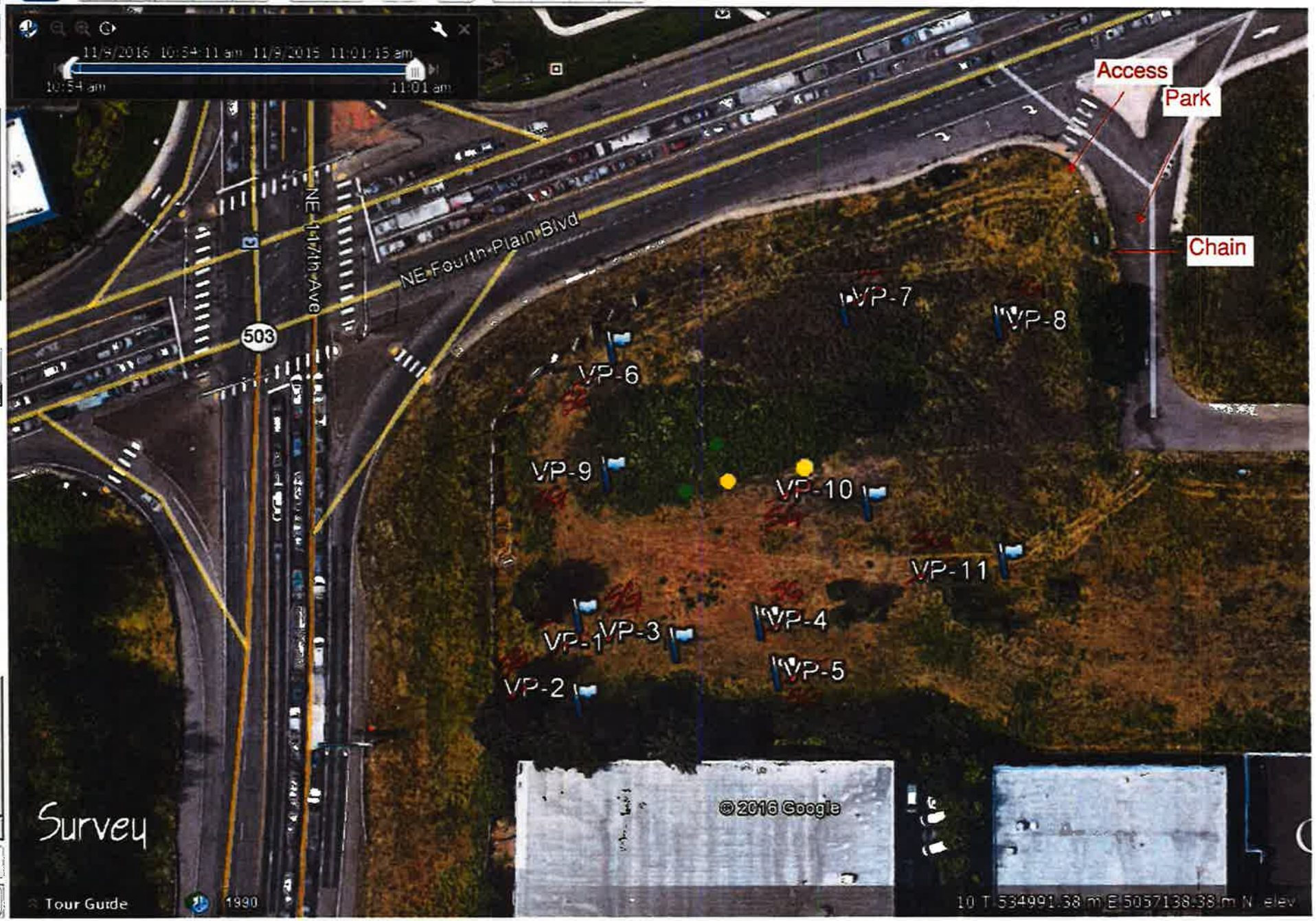
Distribution:

Attachments: Site plan, Methane monitoring data sheet, Soil vapor sampling data collection sheet

Reviewed by: MK

This report presents opinions formed as a result of our observation of activities relating to geotechnical engineering or environmental services. We rely on the contractor to comply with the plans and specifications throughout the duration of the project irrespective of the presence of our representative. Our work does not include supervision or direction of the contractor, the contractor's employees or agents. Our firm is not responsible for site safety. This field report is a **DRAFT** representation of our field observations, testing, and preliminary recommendations. The report can only be considered final upon review of the GeoDesign project manager, as indicated by initials in the "Reviewed By" section.

Signature: MK FOR ANDREW BISTBEE


Help
Search
ons History
11/8/2016 10:54:11 am 11/8/2016 11:01:15 am
10:54 am
11:01 am
Access
Park
Chain
NE 117th Ave
NE Fourth Plain Blvd
503
VP-7
VP-8
VP-6
VP-9
VP-10
VP-11
VP-1
VP-3
VP-4
VP-5
VP-2
Survey
© 2016 Google
Tour Guide
1990
10 T 534991.38 m E 5057138.38 m N elev

Methane Monitoring Data Sheet

Project #:	ORCHARD-1-01
Project Name:	FORMER TURNBULL LANDFILL
Date:	11-14-16
Gem 2000 Cal:	YES
Purge time:	150 SECONDS

Well I.D.	Time	Baro. Press.	Static Pres.	CH4	CO2	O2	Balance	Peak CH4
SG-11	1026	29.99	0.0	0.0	0.5	20.6	78.9	0.0
SG-10	1036	29.98	0.0	1.1	5.8	10.6	82.5	2.0
SG-A	1044	29.98	0.0	0.0	0.2	19.5	80.3	0.0
SG-5	1050	29.98	-0.02	0.8	9.6	0.0	89.7	0.8
SG-3	1055	29.99	-0.05	0.7	11.6	0.0	87.7	0.7
SG-2	1100	29.99	0.0	0.0	6.5	10.0	83.6	0.0
SG-1	1107	29.99	0.0	1.7	13.3	0.0	85.0	1.7
SG-9	1112	29.98	0.0	0.1	12.6	0.0	87.2	0.1
SG-6	1118	29.98	0.0	0.0	3.0	11.8	85.2	0.0
SG-7	1124	29.98	0.0	0.0	9.7	0.0	90.3	0.0
SG-8	1130	29.98	0.0	2.3	9.4	0.8	87.3	2.3

SOIL VAPOR SAMPLING DATA COLLECTION

GeoDesign, Inc
CAN #1862

Project No: ORCHARD-1-01 Date: 11/14/16

Site: FORMER TURNBULL LANDFILL Weather: RAIN

Address: SR 500 VANCOUVER Personnel: AJB, KTH

Probe	Canister	Static Pressure	Start Vacuum	Start Time	End Time	End Vacuum	Helium Concentration
GEO	SUMMA	29.95	28.25	1326	1330	7.0	3,000 PPM

GEODESIGN INC

FIELD REPORT

GDI Project:	Orchard-1-01	Prepared By:	Kyle Haggart (KTH)
Project Name:	Former Turnbull Landfill	Date:	11/15/16
Location:	SR 500 & NE 4th Plain Intersection	Report #:	3
Arrival:	0900	Departure:	1030
Weather:	Rainy, 50's	Permit #:	--
Site Visit Requested By:	--	Met With (on site):	--
Purpose:	Soil gas sampling		
Outstanding Issues:	--		

0900 KTH arrives onsite and monitors soil-gas sampling point SG-8 using a calibrated GEM2000. Methane was measured at a concentration of 3.4 percent by volume (see attached well methane monitoring data sheet).

0920 KTH prepares to collect sample SG-8 using SUMMA canister ESC#1936 and decontaminated fittings. The SUMMA canister was checked for leaks for 5 minutes before placing the helium shroud over the sampling train. The shroud was charged with helium. Helium in the shroud was measured using a GasCheck helium detector at a concentrations greater than 99,999 parts per million.

1006 Soil-gas sample SG-8 was collected from soil-gas sampling point SG-8. The initial vacuum in the SUMMA canister was greater than 30 inches of mercury (inHg). The helium concentration within the sampling train as measured with the GasCheck helium detector was approximately 1,060 ppm, indicating a reasonably tight sampling train. Sample collection was stopped when water was observed entering the tubing. The final vacuum in the SUMMA canister was 8 inHg.

1030 Equipment cleaned, decontaminated, and GDI left site.

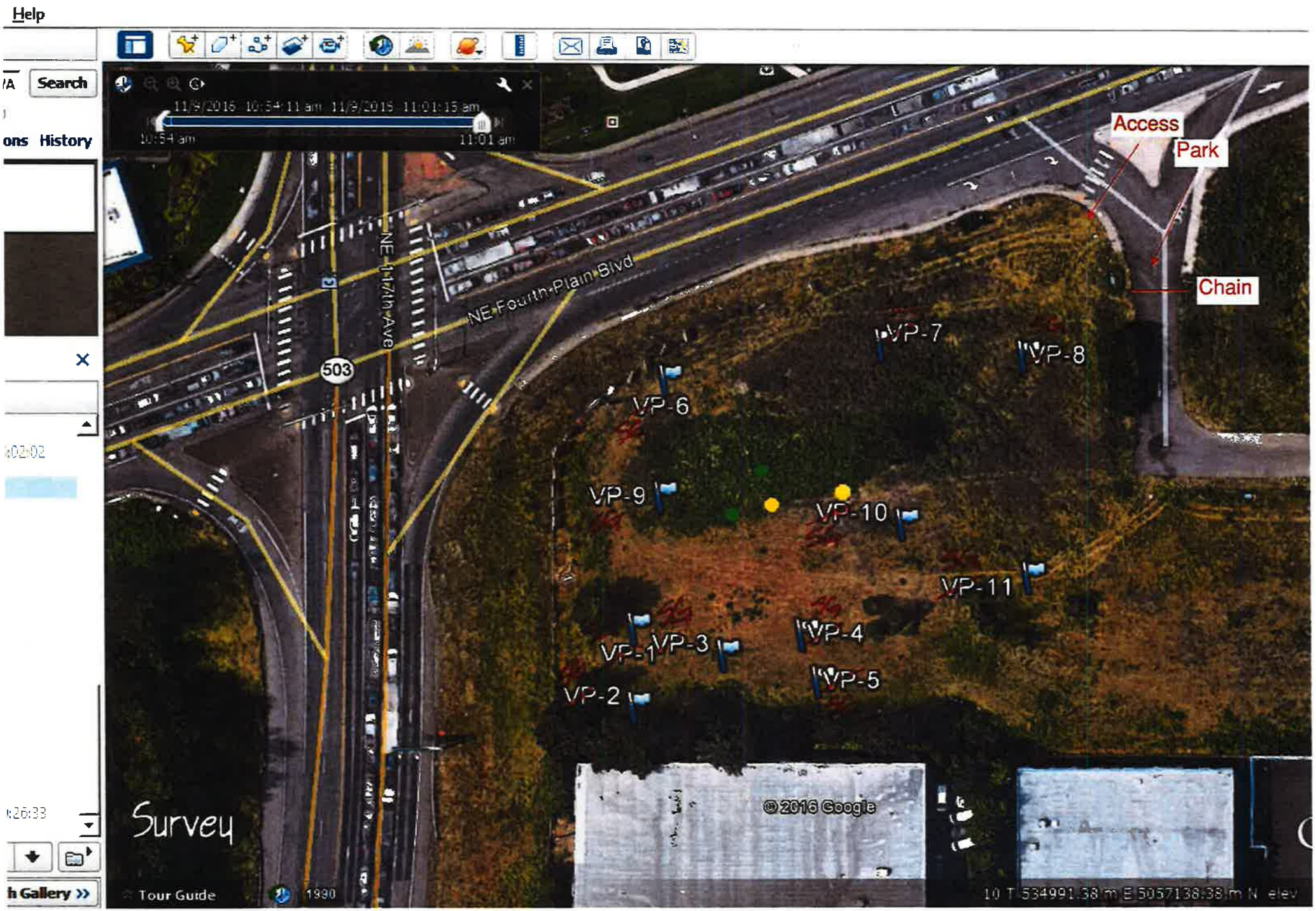
Distribution:

Attachments: Site Plan, soil-vapor sampling data collection sheet, well methane monitoring data sheet, COC

Reviewed by: MLC

This report presents opinions formed as a result of our observation of activities relating to geotechnical engineering or environmental services. We rely on the contractor to comply with the plans and specifications throughout the duration of the project irrespective of the presence of our representative. Our work does not include supervision or direction of the contractor, the contractor's employees or agents. Our firm is not responsible for site safety. This field report is a **DRAFT** representation of our field observations, testing, and preliminary recommendations. The report can only be considered final upon review of the GeoDesign project manager, as indicated by initials in the "Reviewed By" section.

Signature: MLC FOR KYLE HAGGART


Help
Search
ons History
11/9/2016 10:54:11 am 11/9/2016 11:01:15 am
10:54 am
11:01 am
Access
Park
Chain
NE 117th Ave
NE Fourth Plain Blvd
503
VP-1
VP-2
VP-3
VP-4
VP-5
VP-6
VP-7
VP-8
VP-9
VP-10
VP-11
Survey
© 2016 Google
Tour Guide
1990
10 T 534991.38 m E 5057138.38 m N elev
h Gallery >>

SOIL VAPOR SAMPLING DATA COLLECTION

GeoDesign, inc

Project No: ORCHARD-1-01 Date: 11/15/16

Site: SR 500 Vancouver Weather: Cloudy 50's

Address: _____ Personnel: KTH

Probe	Canister	Static Pressure	Start Vacuum	Start Time	End Time	End Vacuum	Helium Concentration
SG-8	1936	29.81 inHg	30+	957	1006	8	1060

WELL METHANE MONITORING DATA SHEET

Date: 11/15/16 Section: ________ ORCHARD1-01 **PAGE 1 OF 1** Weather: Cloudy 50's

Well	Time	T (°C)	Baro. P ~~(mBars)~~ InHg	Static P (" H_2O)	Diff. P (" H_2O)	CH_4 (%)	CO_2 (%)	O_2 (%)	Ambient T (°C)	Comments
SG-8	0936		29.81	-0.65		3.4	8.7	1.7		200 seconds

GeoDesign, Inc.
15575 SW Sequoia Parkway Ste. 100
Portland, OR. 97224

Billing Information:
GeoDesign, Inc.
15575 SW Sequoia Parkway
Ste. 100
Portland, OR. 97224

Report to: ANDREW BASBEE
Email to: abasbee@geodesigninc

Project Description:
City/State Collected: VANCOUVER, WA

Phone: 503-968-8787
FAX:
Client Project #: ORCHARD-1-01
ESC Key:

Collected by: ANDREW BASBEE
Site/Facility ID#:
P.O.#:

Collected by (signature):
Immediately Packed on Ice N Y

Rush? (Lab MUST Be Notified)
____ Same Day.....200%
____ Next Day.....100%
____ Two Day.....50%
____ Three Day.....25%

Date Results Needed:
Email? __No__Yes
FAX? __No__Yes

No. of Cntrs

Analysis/Container/Preservative: METHANE 8015

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	Remarks/Contaminant	Sample # (lab only)
SG-1	GRAB	GT	5'	11/14	1338	1 X		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
~~SG-2~~ SG-8 MEC 11/17/16		GT	5'	11/15	1006	1 X		

Chain of Custody Page 1 of 1

ESC LAB SCIENCES
12065 Lebanon Road
Mt Juliet, TN 37122
Phone: (800) 767-5859
Phone: (615) 758-5858
Fax: (615) 758-5859

CoCode GEODESPO (lab use only)
Template/Prelogin
Shipped Via:

*Matrix: **SS** - Soil/Solid **GW** - Groundwater **WW** - WasteWater **DW** - Drinking Water **OT** - Other SOIL GAS

pH _____ Temp _____
Flow _____ Other _____

Remarks:

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ _____	Condition: (lab use only)
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Temp: / Bottles Received:	CoC Seals Intact: ___ Y ___ N ___ NA
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)	Date: / Time:	pH Checked: / NCF:

ANALYTICAL REPORT

November 25, 2016

GeoDesign Inc.

Sample Delivery Group:	L873120
Samples Received:	11/16/2016
Project Number:	ORCHARD-1-01
Description:	

Report To: Andrew Bisbee
15575 SW Sequoia Pkwy. Suite 100
Portland, OR 97224

Entire Report Reviewed By:

Brian Ford
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

TABLE OF CONTENTS

SG-1 L873120-01 Air

Collected by: Andrew Bisbee
Collected date/time: 11/14/16 13:30
Received date/time: 11/16/16 09:00

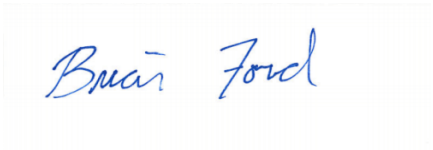
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015M	WG929343	5	11/23/16 16:17	11/23/16 16:17	MJ

SG-8 L873120-02 Air

Collected by: Andrew Bisbee
Collected date/time: 11/15/16 10:06
Received date/time: 11/16/16 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Volatile Organic Compounds (GC) by Method 8015M	WG929343	20	11/23/16 16:30	11/23/16 16:30	MJ

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.



Brian Ford
Technical Service Representative

Volatile Organic Compounds (GC) by Method 8015M

Analyte	CAS #	Mol. Wt.	RDL1 ppmv	RDL2 mg/m3	Result ppmv	Result mg/m3	Qualifier	Dilution	Batch
Methane	74-82-8	16	50.0	32.7	3400	2220		5	WG929343

Volatile Organic Compounds (GC) by Method 8015M

Analyte	CAS #	Mol. Wt.	RDL1 ppmv	RDL2 mg/m3	Result ppmv	Result mg/m3	Qualifier	Dilution	Batch
Methane	74-82-8	16	200	131	10400	6820		20	WG929343

Method Blank (MB)

(MB) R3180302-1 11/23/16 15:55

Analyte	MB Result ppmv	MB Qualifier	MB MDL ppmv	MB RDL ppmv
Methane	U		1.85	10.0

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3180302-2 11/23/16 15:58 • (LCSD) R3180302-3 11/23/16 16:07

Analyte	Spike Amount ppmv	LCS Result ppmv	LCSD Result ppmv	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Methane	500	416	440	83.1	88.0	70.0-130			5.69	25

Abbreviations and Definitions

SDG	Sample Delivery Group.
MDL	Method Detection Limit.
RDL	Reported Detection Limit.
U	Not detected at the Reporting Limit (or MDL where applicable).
RPD	Relative Percent Difference.
Rec.	Recovery.

Qualifier	Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our "one location" design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be **YOUR LAB OF CHOICE.**
***** Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Conneticut	PH-0197	North Carolina [1]	DW21704
Florida	E87487	North Carolina [2]	41
Georgia	NELAP	North Dakota	R-140
Georgia [1]	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky [1]	90010	South Dakota	n/a
Kentucky [2]	16	Tennessee [1 4]	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

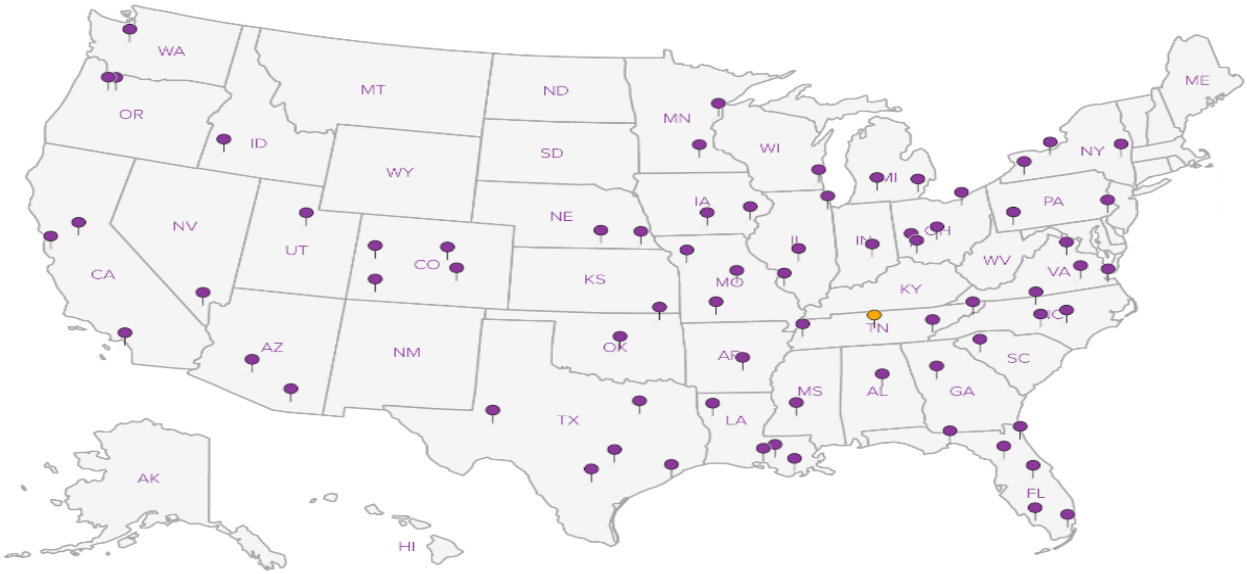
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



GeoDesign, Inc.
15575 SW Sequoia Parkway Ste. 100
Portland, OR. 97224

Billing Information:
GeoDesign, Inc.
15575 SW Sequoia Parkway
Ste. 100
Portland, OR. 97224

Report to: ANDREW BISBEE
Email to: abisbee@geodesigninc

Project Description:
City/State Collected: VANCOUVER, WA

Phone: 503-968-8787
FAX:
Client Project #: ORCHARD-1-01
ESC Key:

Collected by: ANDREW BISBEE
Site/Facility ID#:
P.O.#:

Collected by (signature):
Immediately Packed on Ice N (Y)

Rush? (Lab MUST Be Notified)
___ Same Day.....200%
___ Next Day.....100%
___ Two Day.....50%
___ Three Day.....25%

Date Results Needed:
Email? __No __Yes
FAX? __No __Yes

Analysis/Container/Preservative
No. of Cntrs
METHANE 8015

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No. of Cntrs	METHANE 8015	Remarks/Contaminant	Sample # (lab only)
SG-1	GRAB	OT	5'	11/14	1330	1	X		873120-01
~~SG-1~~	~~GRAB~~	~~OT~~	~~5'~~	~~11/14~~		1	X		
SG-2		OT	5'	11/15	1006	1	X		02

*Matrix: SS - Soil/Solid GW - Groundwater WW - WasteWater DW - Drinking Water OT - Other SOIL-GAS

pH _____ Temp _____
Flow _____ Other _____

Remarks:

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
	11/15	1450	
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)
Relinquished by: (Signature)	Date:	Time:	Received for lab by: (Signature)
			Joseph R

Samples returned via: ☐ UPS ☐ FedEx ☐ Courier ☐ _____
Temp: Amb.
Bottles Received: 2 Summa
Date: 11-16-16
Time: 0900

Condition: (lab use only) ok foil
CoC Seals Intact: ___Y ___N ___NA
pH Checked: NCF:

Chain of Custody
Page 1 of 1

ESC LABORATORY SCIENCES
12065 Lebanon Road
Mt. Juliet, TN 37122
Phone: (800) 767-5859
Phone: (615) 758-5858
Fax: (615) 758-5859

D134

CoCode GEODESPO (lab use only)
Template/Prelogin
Shipped Via:

Brian Ford

From: Mike F. Coenen <mcoenen@geodesigninc.com>
Sent: Thursday, November 17, 2016 11:13 AM
To: Brian Ford
Cc: Andrew Bisbee; Kyle Haggart
Subject: RE: Methane analysis Orchard-1-01

Hi Brian,

I'm reviewing the field reports for our sampling this week and noticed we used the wrong sample id for one of the samples on the COC. SG-2 should be SG-8. I can mark up our copy and email to you. Please let me know what you need from our end to make the correction.

Thanks,

Mike Coenen, P.E.
Associate Engineer

503.726.3143 direct
503.730.1364 mobile
503.968.8787 main

GeoDesign, Inc.
15575 SW Sequoia Parkway – Suite 100
Portland, OR 97224

https://linkprotect.cudasvc.com/url?a=https://www.geodesigninc.com&c=E,1,gGLvMBE04gMq-2vNp7YFjfXRasn0P5MtoctRz6C8xKHC-f3dKmVwnTraKV1fTrCLVrNnOYqQAjhtYGLJGH_aL2oGHIAuhdPu3SQWZKOTsh4,&typo=1

Portland OR I Salem OR I Anaheim CA I Vancouver WA I Longview WA I Seattle WA l Tacoma WA

 Please Consider the Environment before Printing this Email

The information contained in this e-mail is intended only for the individual or entity to whom it is addressed. Its contents (including any attachments) may contain confidential and/or privileged information. If you are not an intended recipient you must not use, disclose, disseminate, copy or print its contents. If you receive this e-mail in error, please notify the sender by reply e-mail and delete and destroy the message.

-----Original Message-----
From: Brian Ford [mailto:BFord@esclabsciences.com]
Sent: Monday, November 14, 2016 7:22 AM
To: Mike F. Coenen
Cc: Andrew Bisbee
Subject: RE: Methane analysis

Mike,

Our courier should be there by 8:30am this morning.

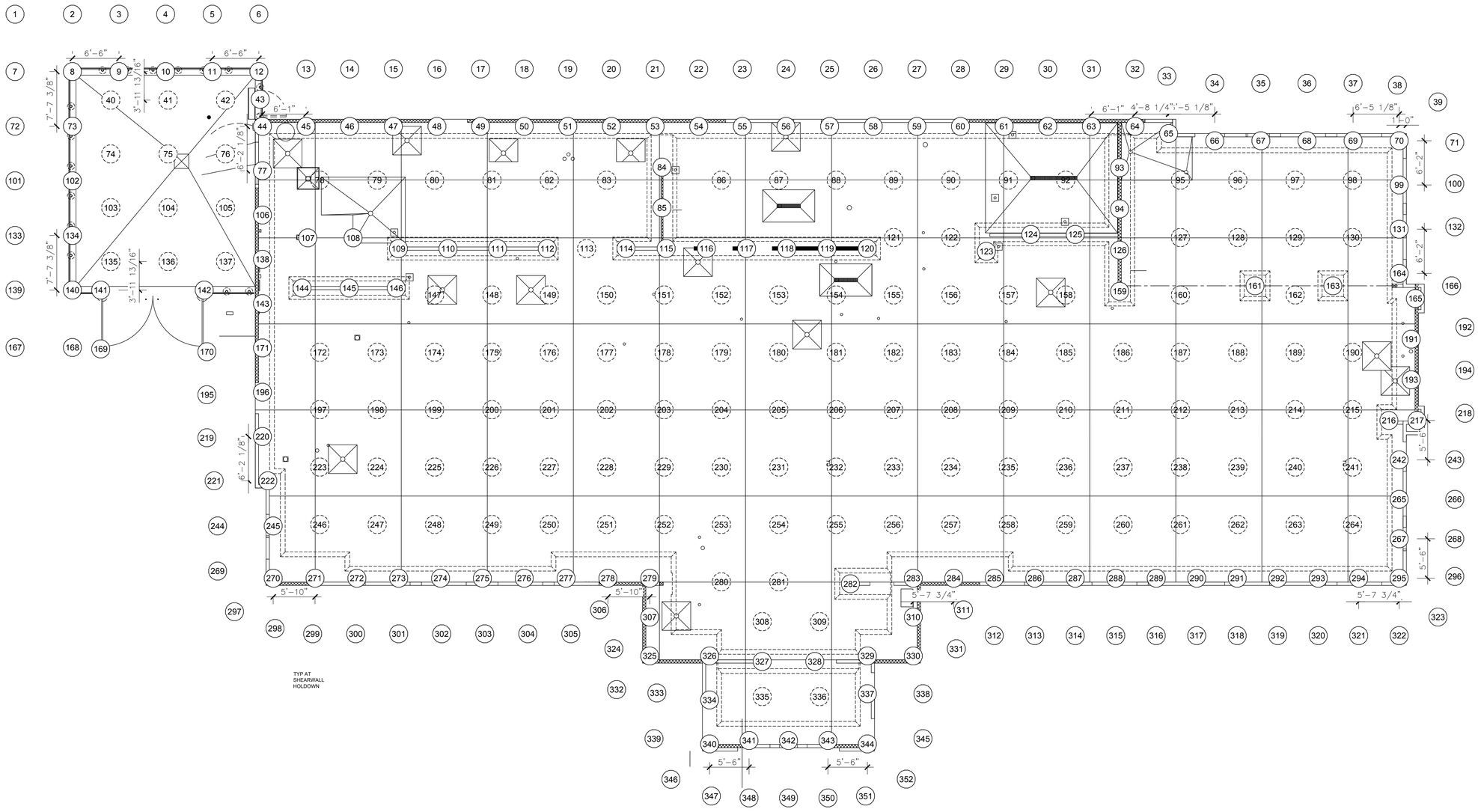
ESC
L·A·B S·C·I·E·N·C·E·S
YOUR LAB OF CHOICE

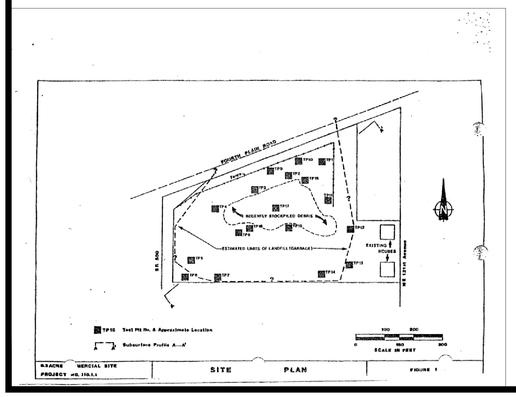
Cooler Receipt Form

Client:	GEODESIGN	SDG#	87712
Cooler Received/Opened On: 11/16/16		Temperature Upon Receipt:	Amb °c
Received By: Joseph Roberts			
Signature:	Joseph R		

Receipt Check List	Yes	No	N/A
Were custody seals on outside of cooler and intact?			✓
Were custody papers properly filled out?	✓		
Did all bottles arrive in good condition?	✓		
Were correct bottles used for the analyses requested?	✓		
Was sufficient amount of sample sent in each bottle?	✓		
Were all applicable sample containers correctly preserved and checked for preservation? (Any not in accepted range noted on COC)			✓
If applicable, was an observable VOA headspace present?			✓
Non Conformance Generated. (If yes see attached NCF)			

APPENDIX C





NOTES AND SYMBOL KEY

1. *THIS GEORAM® ENGINEERED AGGREGATE PIER PLAN CONSTITUTES A PORTION OF THE PROPRIETARY DESIGN-BUILD SCOPE OF GEOTECH FOUNDATION COMPANY - WEST (GTFC-WEST). IT IS PREDICATED ON THE INSTALLATION EQUIPMENT, METHODS (INCLUDING HIGH ENERGY VERTICAL RAMMING), PROPRIETARY QUALITY CONTROL, AND ENGINEERS' OVERSIGHT AS PROVIDED BY GTFC-WEST OR ITS SPECIFICALLY DELEGATED REPRESENTATIVES. THEREFORE, THIS PLAN SHALL NOT BE USED BY ANY COMPANY OTHER THAN GTFC-WEST FOR ANY PURPOSE WHATSOEVER.*
2. *THE SOLE PURPOSE OF THIS DRAWING IS TO INDICATE THE LOCATIONS, ORIENTATION, AND OTHER INFORMATION PERTINENT TO THE INSTALLATION OF THIS ENGINEERED AGGREGATE PIER SYSTEM. ALL OTHER INFORMATION IS FROM SHEET S2, DATED 03/01/2016, BY BRITT PERTERS AND ASSOCIATES INC. CONSULTING ENGINEERS, NORFOLK, VIRGINIA.*
3. *THE DESIGNER OF THE ENGINEERED AGGREGATE PIER SYSTEM HAS RELIED ON GEOTECHNICAL DATA AND STRUCTURAL LOADING INFORMATION PROVIDED BY OTHERS. NOTWITHSTANDING ANY CONTRACTUAL OR OTHER PROVISIONS, GTFC-W HAS NO RESPONSIBILITY TO DETERMINE THE COMPLETENESS OR ACCURACY OF THE INFORMATION PROVIDED.*
4. *REFER TO SHEET G2.00 FOR SPECIFICATIONS AND DIMENSIONING OF THE ENGINEERED AGGREGATE PIER LAYOUTS. ALL LAYOUTS CENTERED BENEATH FOOTINGS U.N.O.*
5. *INDICATES DEAD LOAD + LIVE LOAD IN kips (PROVIDED BY NOT APPLICABLE THIS PROJECT).*
6. *INDICATES DEAD LOAD + LIVE LOAD + SEISMIC IN kips (NOT APPLICABLE THIS PROJECT).*
7. XXX XXX XXX / XX 1A — *INDICATES ESTIMATED NET UPLIFT IN kips (NOT APPLICABLE THIS PROJECT).*
8. *INDICATES PIER LAYOUT NUMBER (SEE SHEET G2.00).*
9. *INDICATES MINIMUM PIER DRILL DEPTH BELOW BOTTOM-OF-FOOTING ELEVATION.*
10. *INDICATES TENSION PIER (NOT APPLICABLE THIS PROJECT).*
11. T / XXX — *INDICATES 30" PIER DRILL DIAMETER FOR FOUNDATION SUPPORT.*
12. *INDICATES PIER REFERENCE NUMBER.*
13. *SITE GRADE AT TIME OF GEOTECHNICAL EXPLORATION = ELEV. 209' TO 214' (PER SHEET 1 OF 1 OF EXISTING CONDITIONS SURVEY, DATED AUGUST 31, 2015, BY PACE; FINISHED FLOOR ELEV. = 211.5).*
14. *ALL PIER DRILL DEPTHS TO EXTEND TO AT LEAST 8' BELOW BOTTOM-OF-FOOTING.*

0 1" 2"

© Copyright 2016 GeoTech Foundation Company - West

GeoTech Foundation - West®, GeoRam®, and the logos are registered trademarks of GeoTech Foundation - West (GTFC-W). This drawing contains information proprietary to GTFC-W and is being furnished solely for use by GeoTech Foundation Company - West in connection with the Project described in this drawing. The information contained herein is not to be transmitted to any other organization other than the Project design team members, unless specifically authorized in advance in writing by GeoTech Foundation - West.

GTFC - WEST
www.gtfcwest.com
GeoTech Foundation Company
- West -
214 SE WALNUT ST., HILLSBORO, OR 97123
PH: (503) 640-1340 FX: (503) 648-6706

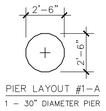
GeoRam® Engineered Aggregate Pier Plan

GOLDEN CORRAL

S.R. 500 & FOURTH PLAIN RD. VANCOUVER, WASHINGTON

DATE:	04/12/2016
REVISED:	06/14/2016
REVISED:	07/19/2016
PERMIT SET:	
DRAWN BY:	ELG/JJG
APPROVED BY:	JPM
SCALE:	5/32"=1'-0"

G1.00



PIER LAYOUTS

SCALE ⅛"=1'

NOTES

1. All Engineered Aggregate Piers to have minimum 30-inch drill diameter, U.N.O.
2. Allowable individual pier-cell capacity = 47 kips for piers beneath spread footings. Applies to gravity dead plus permanently and/or frequently applied live loads, and may be increased by 1/3 to include seismic.
3. No piers designated for tension loading this project.
4. Allowable design bearing pressure for reinforced soil strength = 2000 pounds per square foot for gravity dead plus permanently and/or frequently applied live loads. A 1/3 increase may be applied to include edge pressures due to wind and/or seismic.
5. For lateral force resistance, minimum average allowable coefficient of friction provided by pier-reinforced soils beneath entire spread footing area = 0.55.
6. Structural loads to be supported by pier-reinforced soil are noted on sheet G1.0x.
7. All piers to have minimum drill depths as designated on sheet G1.0x, U.N.O.
8. Engineered Aggregate Pier installer may adjust pier locations in the field as needed to accommodate field conditions. The pier designer shall approve adjustments of more than 6" horizontally in any direction.
9. U.N.O., the pier reinforcement design does not address liquefaction or other potential seismic hazards.
10. U.N.O., the pier reinforcement design is intended to provide settlement control of the structure foundations due to the design static loads only.
11. U.N.O., for large areal loads (such as site fills and/or heavily loaded slabs/mats) where the depth of stress influence exceeds the pier-reinforced depth, the pier design is intended to control settlement within the pier-reinforced depth only. Settlements caused by fills placed prior to pier installation should be monitored by the project Geotechnical Engineer-of-Record and should have reached completion before commencement of pier installation. It is not the responsibility of GeoTech Foundation Company - West (GTFC-W) to confirm that this condition has been met prior to pier installation.
12. The benefits of lateral soil stress increase and resultant footing settlement performance may be significantly diminished by nearby, temporary excavations (see Detail #2) and/or movement of retaining walls within a 15-foot horizontal distance (see Detail #4) that occur after installation of the aggregate piers.
13. Notwithstanding any contractual or other provision, GTFC-W has no responsibility to determine the subsurface conditions at the site, and has relied upon the project geotechnical recommendation by Redmond Geotechnical Services, LLC (Portland, Oregon), dated May 10, 1983 as solely representing subsurface conditions at the location where the foundation system is to be installed and to the depths of stress influence from the planned foundations. The Geotechnical Engineer-of-Record is responsible for confirming, during pier construction, that subsurface conditions revealed in the pier cavities are generally as expected from their various geotechnical explorations. However, this shall not relieve GTFC-W of Quality Control responsibility for the pier installation, nor from responsibility for design modifications needed in the event that the Geotechnical Engineer-of-Record advises GTFC-W that subsurface conditions vary from those indicated by the geotechnical explorations.
14. It is not the responsibility of GTFC-W to confirm that work done after pier installation (such as trenching, excavation, elevator casing installation, footing excavation, and footing bottom protection) satisfies the requirements outlined in the Specification and Details presented hereon.
15. U.N.O., the aggregate pier reinforcement system may not mitigate the potential for hydro-collapse or expansion of the matrix soil, if such is identified in the project geotechnical report as being a potential issue. While the Engineered Aggregate Pier elements themselves are not subject to collapse or swell, if the matrix soils are prone to these effects (per the geotechnical report) then appropriate precautions should be taken to minimize the exposure of the soils to water infiltration, per conventional practice and as recommended by the project Geotechnical Engineer.
16. The pier design presented on these drawings is copyrighted by GeoTech Foundation Company - West and is not applicable in any way to any other soil reinforcement system. Use of this design in any way for any system other than that designed and constructed by GTFC-W is an express violation of U.S. copyright law.

GeoTech Foundation - West®, GeoRam®, and the logos are registered trademarks of GeoTech Foundation - West (GTFC-W). This drawing contains information proprietary to GTFC-W and is being furnished solely for use by GeoTech Foundation Company - West in connection with the project described on this drawing. The information contained herein is not to be transmitted to any other organization other than the Project design team members, unless specifically authorized in advance in writing by GeoTech Foundation - West.

GTFC - WEST
www.gtfcwest.com
GeoTech Foundation Company - West
214 SE WALNUT ST., HILLSBORO, OR 97123
PH: (503) 640-1340 FX: (503) 648-6706

SECTION 02360 / 31 34 30.13

ENGINEERED AGGREGATE PIERS
(SOIL REINFORCEMENT AND FOUNDATION SYSTEM)

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide all equipment, material, labor and supervision to design and install Engineered Aggregate Piers for the soil reinforcement. Design shall rely on subsurface information presented in the project geotechnical report, and structural loading provided by the project Structural Engineer.
B. Provide design submittal, including appropriate drawings and calculations, sealed by a Professional Engineer licensed in the state in which the project is located.
C. Design engineer for the project shall be directly employed by the aggregate pier installer, and shall be readily available throughout project Design Development and pier installation to address Requests For Information (RFI's).
D. Installer's Design Engineer and Quality Control representative shall each have a minimum of 5 years of documented experience with engineered aggregate piers constructed with high energy, vertical ramming of the type specified herein.

1.02 RELATED WORK BY OTHERS

A. Prior to any pier installation, the Engineered Aggregate Pier installer shall be provided with written confirmation that settlement caused by any fill placed on the site prior to pier installation has stopped. Such confirmation shall come from or be approved by the project Geotechnical Engineer.
B. Layout of footings, mats, grade beams and staking of all aggregate pier locations prior to aggregate pier installation shall be the responsibility of the General Contractor. If layout and pier staking is not conducted by a licensed surveyor, then General Contractor shall assume full responsibility. Information provided shall include existing ground surface elevations (± 3') within 50 feet of each aggregate pier element. General Contractor shall assume full responsibility for any and all costs associated with piers that may be found later to have been mislocated or constructed to the wrong elevation control.
C. All above and below ground utilities shall be located, clearly marked, and relocated as necessary prior to installation of aggregate pier elements.
D. Pier aggregate, if supplied or placed by the Owner's representatives or Contractors, shall be placed within 50 feet of the pier construction area and in sufficient locations as to facilitate unhindered, continuous pier construction, determined in coordination with the aggregate pier installer.
E. Removal of drill spoils from the site, and fugitive dust control are not included.
F. Foundation excavations to expose the tops of aggregate piers shall be made in a workmanlike manner, and shall be protected until concrete placement, with procedures and equipment best suited to (1) preventing softening of the matrix soil between and around aggregate piers prior to pouring structural concrete, and (2) achieving suitable contact between the dense, undisturbed aggregate piers and the concrete footing.
Procedures that can be employed for the purpose of achieving these goals include but are not limited to (1) excavate using a smooth bucket, (2) prevent excavation below scheduled bottom-of-footing elevation, (3) place footing concrete or suitable concrete seal ("mud mat") immediately after footing excavation is made and approved.
Footing excavations shall be inspected by the project Geotechnical Engineer . The following criteria shall apply, and a written inspection report sealed by the project Geotechnical Engineer shall be furnished the aggregate pier installer confirming that:
a) water (which may have softened unconfined matrix soil between and around aggregate piers, and may have detrimental effects on the supporting capability of the pier-reinforced subgrade) has not been allowed to pond in any footing excavation at any time;
b) all aggregate pier elements designed for each footing have been exposed in the footing excavation;
c) immediately prior to footing construction, the tops of all aggregate piers exposed in each footing excavation have been inspected by the Geotechnical Engineer and recompacted, as necessary, with mechanical (*not vibratory*) compaction equipment; and that the tops of any pier elements which may have been disturbed by footing excavation and related activity have been recompacted to a dry density equivalent to at least 95% of the maximum dry density obtainable by the modified AASHTO compaction procedure (ASTM D1557);
d) any structural fill placed between the tops of aggregate pier elements and the bottoms of foundations consists of the same quality and gradation material, or better, as used in constructing the piers; and that the fill has been compacted to a dry density equivalent to at least 95% of the maximum dry density obtainable by the modified AASHTO compaction procedure (ASTM D1557); and
e) no excavations or drilled shafts have been made after installation of aggregate pier elements within a horizontal distance of 10' from the edge of any pier, without the written approval of the aggregate pier installer.
G. Failure to provide the above items, which are beyond the responsibility of the aggregate pier installer, may void any written or implied warranty on the performance of the aggregate pier system.

1.03 QUALITY CONTROL / QUALITY ASSURANCE

A. The installer of the aggregate pier system shall provide evidence of satisfactory experience with the design and installation of Aggregate Pier Soil Reinforcement systems using high energy vertical ramming with no vibration, including examples of at least 3 previous projects for which the installer has supported comparable structural loads and controlled settlement to the project tolerances. The design and installation shall be conducted and overseen by a registered professional engineer employed by the installer.
B. The installer of the aggregate pier system shall use exclusively high energy, low frequency vertical ramming to construct non-displacement piers. No vibratory energy shall be used in constructing the piers. The installer shall provide credible research data to confirm that the rammer design to be used for constructing the aggregate piers develops nearly full passive lateral pressure in the soil surrounding the aggregate pier for a distance of at least 4 feet horizontally beyond the edge of the pier.
C. The installer of the engineered aggregate pier system shall provide a full time Quality Control (QC) representative on-site during pier construction who shall maintain QC records during pier installation. This work shall be conducted under the supervision of a registered professional engineer. A testing agency or Geotechnical Engineer may be retained by the Architect/Owner for Quality Assurance (QA) services.
D. The testing agency/Geotechnical Engineer providing QA services, shall monitor installation procedures relative to these specifications, and shall confirm that subsurface conditions across the installation area as revealed by the pier drilling are in general agreement with the project geotechnical explorations.
E. Prior to installing production piers, the aggregate pier designer shall establish the required target energy output for the rammer and terminal rammer-blow deflection criterion for the ramming of each lift. Rammer energy output shall be confirmed by the installer prior to construction of production piers and the final terminal rammer-blow deflection criterion then specified. Instrumentation used to confirm rammer-blow deflections shall be capable of recording to a precision of at least 0.001 inch per rammer stroke, and shall be capable of recording deflection accompanying each rammer blow. During pier lift construction, rammer-blow deflection monitoring shall be performed randomly in at least 5% of the piers installed for the project to confirm that terminal rammer-blow deflections meet the established acceptance criterion. At the discretion of the aggregate pier designer, rammer blow deflection monitoring may negate the need for a static modulus test.
F. The aggregate pier installer shall provide a certified quality control representative to observe the drilling and construction of all engineered aggregate piers. Quality Control observations shall include confirmation that all aggregate lifts located 3 feet or more above the bottom of the pier have been constructed to the design criteria, as established by the aggregate pier design engineer.
G. A Daily Aggregate Pier Progress Report shall be completed by the installer during each day of installation, and shall consist of the following:
a) Date of installation and summary of installation equipment and installation procedures.
b) Pier location, length, and diameter.
c) Final elevations of the pier top and bottom.
d) Documentation of any unusual subsurface conditions encountered.
e) Soil and groundwater observations, if any.
f) The results of any field Quality Control testing or deflection monitoring done.
H. The designer of the aggregate pier system shall carry Errors and Omissions / Professional Liability Insurance with coverage of at least $2 Million.
I. A calibrated dynamic penetration test (ASTM STP 399) may be performed on representative aggregate pier elements as a supplement to rammer deflection observations. A minimum of 15 blows per 1.75 inch vertical movement shall be the minimum average penetration resistance of compacted, graded aggregate base course stone. On lifts of open graded aggregate, lower values may be approved by the system designer as appropriate.

1.04 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
1. ASTM D1143 Pile Load Test Procedures
2. ASTM D1194 Spread Footing Load Test
3. ASTM D1557 Aggregate Densification
4. ASTM D1241 Aggregate Quality
5. ASTM STP 399 Dynamic Penetrometer Testing
6. ASTM D3689 Uplift Load Test

1.05 SUBMITTALS

A. Make submittals in accordance with requirements of Division 1 and as specified in this section.
B. When load tests are required and authorized, the installer shall furnish within 5 working days of the completion of the test, a report including a description of the installation, test data, and any changes in design parameters based on the load test results. The report shall be prepared by or under the direct supervision of a registered professional engineer experienced in modulus testing, performance and analysis of the aggregate pier system.
C. A Daily Aggregate Pier Progress Report shall be furnished by the installer to the General Contractor.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Any materials ordered or delivered to the project site before approval will be at the aggregate pier installer's risk.
B. Deliver materials to project site in quantities and at times to assure conformity of activities with the installation schedule for the aggregate pier system.

PART 2 PRODUCTS

2.01 MATERIALS

A. Aggregate for the piers shall typically consist of materials that are in general conformance with gradation requirements for State DOT highway base course and/or drainage materials, or as approved by the aggregate pier designer. Wet weather or soil conditions may require that the aggregate contain less than 5 percent fines (silt and clay particles passing the No. 200 sieve). The aggregate pier system designer and installer shall make the determination of acceptable materials to be used in pier construction.
B. A suitable washed, open graded aggregate may be used in wet conditions or as initial lifts where soft soils are present at the bottom of the aggregate pier.
C. Potable water or other suitable source shall be used to increase aggregate moisture content as needed for workability. Water shall be made available on-site to the installer of the aggregate pier system for his use in moisture conditioning aggregate for compaction, as needed. The need for moisture conditioning aggregate shall be made by the aggregate pier system installer based on workability and/or dust control; however, moisture content of aggregate is not a requirement for pier acceptance.

PART 3 EXECUTION

3.01 INSPECTION

A. Examine areas and conditions under which aggregate pier elements are to be installed.
B. Notify General Contractor of conditions detrimental to proper and timely completion of Work.
C. Do not proceed with Work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION

A. The General Contractor shall locate and protect underground and above ground utilities, and other structures from damage during installation of the engineered aggregate pier system.
B. Install aggregate pier elements after Earthwork in the installation area has been completed as follows:
a) Site subgrade established by General Contractor shall be within 6 inches of finish subgrade, or as approved by installer of the aggregate pier system.
b) Any fills needed to establish finish subgrade have been installed, and settlement resulting from fill loads is complete (unless specifically approved in writing by the aggregate pier designer prior to installation).
c) A working surface has been established by General Contractor to provide wet weather protection of subgrade and to provide a base for efficient operation of pier installation equipment.

3.03 INSTALLATION

A. The locations, size, and spacing of aggregate pier elements are described on the appropriate drawings or details. Any modifications in size and spacing of the aggregate pier element layout shall be approved by the system designer.
B. Should any obstruction, including but not limited to boulders, timber, concrete, asphalt, large roots etc., be encountered which prevents placing the elements to the required depth, or causes the aggregate pier to drift from the required location, the obstruction shall be removed by the General Contractor. The excavation shall be backfilled by General Contractor with suitable materials and sufficiently compacted, in order to continue with installation of the aggregate pier element. Piers may be terminated short of design depth on rock, gravel or other suitable materials. Additional aggregate pier elements shall be installed when required by the presence of obstacles.
C. Special high-energy impact apparatus shall be used to construct the aggregate pier elements. Specially designed rammers per paragraph 1.03.B of this specification shall be used. Approval of constructed pier lifts shall be based on observed vertical deflections per blow of the rammer over the last several blows of ramming.
D. The bottom of the pier excavation shall be rammed prior to the placement of aggregate. If wet, soft or sensitive soils are present, open graded aggregate shall be placed and rammed to stabilize the pier bottom and may serve as the initial pier lift.
E. The center of each constructed aggregate pier element shall be within 6 inches of the design location, as located and staked in accordance with Article 1.02.A. Foundation elements installed outside of the above tolerance and deemed not to be acceptable, shall be either rebuilt or other remedial measures taken as approved by the aggregate pier system designer.
F. Casing for elevator jack shafts located within 10 feet horizontally of any aggregate element shall be installed by others prior to aggregate pier installation, and shall be grouted in-place for the full length of the casing.
G. Acceptable constructed lift thickness shall be established by the aggregate pier designer and confirmed by the aggregate pier installer for each lift installed.
H. Required ramming time per lift, or acceptable terminal rammer deflection per blow, shall be established by the aggregate pier designer, and (if a test pier is constructed) shall be consistent with the time or deflection criteria used for the test pier construction.

3.04 AGGREGATE PIER ELEMENT MODULUS TESTING **(NOT APPLICABLE THIS PROJECT)**

A. When modulus tests on aggregate pier element(s) are included, they shall be of the type and installed in a manner specified herein. Modulus test data shall be used by the aggregate pier system designer to confirm aggregate pier element design parameters for the project.
B. Aggregate pier elements used for modulus testing which are located within tolerance and provide a safe design capacity may, upon approval of the aggregate pier system designer, be used in the finished work.
C. Compressive load test procedures shall be conducted in general accordance with ASTM D1143 and D1194, as appropriate. A test pier shall be loaded to 150 percent of the estimated element design pressure. Alternatively, at the discretion of the aggregate pier designer, the modulus test may be terminated when a modulus equal to 150 percent of the modulus used in the design is achieved.
D. The modulus test shall be conducted as follows:
1. ASTM D1143 general test procedures shall be used as a guide to establishing load increments, load increment duration, load decrements, and total applied load.
2. In order to evaluate bulging of the aggregate pier element itself under loading, the test pier shall be constructed in such a manner that deflections at both the bottom and top of the pier can be measured at each increment of loading.
3. With the exception of the load increment representing approximately 112% of the design maximum aggregate pier element stress, all load increments shall be held for a minimum of 15 minutes, a maximum of 1 hour, and until the rate of deflection reduces to 0.01 inch per hour, or less.
4. The load increment which represents approximately 112% of the design maximum aggregate pier element stress shall be held for a minimum of 15 minutes, a maximum of 4 hours, and until the rate of deflection reduces to 0.01 inch per hour, or less.
5. A seating load equal to 5 percent of the total load shall be applied to the loaded steel plate prior to application of load increments and prior to measurement of deflections to compensate for surficial disturbance.
6. The test data shall be presented as a graph showing deflection of the pier top and bottom under each load increment.
7. At the design load, deflection measured at the top of the pier shall not exceed the design settlement for the aggregate pier-reinforced soil zone, and the ratio of bottom plate deflection to top plate deflection shall not exceed 0.25 unless specifically approved by the aggregate pier designer.

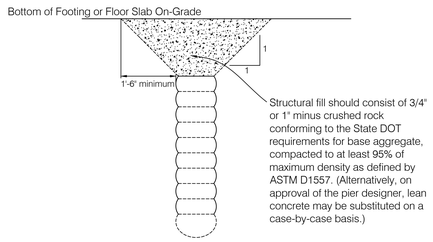
3.05 AGGREGATE PIER ELEMENT UPLIFT TESTING **(NOT APPLICABLE THIS PROJECT)**

A. When field uplift tests are performed on aggregate pier elements, ASTM D-3689-07 shall serve as a basis. Uplift deflections shall be measured for both the reaction plate installed at the bottom of the aggregate pier element shaft and for a steel plate installed at the top of the element. Dial gages accurate to at least 0.001" shall be used and shall be supported on independent reference supported beams. Unloading shall be in at least four equal decrements, if possible.
B. The following procedure shall be followed in performance of field tests to confirm uplift design parameters for aggregate pier elements designed to resist seismic uplift, as required.
1. The pier shall be constructed in such a manner that deflections at each load increment can be measured for the top of the pier as well as the bottom of the pier.
2. Apply a seating load to the top plate not to exceed 5 kips.
3. Zero dial gages following application of seating load.
4. Rapidly apply loads in approximately equal increments of at least 5 kips each, with a maximum of 8 increments between the seating load and 200 percent of the element design load. Record deflections at each load increment.
5. The final increment of loading shall be equal to at least 200 percent of the design load.
6. Unload to approximately 5 kips in 4 approximately equal increments, and record rebound for each increment.
7. Repeat the load-unload cycle at least 3 times.

C. For tests conducted to evaluate performance under sustained uplift conditions (such as hydrostatic), the loading procedure shall be generally as described in B, above, except that only one load-unload cycle is required. Additionally, each load shall be maintained for a minimum of 10 minutes and until the rate of deflection equals 0.01 inch per hour, or less.
D. The deflections recorded during the test shall be averaged, and a load vs. deflection curve plotted for the top plate and the bottom plate. The ultimate uplift capacity for the aggregate pier element shall be defined as the load at which the rate of deflection measured at the top of the element is approximately equal to the rate of deflection at the bottom of the element. Loading beyond 200 percent of the design load is not required.

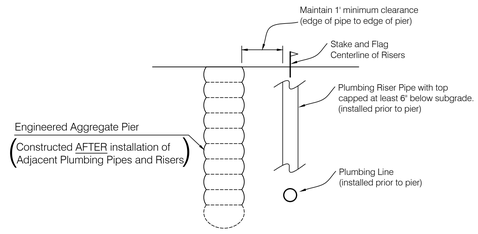
SPEC01-2016.DOC

REQUIREMENTS FOR STRUCTURAL FILL PLACED OVER ENGINEERED AGGREGATE PIERS



DETAIL #1

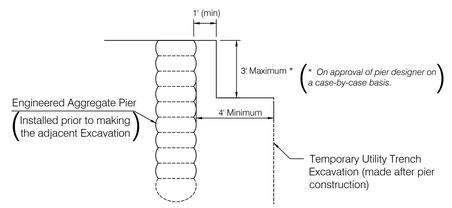
CLEARANCES FOR *PLUMBING LINES AND RISERS* INSTALLED PRIOR TO CONSTRUCTION OF ADJACENT ENGINEERED AGGREGATE PIERS



NOTE: Backfill for plumbing lines and risers for a horizontal distance of at least 4' from the edges of the pier in all directions to be compacted to at least 90% of the maximum dry density as determined by the ASTM D1557 test procedure.

DETAIL #3

CLEARANCES FOR *TEMPORARY UTILITY TRENCH EXCAVATIONS* MADE ADJACENT TO PREVIOUSLY CONSTRUCTED ENGINEERED AGGREGATE PIERS

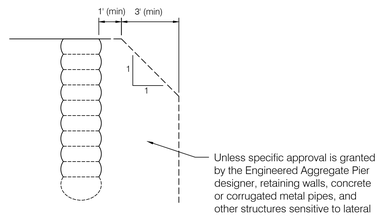


NOTES:

1. *Trench side wall within at least 4' (horizontal) to pier to be protected from caving and softening.*
2. *Trench backfill within at least 4' (horizontal) of pier in all directions shall be compacted to at least 90% of the maximum dry density as determined by the ASTM D1557 test procedure.*

DETAIL #2

CLEARANCES FOR *PRE-EXISTING* RETAINING WALLS, CONCRETE OR CORRUGATED METAL PIPES AND OTHER STRUCTURES SENSITIVE TO LATERAL PRESSURE RESULTING FROM ENGINEERED AGGREGATE PIER CONSTRUCTION



DETAIL #4

GeoRam® Engineered Aggregate Pier Details and Specifications

VANCOUVER, WASHINGTON

GOLDEN CORRAL

DATE:	04/12/2016
REVISED:	06/14/2016
REVISED:	07/19/2016
PERMIT SET:	
DRAWN BY:	ELG/JJG
APPROVED BY:	JPM
SCALE:	N.T.S.

G2.00

© Copyright 2016 GeoTech Foundation Company - West

APPENDIX D

GeoDesign INC

CONTAMINATED MEDIA MANAGEMENT PLAN

Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington

For
Orchard Crossings, LLC
December 19, 2016

GeoDesign Project: Orchard-1-01

GeoDesign Inc

December 19, 2016

Orchard Crossings, LLC
c/o Redmond Geotechnical Services, LLC
P.O. Box 20547
Portland, OR 97294

Attention: Daniel M. Redmond, P.E., G.E.

Contaminated Media Management Plan
Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington
GeoDesign Project: Orchard-1-01

GeoDesign, Inc. is pleased to submit this Contaminated Media Management Plan (CMMP) for the proposed development at the former Turnbull Landfill located southeast of SR 500 and NE Fourth Plain Boulevard in Vancouver, Washington (project site). This CMMP provides guidance to the project team related to the management of potentially contaminated media during site preparation and earthwork activities. It is intended to be used by the excavation contractor during earthwork activities and should be used in conjunction with any other project specifications provided to the contractor pertaining to the handling, management, characterization, re-use, and/or disposal of potentially impacted media at the project site. Please call us if you have questions regarding this CMMP or any aspect of the project.

Sincerely,

GeoDesign, Inc.

Jason O'Donnell, L.G.
Principal Geologist

cc: Panjini Balaraju, Washington State Department of Ecology (via email only)

KJK:MFC:JSO:kt
Attachments
One copy submitted (via email only)
Document ID: Orchard-1-01-121916-envr-CMMP.docx
© 2016 GeoDesign, Inc. All rights reserved.

TABLE OF CONTENTS **PAGE NO.**

1.0 INTRODUCTION

GeoDesign, Inc. has prepared this CMMP for the proposed development at the former Turnbull Landfill located southeast of SR 500 and NE Fourth Plain Boulevard in Vancouver, Washington (project site).

Anticipated construction activities at the project site include excavation and grading, trenching, aggregate pier drilling, utility installation, methane mitigation system installation, and building construction. This CMMP was prepared to assist the project team in identifying and addressing potentially contaminated media that may be encountered during earthwork activities.

Acronyms and abbreviations used herein are defined at the end of this document.

2.0 PROJECT DESCRIPTION AND BACKGROUND

The former Turnbull Landfill encompasses approximately 6.5 acres. The project site is currently undeveloped and comprised of approximately 2.55 acres of the western portion of the landfill. The project site is bound by NE Fourth Plain Boulevard to the north, SR 500 to the west, a commercial and light industrial development to the south, and undeveloped former landfill property to the east. The proposed development will include the construction of an approximately 11,100-square-foot, one-story structure on the project site with associated infrastructure, including new roadways, parking lots, and utilities.

Based on our review of available documentation, we understand the project site was operated as a gravel quarry from the early 1900s through the early to mid-1960s. Following cessation of gravel mining, the site operated as a permitted solid waste landfill beginning sometime in 1969 by the Turnbull Construction Company, the former property owner. The landfill accepted construction debris and demolition debris, as well as municipal solid waste. The solid waste disposal permit was reportedly revoked by the Southwest Washington Health District in 1973 due to permit non-compliance. Some non-permitted solid waste disposal occurred at the project site through at least 1974.

The former Turnbull Landfill is a listed cleanup site in DOE's cleanup site database. Sometime in the late 1990s surficial landfill refuse and debris were removed from the project site and an engineered protective soil cap was installed and graded to help minimize surface water infiltration and to help facilitate redevelopment of the project site. In 2000 DOE determined the project site was eligible for an NFA determination, which included institutional controls in the form of a restrictive covenant.

Between 1983 and 2006 a number of geotechnical and environmental investigations were completed to evaluate the content and extent of the solid waste. Prior site explorations completed by GeoDesign indicate the protective cap material consists of a 12- to 36-inch-thick layer of dense, brown sand with some gravel underlain by fill to depths varying between 8 and 18 feet BGS. The fill contains variable amounts of refuse, including concrete, lumber, and trash. Native sand and gravel deposits are present below the fill. Groundwater was reportedly encountered at depths varying between 15 and 20 feet BGS.

3.0 PROJECT UNDERSTANDING AND PLANNED EARTHWORK ACTIVITIES

It is our understanding the landfill is currently covered with a soil cap that consists of a 12- to 36-inch-thick layer of dense, brown sand with some gravel underlain by fill to depths varying between 8 and 18 feet BGS. The fill contains variable amounts of refuse, including concrete, lumber, and trash. In addition, imported soil may be required to achieve the grades for the proposed development. It is reasonable to assume deeper excavations will be required and solid waste will be encountered at some point during construction. This CMMP will address the proper handling and management of imported and exported soil as well as solid waste management during earthwork activities. In addition, it will address the proper handling of groundwater if encountered during site development.

As noted in the Periodic Review Report-Final[1], a soil gas survey was completed in 1992. During the soil gas survey, 27 soil gas probes were installed in the upper 4 feet of soil along the project site perimeter. Methane was not detected during the soil gas survey. Nonetheless, methane may be present in the subsurface and could accumulate in trenches and deeper excavations. Construction workers should not smoke or engage in other activities that could result in a spark in such areas. If workers are required to enter excavations, air monitoring shall be performed prior to entry to verify that explosive or oxygen-deficient atmospheric conditions are not present in the work area. The site-specific HSP provides detailed measures to help ensure worker safety during construction.

4.0 CMMP

This section summarizes methods to be employed for the management of soil, solid waste material, and groundwater that may be encountered during earthwork activities.

The objectives of the CMMP procedures are to (1) outline standard procedures for the evaluation of imported and exported fill soil, (2) outline procedures for the identification and management of contaminated media or solid waste material that may be encountered during portions of site earthwork, (3) provide the earthwork contractor with guidance related to the identification, notification, handling, and disposal of potentially contaminated media and/or solid waste, and (4) establish a decision structure supporting the management of potential contaminated media and/or solid waste.

4.1 SOIL MANAGEMENT

4.1.1 General Management

Soil that is either imported or exported will be managed, to the extent practicable, to help minimize fugitive dust generation or runoff using BMPs (typically specified in an ESCP). The primary management methods to achieve these objectives are as follows:

[1] State of Washington Department of Ecology, *Periodic Review Report-Final; Turnbull Landfill; Facility Site ID#: 51658363; 12001 NE Fourth Plain Boulevard; Orchards, WA 98682*, dated January 2014.

- Minimizing fugitive dust conditions by light watering of stockpiled and placed fill material, as needed
- Minimizing free fall of soil and eliminating excessive drop heights during material transfer
- Covering stockpiled fill material with plastic sheeting, as appropriate, to minimize erosion and sediment transport
- Sequencing the delivery of imported fill material to minimize excessive stockpile volumes

4.1.2 Imported Fill Screening

It is our understanding that soil will be imported to achieve finished grades. Sources of imported fill have not been identified. When sources of soil are identified, we recommend pre-characterizing the import material prior to delivery on site in order to demonstrate that the material is suitable as clean fill. Pre-characterization will be necessary on a source-by-source basis. Pre-characterization may include a historical background search of past uses at the fill source site and appropriate sampling and chemical analysis based on the historical findings. If available, historical chemical analytical data can be used to show the proposed soil is suitable as clean fill. After pre-characterization is complete, further on-site evaluation of imported soil will not be exhaustive. Rather, basic qualitative observation of imported soil will be conducted on a routine basis. These routine observations of imported fill soil will consist of the following:

- Visual observation of the material, including observations for the presence of significant staining, sheens, and/or deleterious material
- Olfactory observations of the material, including observations for the presence of petroleum-like or other suspect odors

If the basic qualitative observations do not indicate the presence of contamination, the soil will be treated as clean material.

In the event that basic field observations indicate the import material is contaminated, the respective portions of fill stockpiles will be flagged or otherwise isolated for further evaluation. The fill material supplier will be notified and directed to suspend hauling until further evaluation is complete. A more intensive evaluation of the material will then be conducted and shall initially include formal field screening using the following criterion:

Staining: Generally, soil that is contaminated with petroleum hydrocarbons exhibits gray or black staining, although other contaminants and natural conditions may also cause staining.

Sheen: Sheen is another indication of petroleum contamination. Soil with a sheen may appear shiny and reflective. Sheens from heavily impacted soil may appear iridescent with rainbow-like colors. Sheens may be characterized as slight sheen, moderate sheen, and heavy sheen.

Odor: Soil impacted with petroleum products, volatile organics, and other types of contamination may release vapors when exposed to the atmosphere. If concentrated enough, these vapors will be interpreted as an odor.

PID Readings: PID readings involve the measurement of headspace vapors originating from a soil sample. PID screening is performed by placing a soil sample in a plastic bag. Air is captured

in the bag, and the bag is shaken to expose the soil to the air trapped in the bag. The probe of a PID is inserted into the bag, which measures VOC vapor (petroleum constituent) concentrations in units of ppm. A PID is designed to quantify VOC vapor concentrations in the range between 1 and 2,000 ppm. For purposes of field evaluation, a PID reading exceeding 20 ppm may indicate potentially impacted soil in addition to visual indicators described above.

Based on the results of more comprehensive field screening, GeoDesign personnel may recommend chemical analytical testing. Further analytical testing may be triggered by the observation of soil with moderate or heavy sheens, soil exhibiting strong odors, and/or soil exhibiting PID readings exceeding 20 ppm. In this event, DOE will be notified and additional chemical analyses would be completed in order to evaluate the suitability of the fill material for use at the project site

4.1.3 Exported Fill Screening

Contaminated soil is not anticipated to be encountered during earthwork activities. However, the contractor must be aware that the potential exists. Based on the debris encountered during geotechnical explorations, excavated soil may not be suitable for re-use on site. Any soil exported from the project site should be screened for the presence of contamination. The following sections provide guidance for identifying contaminated soil and the framework to properly address contaminated soil, if encountered.

4.1.4 Identification and Management of Contaminated Soil

The three primary physical indicators of petroleum-related contamination in soil include staining, sheens, and petroleum-like odor. During excavation activities, soil should be continuously observed by the excavation contractor for evidence of staining and sheen. Odor can be subjective, and inhalation of vapors from impacted soil is harmful to human health. Therefore, odor is considered an inadvertent field indicator and will not be used for continuous screening of soil. A more detailed description of the three indicators is provided in Section 4.1.2.

If soil exhibiting evidence of contamination or other debris associated with chemical contamination is encountered during excavation work (transformers, drums, other containers, and USTs), special soil handling procedures must be initiated and GeoDesign must be contacted.

GeoDesign contact information is:

- Primary contact: Mike Coenen, 503-726-3143 (direct) or 503-730-1364 (cell)
- Alternate contact: Jason O'Donnell, 503-726-3123 (direct) or 503-729-9273 (cell)

4.1.5 Soil Handling

If contaminated soil is encountered, additional characterization for export may be required to evaluate if it is considered special waste in accordance with applicable federal, state, and local regulations. Exported soil with special waste characteristics will most likely require permitted disposal at a RCRA Subtitle D landfill. The disposal receipts must be collected and maintained for all soil/material transported off site. This documentation will be needed for project closeout with DOE. Soil will not be transported to any other disposal site without prior authorization from the owner, the accepting facility, and DOE.

Site excavation oversight, field screening, and additional soil characterization may become necessary if unanticipated soil contamination is encountered. The frequency of oversight will be based on the field conditions encountered, construction schedule, and contractor requests. GeoDesign will evaluate the potential risk and disposal alternatives, as warranted.

4.1.6 Soil Stockpiling

If temporary stockpiling of contaminated soil or solid waste becomes necessary, the stockpiles must be well maintained at all times. The excavation contractor must designate the temporary stockpile location(s) prior to starting excavation or grading activities. In addition, the contractor shall separate and distinguish clean soil stockpiles from potentially contaminated soil or debris stockpiles.

Potentially contaminated soil and landfill debris stockpiled on site must be placed on impermeable plastic sheeting (minimum 6-mil thick) with a berm around the perimeter of the stockpile. The plastic sheeting and berm should be installed to prevent the runoff of stockpiled soil contaminants (e.g., chemical contaminants or sediment laden water) to surrounding areas. The berm may be constructed with hay bales or other equivalent methods. The bottom plastic sheeting should be lapped over the berm materials, and the soil stockpile within the berm should also be covered with plastic sheeting to prevent erosion or leaching of contaminants (if the stockpile contains potentially contaminated soil) from the soil stockpile impacting the underlying soil. The upper plastic sheeting covering the soil stockpile should be lapped over the berm and secured using sand bags or equivalent. The upper plastic sheeting prevents the stockpiled soil from being exposed to precipitation and wind.

The contractor is responsible for restoration of all stockpiled areas to a pre-stockpile condition. The contractor shall remove all soil, plastic sheeting, and debris from these areas and any adjacent sites, if applicable, following stockpiled soil removal. Restoration of the stockpile areas must be satisfactory to Orchard Crossing, LLC or their designated representative.

4.1.7 Soil Re-Use

Soil free of obvious indicators of contamination may be re-used on site during earthwork activities. If the soil will be used for subgrade or structural purposes, the geotechnical engineer must evaluate the suitability of the soil. Soil with obvious field indications of potential contamination shall not be re-used unless additional characterization is completed. Potentially contaminated soil designated for on-site re-use will be analyzed for the following constituents:

- VOCs
- SVOCs
- TPHs
- RCRA 8 Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver)

4.1.8 Load and Haul

In the event soil or landfill debris is hauled off site, the contractor must exercise care during loading of the project soil to minimize spillage of the soil onto the ground surface and sensitive

environments. All trucks leaving the project site will be free of loose soil. If vehicles require decontamination prior to leaving the project site, the contractor shall be responsible for constructing a truck tire wash at the project site.

Contaminated soil and/or landfill debris loaded into trucks must be covered (tarped, etc.) during transport to the disposal facility. The contractor must use care not to track soil onto City roads. The contractor must routinely clean the roads to help prevent off-site tracking. City roads will be cleaned using dry methods (e.g., sweeping) to prevent contaminated material from entering the City's storm system. Wet methods may be used for on-site roads as long as wash water cannot leave the project site and enter the City's storm system. Trucks will not be allowed to leave the project site if liquids are draining from the load. The transport of soil will be conducted in accordance with applicable WSDOT regulations. The contractor shall obtain disposal receipts from the disposal facility and provide copies as requested.

4.1.9 Erosion and Dust Control

Exposed stockpiles and graded surfaces may become susceptible to erosion by wind and water. Therefore, erosion control measures should be planned carefully and in place before excavation operations begin. Silt fences, hay bales, and/or granular haul roads will be used as required to reduce sediment transport during construction to acceptable levels. Measures to reduce erosion and control dust should be implemented in accordance with the site-specific ESCP and federal, state, and local regulations regarding erosion and sediment control. In general, erosion and sediment control measures must limit offsite sediment transport to less than 1 ton per acre per year, as calculated by the Universal Soil Loss equation.

BMPs to help control erosion and dust will be presented in the ESCP as part of the NPDES stormwater discharge permit requirements that will presumably be required for the project site.

4.1.10 Cultural Resources

The areas of planned excavations are not expected to contain cultural or archaeological artifacts. However, if cultural or archaeological resources are inadvertently discovered during excavation, work in the area must stop and the Legislative Commission on Indian Services shall be notified. The Washington State Department of Archaeology and Historic Preservation should be contacted regarding discovery or potential damage to archaeological sites. The owner and/or GeoDesign should also be contacted so that modifications to the work scope can be discussed.

4.2 SOLID WASTE MANAGEMENT

It is anticipated that during site grading and excavation activities cuts will be greater than the soil cap thickness and solid waste will be exposed. Based on our understanding, we anticipate that the typical solid waste material will be non-hazardous in nature. However, solid waste material that would be considered hazardous waste or require special handling may be present in the landfill. Management of project site-related solid waste generated during these activities is detailed in the sections below.

4.2.1 General Management Practices

General management practices will include excavating through the soil cap and landfill, proper handling and disposal of the solid waste, and management of nuisance conditions. To the

extent practicable, segregate and stockpile soil cap material for on-site re-use. Excavated solid waste can be managed in two ways: (1) stockpiling and potential replacement within the landfill or (2) off-site disposal at an appropriate disposal facility (e.g., Waste Connections of Washington).

During excavation activities, work should be conducted to help minimize the duration the solid waste is exposed and measures to help reduce odors and dust should be employed until the solid waste is covered or transported off site. These measures include covering stockpiled material with plastic sheeting (see Section 4.1.6 for stockpiling) or light watering to help reduce dust and odors. For solid waste remaining on site, the soil cap must be restored to a minimum thickness of 2 feet. If ACM is encountered, the contractor shall take appropriate measures as described in Section 4.2.2.

Given the proposed development, it is reasonable to assume that disposal of some solid waste will be required. We recommend the contractor identify a suitable disposal facility prior to site work and obtain the necessary approvals and permits. With these approvals, direct loading and hauling of the solid waste will be possible and excessive handling of the solid waste will be minimized. The contractor must exercise care during loading of the material to minimize spillage onto the ground surface and to minimize fugitive dust emissions. Trucks hauling soil or solid waste off the project site will be free of loose material on the exterior of the trucks and loads shall be covered. The contractor must use care not to track material onto any roadways and must routinely sweep the roads or perform other methods of cleanup as specified in the ESCP if material is being tracked onto them. Trucks or other equipment (e.g., backhoe) may need to be washed down on site and the collected residue properly contained and disposed of. Trucks will not be allowed to leave the project site if liquids are draining from the load. The transport of soil or solid waste will be conducted in accordance with applicable WSDOT regulations.

4.2.2 Identification and Management of Unforeseen Waste

The solid waste expected to be encountered at the project site primarily consists of refuse, including concrete, lumber, and trash, and is generally considered non-hazardous. However, acceptance practices during active landfilling at the project site may have allowed waste material that would be considered hazardous waste if removed and transported to another disposal facility. Therefore, these hazardous or special wastes, if encountered, will require special handling and disposal to comply with applicable rules and regulations. The excavation contractor should be diligent during excavation in the event USTs, drums, unmarked containers, NAPLs, sludges, ACM, and potentially explosive or otherwise intrinsically dangerous debris are encountered. Stained, discolored, or odiferous material and adhered soil containing inert concrete, asphalt, brick, wood, glass, or metal debris will not be considered as “unforeseen” conditions. GeoDesign personnel will observe the site excavation and earthwork activities to evaluate unanticipated and unforeseen conditions. GeoDesign personnel will be AHERA trained and will provide routine observation for the potential presence of ACM that will require specialized handling and disposal. Unforeseen waste material identified above will not be subject to on-site re-distribution.

If unforeseen features or conditions are encountered, the earthwork contractor will stop work and DOE will be notified. GeoDesign will evaluate the appropriate course of action to protect

human health and the environment. In the event that ACM is encountered, additional area wetting will be conducted and a licensed asbestos abatement supervisor will coordinate the containment and proper disposal and provide area clearance to proceed with the work scope.

Unforeseen waste material will be managed for off-site disposal in accordance with local, state, and federal laws and regulations. As conditions warrant, unforeseen waste will be transferred away from the work area and placed in separate stockpile(s). All stockpiled material will be placed on impermeable plastic sheeting (minimum 6-mil thick) with a berm around the perimeter of the stockpile. The plastic sheeting and berm prevent the runoff of stockpiled waste and soil contaminants to surrounding areas. The berm may be constructed with soil, hay bales, or other equivalent methods. The bottom plastic sheeting will be lapped over the berm materials, and the stockpile within the berm will be covered with plastic sheeting to prevent erosion or leaching of contaminants from the soil stockpile impacting the underlying soil. The upper plastic sheeting covering the stockpile will be secured using sand bags or equivalent.

GeoDesign will communicate with DOE on a case-by-case basis to evaluate the appropriate characterization procedures and necessary chemical analyses for unforeseen waste. The results of waste characterization will be used to support off-site disposal permitting. All unforeseen waste material designated for off-site disposal will be appropriately characterized, permitted, and transported in accordance with the receiving facility's requirements.

If encountered, the identification, characterization, management, permitting, and disposal of unforeseen waste will be documented in the Construction Completion Report.

4.3 GROUNDWATER MANAGEMENT

If dewatering is necessary, the contractor must be prepared to pump, contain, characterize, and properly treat all groundwater generated prior to discharge. Permits and associated fees related to the discharge of the treated water will likely be required. The contractor shall be responsible for obtaining the appropriate permits and paying associated fees. The permits will stipulate effluent concentration limitations for discharge depending on the discharge point and the permitting agency.

Typically, groundwater generated from dewatering activities is pumped to storage tanks, tested and treated to remove specific contaminants, and discharged to a predetermined location. The contractor will be responsible for the setup, maintenance, and modification of any required containment and treatment system.

After adequate characterization and treatment, water can be discharged to the designated discharge point. The rate and total volume will be monitored as required by the discharge permit. Discharge water shall not contain contaminants in excess of maximum constituent concentrations established by the permit. Typical constituent limitations include those for metals, total toxic organics, petroleum, and turbidity. The effluent will require periodic monitoring and sampling and associated reporting as required by the permit.

Additional reporting may include daily status of dewatering operations, maintenance of the dewatering system, flow measurements, and dewatering sump locations.

4.4 CONTRACTOR REPORTING REQUIREMENTS

The contractor is responsible for keeping a detailed daily record of soil excavation, stockpiling, export, and disposal of project site soil. This includes the purpose, origin, destination, and volume of soil that is loaded and hauled to the approved off-site disposal site(s) and transported to temporary stockpile locations (within the project site). The contractor is responsible for preparing a daily field report for distribution to GeoDesign that identifies the number of truckloads of soil transported off site and daily tonnage. In addition, the contractor is responsible for keeping detailed records of groundwater characterization, discharge rates, and total volume of groundwater discharged. Operation and maintenance records of treatment systems that may be required to treat groundwater prior to discharge will be kept and maintained by the contractor as well. As previously stated, disposal receipts and associated documentation will need to be provided to GeoDesign for inclusion in a Construction Completion Report, which will be submitted to DOE for review and project closeout.

5.0 ASSUMPTIONS AND LIMITATIONS

This CMMP is designed to provide earthwork contractors with guidance for the proper handling and management of soil, solid waste, and groundwater. This document is intended to be used as a general overview document for the use of the excavation contractor and project development team during the earthwork portions of the project.

The prime contractor will prepare and implement an HSP. The site-specific HSP fulfills "worker right to know" requirements (29 CFR 1926.59) and to help ensure adequate protection for their workers while on site. A copy of the HSP should be provided to Orchard Crossings, LLC or their designated representative prior to the start of work on the project. During work on the project, the HSP must be posted at the project site. The prime contractor is responsible for notifying subcontractors of pertinent environmental conditions. Subcontractors may either adopt the prime contractor's HSP or must prepare their own HSP. This document should be used in conjunction with, not in place of, the HSP and the project specifications. Each contractor and subcontractor is responsible for the safety of its employees, including compliance with applicable Washington OSHA regulations, and compliance with all specifications in the technical specifications manual for the project.

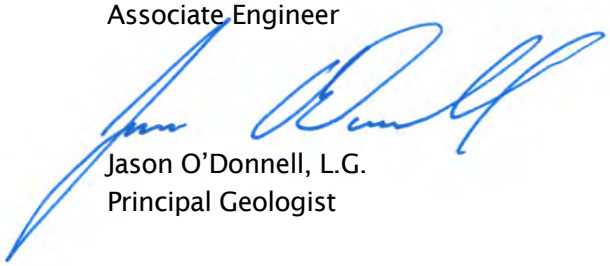
♦ ♦ ♦

If you have questions regarding this CMMP, please contact GeoDesign.

Sincerely,

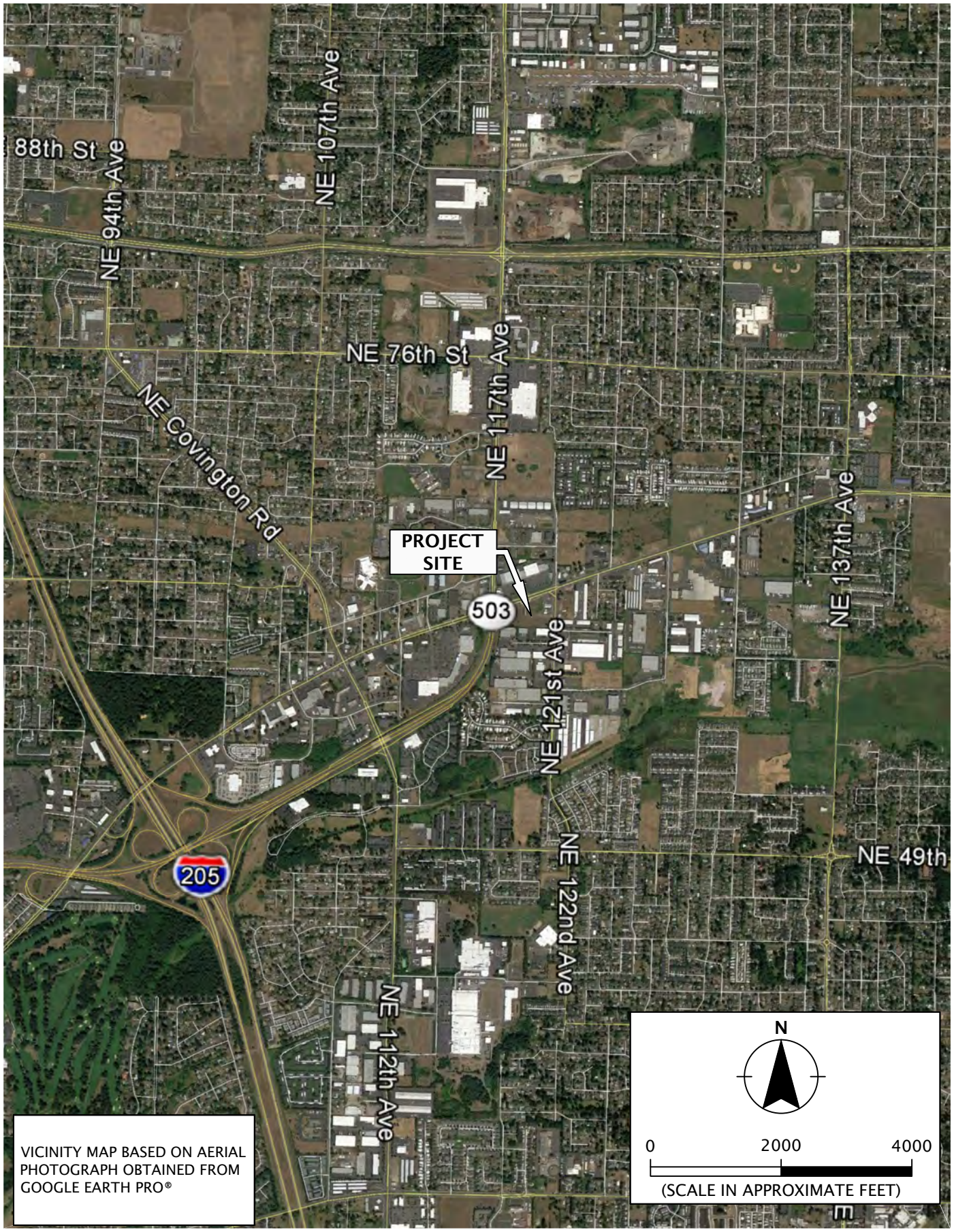
GeoDesign, Inc.

Mike F. Coenen, P.E.
Associate Engineer



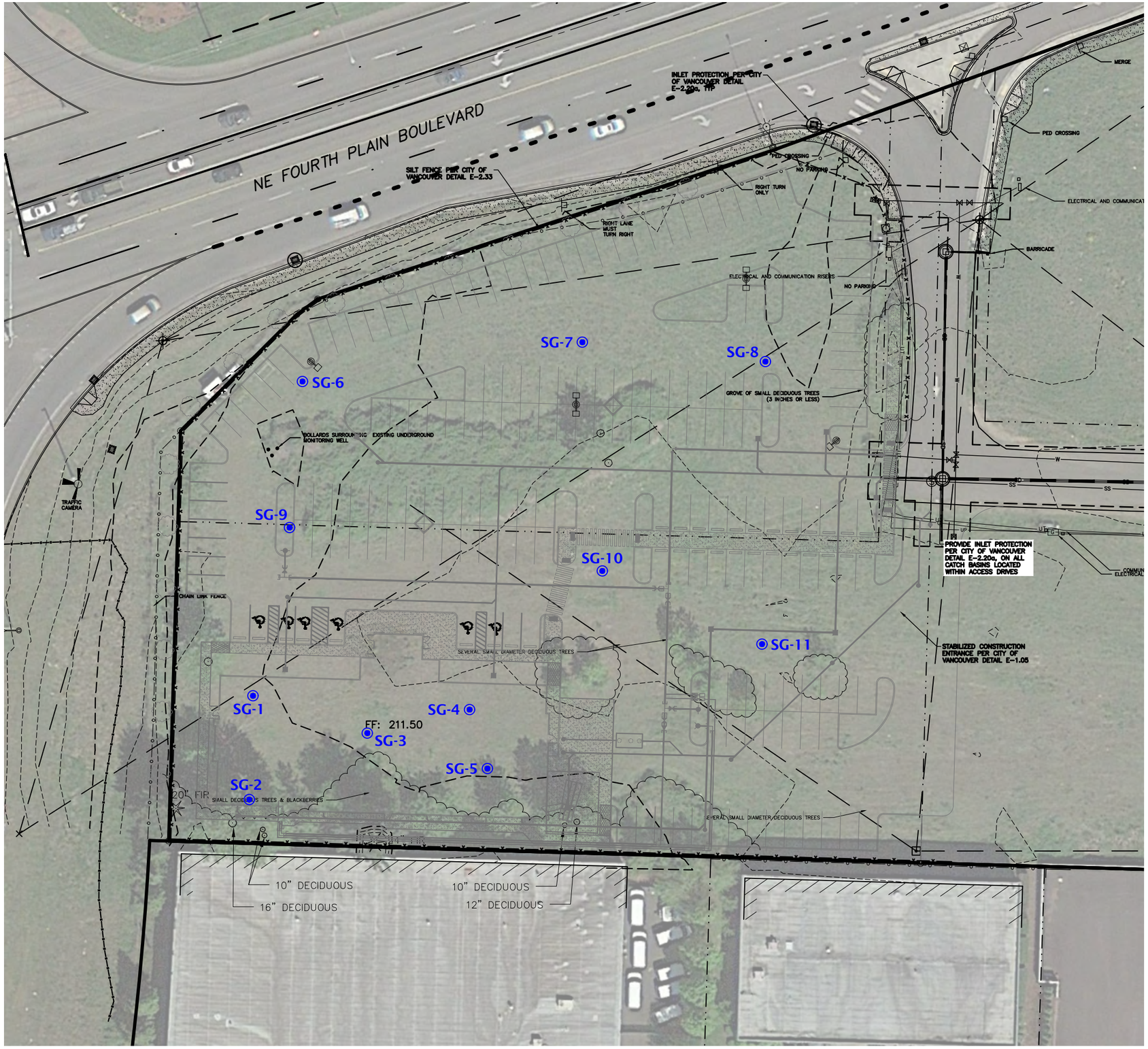
Jason O'Donnell, L.G.
Principal Geologist

FIGURES



GeoDesign Inc 9450 SW Commerce Circle - Suite 300 Wilsonville OR 97070 503.968.8787 www.geodesigninc.com	ORCHARD-1-01	**VICINITY MAP**	
	DECEMBER 2016	PROPOSED DEV. - FORMER TURNBULL LANDFILL VANCOUVER, WA	**FIGURE 1**

Printed By: mmiller | Print Date: 12/19/2016 8:32:07 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\HSP\Orchard-1-01-VM01.dwg | Layout: FIGURE 1



LEGEND:

SG-1◉ SOIL GAS SAMPLING POINT

N

0 50 100

(SCALE IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY PACE AND IMAGE OBTAINED FROM GOOGLE EARTH PRO ON AUGUST 24, 2016

SITE PLAN

PROPOSED DEV. - FORMER TURNBULL LANDFILL
VANCOUVER, WA

FIGURE 2

ORCHARD-1-01

DECEMBER 2016

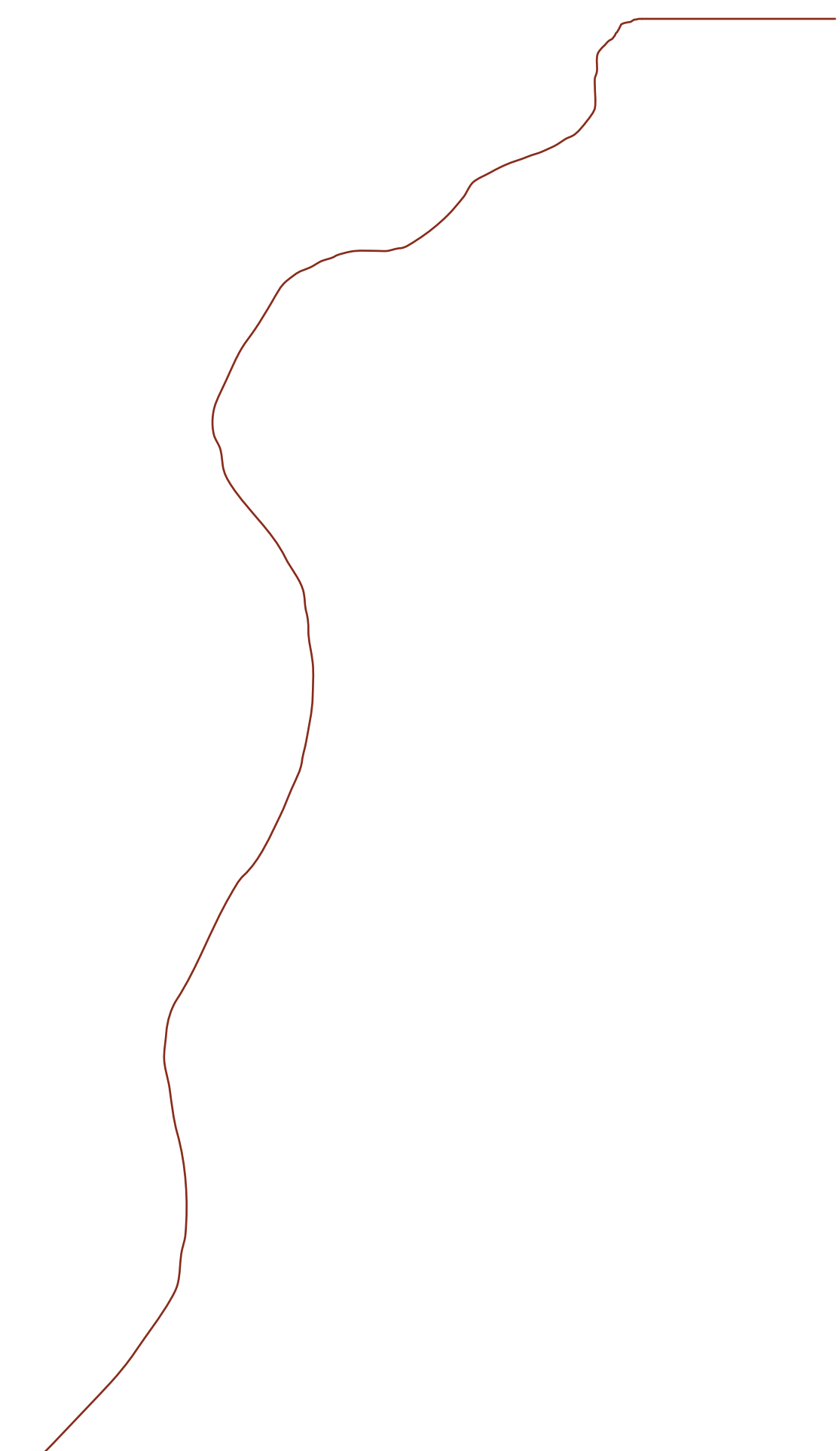
GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

Printed By: mmiller | Print Date: 12/19/2016 8:32:09 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\HSP\Orchard-1-01-SP03.dwg | Layout: FIGURE 2

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

ACM	asbestos-containing material(s)
AHERA	Asbestos Hazard Emergency Response Act
BGS	below ground surface
BMP	best management practice
CFR	Code of Federal Regulations
CMMP	Contaminated Media Management Plan
DOE	Washington State Department of Ecology
ESCP	Erosion and Sediment Control Plan
HSP	Health and Safety Plan
NAPL	non-aqueous phase liquid
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PID	photoionization detector
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
SVOC	semi-volatile organic compound
TPH	total petroleum hydrocarbon
UST	underground storage tank
VOC	volatile organic compound
WSDOT	Washington State Department of Transportation



APPENDIX E

GeoDesign INC

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington

For
Orchard Crossings, LLC
December 19, 2016

GeoDesign Project: Orchard-1-01

GeoDesign Inc

December 19, 2016

Orchard Crossings, LLC
c/o Redmond Geotechnical Services, LLC
P.O. Box 20547
Portland, OR 97294

Attention: Daniel M. Redmond, P.E., G.E.

Site-Specific Health and Safety Plan
Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington
GeoDesign Project: Orchard-1-01

GeoDesign, Inc. is pleased to submit this site-specific Health and Safety Plan (HSP) for the proposed development at the former Turnbull Landfill located southeast of SR 500 and NE Fourth Plain Boulevard in Vancouver, Washington (project site). This site-specific HSP contains a description of existing project site conditions and responsibilities of project personnel and describes the criteria for hazard and risk evaluation, levels of personal protection, air monitoring procedures, decontamination procedures, safety rules, emergency response procedures, training requirements, and standards for routine healthcare monitoring. Please call us if you have questions regarding this site-specific HSP or any aspect of the project.

Sincerely,

GeoDesign, Inc.

Jason O'Donnell, R.G.
Principal Geologist

cc: Panjini Balaraju, Washington State Department of Ecology (via email only)

NJF:MFC:JSO:kt
Attachments
One copy submitted (via email only)
Document ID: Orchard-1-01-121916-envr-HSP.docx
© 2016 GeoDesign, Inc. All rights reserved.

TABLE OF CONTENTS **PAGE NO.**

1.0 INTRODUCTION

This site-specific HSP has been prepared to identify and address potential hazards and safety issues during construction of the proposed development at the former Turnbull Landfill located southeast of SR 500 and NE Fourth Plain Boulevard in Vancouver, Washington (project site). This site-specific HSP contains a description of existing project site conditions and responsibilities of project personnel and describes the criteria for hazard and risk evaluation, levels of personal protection, air monitoring procedures, decontamination procedures, safety rules, emergency response procedures, training requirements, and standards for routine healthcare monitoring.

GeoDesign, Inc. has prepared and will implement this site-specific HSP for its employees and employees of subcontractors contractually bound to GeoDesign during project site activities. Other consultants, agencies, and contractors not under the direction of GeoDesign will be responsible for developing and implementing their own HSPs. The project site and surrounding area is shown on Figure 1, the project site layout is shown on Figure 2, the Health and Safety Plan Acknowledgement Form is included as Figure 3, the Emergency Information Sheet is included as Figure 4, and the Health and Safety Signature Page is included as Figure 5.

Acronyms and abbreviations used herein are defined at the end of this document.

2.0 PROJECT DESCRIPTION AND BACKGROUND

The former Turnbull Landfill encompasses approximately 6.5 acres. The project site is currently undeveloped and comprised of approximately 2.55 acres of the western portion of the landfill. The project site is bound by NE Fourth Plain Boulevard to the north, SR 500 to the west, a commercial and light industrial development to the south, and undeveloped former landfill property to the east. The proposed development will include the construction of an approximately 11,100-square-foot, one-story structure on the project site with associated infrastructure, including new roadways, parking lots, and utilities.

Based on our review of available documentation, we understand the project site was operated as a gravel quarry from the early 1900s through the early to mid-1960s. Following cessation of gravel mining, the site operated as a permitted solid waste landfill beginning sometime in 1969 by the Turnbull Construction Company, the former property owner. The landfill accepted construction debris and demolition debris, as well as municipal solid waste. The solid waste disposal permit was reportedly revoked by the Southwest Washington Health District in 1973 due to permit non-compliance. Some non-permitted solid waste disposal occurred at the project site through at least 1974.

The former Turnbull Landfill is a listed cleanup site in DOE's cleanup site database. Sometime in the late 1990s surficial landfill refuse and debris were removed from the project site and an engineered protective soil cap was installed and graded to help minimize surface water infiltration and to help facilitate redevelopment of the project site. In 2000 DOE determined the project site was eligible for an NFA determination, which included institutional controls in the form of a restrictive covenant.

Between 1983 and 2006 a number of geotechnical and environmental investigations were completed to evaluate the content and extent of the solid waste. Prior site explorations completed by GeoDesign indicate the protective cap material consists of a 12- to 36-inch-thick layer of dense, brown sand with some gravel underlain by fill to depths varying between 8 and 18 feet BGS. The fill contains variable amounts of refuse, including concrete, lumber, and trash. Native sand and gravel deposits are present below the fill. Groundwater was reportedly encountered at depths varying between 15 and 20 feet BGS.

3.0 HEALTH AND SAFETY PLAN PURPOSE

This HSP applies to GeoDesign and subcontractor personnel performing field activities at the project site. Other site visitors, including other consultants, contractors, regulatory agency representatives, and City officials, entering the work zones will be briefed by the SSO regarding project site hazards, but they must use their own HSPs.

GeoDesign personnel and subcontractor personnel must read and understand this HSP prior to participation in on-site work. After an individual has read and understands this HSP, the individual must sign and date the acknowledgment form (Figure 3). Prior to beginning daily on-site activities, the SSO will conduct a tailgate safety meeting with on-site GeoDesign personnel and subcontractor personnel. The purpose of the tailgate safety meeting will be to address health and safety issues relevant to the planned daily activities. The SSO assigned to the project will maintain a record of the tailgate safety meeting(s).

This HSP is designed to be flexible so unanticipated site-specific problems can be addressed. This HSP may be modified at any time based on the judgment of the SSO, PM, and HSM. Modifications to this HSP will be documented, and the HSP participants will acknowledge modifications to the HSP by re-signing and dating the acknowledgment form.

4.0 RESPONSIBLE INDIVIDUALS

Site safety for GeoDesign field personnel and subcontractor personnel during construction activities will be the responsibility of the SSO, PM, and HSM. Site safety for site visitors, including other consultants, contractors, regulatory agency representatives, and City officials, is the responsibility of each individual employer.

The SSO or PM will be present during most activities conducted during the mass grading, excavating, and installing a methane mitigation system. Specifically, safety-related responsibilities for the PM include overall project safety policies, planning, and execution. The PM will be responsible for making project-level decisions regarding safety issues and operations in consultation with the SSO.

The SSO will be responsible for the day-to-day activities, including implementation of the HSP during construction activities. The SSO will notify the PM of unanticipated conditions that are encountered during construction activities that may necessitate modification to this HSP. In addition, the SSO will be responsible for implementing the appropriate level of

personal protection for activities that could expose refuse, as outlined in Section 11.0, but will suspend work and evacuate the work area if hazards are encountered that are not addressed in this HSP or if action levels are exceeded.

Once work is suspended due to safety concerns, only the PM and HSM can evaluate whether work can resume following evaluation of the hazard. The HSM is responsible for resolving problems or issues concerning health and safety and is a resource person for information, procedures, and safety equipment.

5.0 WORK AREA AND SECURITY

Excavation and grading activities may occur across the project site during site redevelopment. Overall work area security will be typical of most construction sites (security fence, signage, etc.) and project site access will be limited to those contractors, agency personnel, and others with specific purpose and necessary work tasks. Security measures, in addition to that typical of a construction site, will be required if contaminated fill is identified during excavation. LFG, if present, will dissipate in well-ventilated areas to safe levels on exposure to atmospheric conditions and is not anticipated to represent a hazard during excavation activities. However, additional safety provisions, general awareness, and notification to GeoDesign, as necessary, are required during excavation of soil containing organic or deleterious material because of the potential for LFG accumulation. Trenches and low-lying areas may pose an increased hazard due to LFG accumulation.

In the event that contaminated fill is encountered, or if routine monitoring of atmospheric work area conditions or excavations/trenches results in methane detections exceeding 1.25 pbv (i.e., 25 percent of the LEL for methane), an area-specific exclusion zone will be established pending additional evaluation and development of appropriate response actions for worker protection. The exclusion zone will be an area with a radius of approximately 25 feet surrounding the designated work area. For exclusion zones established for contaminants other than methane, only 40-hour, OSHA-trained team members will be allowed in the exclusion zone pending evaluation of project site conditions and determination of appropriate response actions. Protective gear described in Section 11.0 will be required in the exclusion zone. Prior to leaving the exclusion zone, personnel and equipment will be decontaminated, as outlined in Section 13.0. In addition, a support vehicle shall be present near the entrance of the exclusion zone with a mobile telephone, first-aid kit, and a fire extinguisher.

Project site visitors will not be allowed within the exclusion zone. Individuals that enter an established exclusion zone must complete the training discussed in Section 21.0 and the healthcare monitoring discussed in Section 22.0 unless otherwise directed by the SSO. Field team members will be responsible for prohibiting access to unauthorized individuals.

Field team members should direct inquiries from the news media to the project superintendent. At the end of each day's activities, exclusion zones shall be appropriately secured with fencing or other methods to help prevent access.

6.0 PLANNED ACTIVITIES

Anticipated activities during the construction of the project site development include excavating and grading, trenching, aggregate pier drilling, installing utilities, installing the methane mitigation system, and constructing the building. GeoDesign personnel will not be involved with all of these activities, but activities may occur concurrently and personnel will need to be aware of the associated safety issues.

7.0 HAZARD EVALUATION

The primary project site hazards are associated with the potential presence of methane and hydrogen sulfide gas as a result of decomposition of the solid waste. In addition, if excavating at depths greater than the landfill cap, the landfill material may contain one or more of the following contaminants: VOCs, TPH, ACM, PCBs, PAHs, and metals. Environmental investigations previously conducted on the landfill reported lead and TPH detected in soil samples and dissolved manganese/select metals in groundwater samples. In addition, 27 soil gas probes were installed on the project site within the upper 4 feet along the perimeter of the landfill. LFG was not detected in the soil gas probes. However, it is possible that LFG may be encountered during construction activities at the project site.

If areas of organic debris are encountered during grading, the constituents of potential concern are methane and hydrogen sulfide gas. Organic debris existing in an anaerobic environment can generate methane gas. Although methane is not toxic, it poses a hazard as an asphyxiant and may pose an explosive hazard at concentrations of 5 to 15 pbv. In addition, hydrogen sulfide can be present in the subsurface. Hydrogen sulfide is toxic and is also explosive at concentrations of 4 to 44 pbv. Air monitoring for methane and hydrogen sulfide will be conducted during field activities as described in Section 12.0.

8.0 TOXICITY AND POTENTIAL EXPOSURE

If contaminated soil is encountered during grading or excavation activities, potential exposure pathways may include (1) inhalation/ingestion of contaminated airborne particles and vapors, (2) ingestion of contaminated media, and (3) dermal and/or eye contact with contaminated media or equipment. If contaminated soil is encountered, workers should leave the affected area to mitigate potential exposure. Project site workers involved in assessing contaminant conditions or removal activities will wear PPE as described in Section 11.0.

The PM and DOE should be notified of excavation activities in areas of high organic content, and appropriate precautions should be employed. Although methane has negligible toxicity, methane may cause an explosive hazard under certain conditions and may also result in oxygen-deficient environments (subgrade or enclosed space) that may cause asphyxiation. Hydrogen sulfide can cause eye and upper respiratory irritation and central nervous system effects. It has a TLV of 1 ppm, an STEL of 5 ppm, and an IDLH of 100 ppm. Hydrogen sulfide has a distinct rotten egg odor, which is generally detectable below the assigned exposure limits. However, continued exposure to hydrogen sulfide will rapidly fatigue the sense of smell. Therefore, odor cannot be used as a reliable indicator of the presence of hydrogen sulfide. In addition, hydrogen

sulfide is slightly heavier than air and can accumulate in excavations, trenches, or low-lying areas. Air monitoring requirements are presented in Sections 12.0.

If potentially hazardous materials as described in Section 7.0 are encountered, they will be segregated from clean material and evaluated for disposal options. All material that is considered hazardous waste will be properly characterized and disposed of in a landfill designated for hazardous waste disposal.

9.0 PHYSICAL INJURY

Field work near heavy machinery will pose physical hazards. Workers must be aware of activity around equipment and be prepared to avoid moving equipment. Prior to intrusive activity, underground utilities should be clearly marked. General construction safety practices will be followed during all field activities.

Given the potential for LFG (including methane and hydrogen sulfide) accumulation or oxygen-deficient environments in confined spaces, specific field procedures and protocol must be followed to mitigate potential for physical injury. LFG may accumulate in trenches or other confined space excavations. Based on this potential, smoking will not be allowed within 25 feet of trenches or confined space excavations. Trenches or excavations greater than 4 feet in depth that require access by construction personnel will require pre-entry air monitoring of methane, hydrogen sulfide, and oxygen levels in addition to proper shoring. Workers will not be allowed entry into such trenches or excavations with oxygen levels less than 19.5 pbv, methane at concentrations exceeding 1.25 pbv, or hydrogen sulfide concentrations exceeding 1 ppm. Clearance monitoring will be required for worker entry into trenches or excavations to conduct work involving the use of electrical tools or equipment that may generate heat or spark.

10.0 HEAT- AND COLD-RELATED STRESS

Heat-stress monitoring during field activities will be conducted if air temperatures exceed 80 degrees Fahrenheit. The initial work period should be set at two hours, and workers should monitor their pulse rate for 30 seconds at the beginning of rest periods. If the pulse rate exceeds 110 beats per minute, the next work period will be shortened by one-third. To prevent heat-induced illness, such as heat cramps, heat exhaustion, and/or heat stroke, workers will maintain appropriate work/rest cycles and drink plenty of water that is supplemented with electrolytes.

Cold temperatures also can pose health hazards. If the temperature drops below 40 degrees Fahrenheit, workers will wear adequate insulated clothing and work periods may be shortened.

11.0 PERSONAL PROTECTION

Based on current conditions identified at the project site, the level of protection required for general construction workers and other on-site personnel will be Level D, which includes hard hat, safety glasses, steel-toe boots, and safety vest. If contamination is encountered during

grading, construction site workers will secure the area from general access, and appropriately trained and knowledgeable personnel will wear, at a minimum, Modified Level D protection consisting of the following:

- Hard hat
- Safety glasses with side guards
- Thin disposable latex or PVC inner gloves with nitrile outer gloves
- Chemically resistant steel-toe boots
- Safety vest

Other safety gear that will be on site during site work will include a first-aid kit, mobile telephone, and fire extinguisher.

12.0 AIR MONITORING

A calibrated LandTec GEM-2000 Plus Gas Analyzer will be used to monitor methane and hydrogen sulfide concentrations during site excavation and grading activities. Based on previous field-measured concentrations, earthwork activities resulting in confined spaces that would allow accumulation of methane, hydrogen sulfide, or oxygen deficient environments are not anticipated. However, monitoring of atmospheric work area conditions will be performed routinely during earthwork activities that encounter landfill debris at a minimum of twice weekly to verify safe work conditions. Monitoring will be conducted more frequently in areas observed to have increased organic material content or when workers enter trenches or low areas where methane or hydrogen sulfide can accumulate. If detections of oxygen at concentrations less than 19.5 pbv, methane at concentrations greater than 1.25 pbv, or hydrogen sulfide at concentrations greater than 1 ppm occur in the work area, work in the area will be stopped and the PM and SSO will further evaluate conditions before work can continue.

Smoking will not be allowed within 25 feet of trenches or confined space excavations. For trenches or excavations greater than 4 feet in depth that require access by construction personnel, pre-access monitoring of methane, oxygen, and hydrogen sulfide levels is required prior to entry. Workers will not be allowed entry into such trenches or excavations prior to conducting the monitoring or if results of the monitoring indicate oxygen levels less than 19.5 pbv, methane at concentrations exceeding 1.25 pbv, or hydrogen sulfide levels exceeding 1 ppm. Clearance monitoring will be required for worker entry into excavations or trenches to conduct work involving the use of electrical tools that may generate heat or spark. A calibrated Mini Rae PID will also be used to monitor VOCs as part of additional assessment in areas of suspected contamination. The PID will be calibrated prior to each sampling period using the manufacturers' recommended procedures. A calibration record will be maintained during the evaluation.

The PID will be used to evaluate the level of protection needed to eliminate exposure to VOCs in areas of contamination. If VOCs exceed 25 ppm for more than 15 minutes in the breathing zone, the workers will be instructed to wear respirators with air-purifying high efficiency

particulate air/organic vapor cartridges. If VOCs exceed 150 ppm for more than 15 minutes in the breathing zone, activities will cease until the SSO can evaluate conditions and activities can be safely continued.

13.0 DECONTAMINATION PROCEDURES

Proper decontamination procedures to help minimize the risk of contaminants leaving the project site will be required following the completion of activities that disturb the soil where suspect contamination is observed. Decontamination procedures are presented in the following subsections.

13.1 PERSONNEL DECONTAMINATION

Personnel involved with activities that disturb solid waste and/or suspected contaminated soil at the project site will complete full decontamination procedures prior to leaving the project site and/or eating lunch.

Full Decontamination Procedures

- Clean boots in a Liquinox wash and rinse the boots twice in clean tap water
- Remove gloves and discard in labeled drum
- Wash hands and face soap and clean tap water

13.2 EQUIPMENT DECONTAMINATION

Non-disposable equipment will be decontaminated prior to leaving the project site. The heavy equipment used to disturb solid waste and/or suspected contaminated soil will be cleaned with a hot water pressure wash prior to leaving the project site. Hand tools and other similar equipment, such as sampling equipment, will be cleaned with a Liquinox wash and rinsed with clean tap water.

13.3 EMERGENCY DECONTAMINATION

In case of an emergency, gross decontamination procedures will be implemented, if possible. If life-threatening injury occurs that results in the individual becoming highly contaminated, and the injured person cannot undergo decontamination procedures without incurring additional injuries or risk, the person should be wrapped in plastic and transported to PeaceHealth Southwest Medical Center. Hospital officials will be notified of the type of injury and given additional information regarding the most probable contaminant(s).

14.0 DISPOSAL OF CONTAMINATED MATERIALS AND LIQUIDS

Equipment and materials will be collected for proper disposal. After use, personal protective clothing (such as used Tyvek and rubber gloves) shall be rendered unusable and contained in 55-gallon drums. Water collected during decontamination of equipment and personal protective clothing (such as boots) will be captured and stored in 55-gallon drums. Drums will be labeled and kept in a secure area until disposal can be arranged.

15.0 HOUSEKEEPING

Work areas will be kept clean and orderly at all times. Ordinary refuse will be placed in suitable trash containers and transported off site. Unnecessary materials and supplies will not be introduced to the exclusion zone to help minimize the amount of material requiring special handling and disposal.

16.0 MATERIAL HANDLING

Excavated material from identified areas of contamination will be transferred directly into 55-gallon drums or appropriately stockpiled on plastic sheeting to lessen the potential of tracking contaminated material across the project site. The excavated material will be temporarily stored on site for later disposal unless provisions have been established for direct loading of the material to trucks for transportation to an approved disposal facility.

17.0 SPILL CONTROL

Fuels and other hazardous material brought onto the project site will be limited in quantity. Stored flammable liquids will be confined to flammable storage cans or drums. During fueling operations, drip pans and absorbent socks must be used to help ensure that fuels are not spilled. If greater than 55 gallons of fuel are to be stored on site, a proper storage area with appropriate containment must be instituted.

18.0 FIRE MITIGATION MEASURES

Suitable fire extinguishing equipment, consisting of portable fire extinguishers, shall be maintained in a state of readiness for instant use. At a minimum, portable fire extinguishers must be located on each vehicle operating at the project site and at any flammable chemical storage location. The extinguishers need to be fully charged and inspected on at least a monthly basis. Workers that are expected to use portable fire extinguishers must have fire extinguisher training within the last year.

During particularly dry periods (summer months), the SSO, or designee, shall patrol the work areas at the conclusion of daily work activities, or more frequently if needed, to check for smoldering fire.

19.0 SITE-SPECIFIC SAFETY RULES

Safety is the responsibility of every individual involved with the project. While in an established exclusion zone, properly followed procedures are essential for personal safety and to help minimize lost time due to injuries and/or accidents involving equipment or unnecessary exposure to contaminants. General safety rules that each field person must follow are listed below.

- All personnel must comply with established safety procedures. On-site field workers who do not comply with this HSP may be immediately dismissed from the project site.
- Working while under the influence of intoxicants, narcotics, or controlled substances is prohibited.
- Care should be taken around equipment, as protective clothing, fingers, and/or hair could be caught in moving parts and machinery may become extremely hot during use.
- Earplugs should be used when working around loud machinery.
- Eating, drinking, and/or smoking are not allowed within the exclusion zone.
- Exchange of PPE will not be allowed.
- If physical discomfort is experienced (abnormalities such as light-headedness), work will immediately stop and the affected individual will leave the exclusion zone.
- At least two people must be present in the exclusion zone at all times while it is occupied.

20.0 EMERGENCY RESPONSE PROCEDURES

This section outlines the emergency response procedure in case there is an accident during work conducted at the project site.

20.1 EMERGENCY TELEPHONE NUMBERS

PeaceHealth Southwest Medical Center
400 NE Mother Joseph Place
Vancouver, WA 98664
(360) 514-2000

Ambulance/Fire
911

SSO – Nathan Fulton, GeoDesign (503) 968-8787 or (503) 780-1545

PM – Mike Coenen, GeoDesign (503) 968-8787 or (503) 730-1364

HSM – Andrew Blake, GeoDesign (503) 968-8787 or (971) 409-6980

20.2 EMERGENCY PROCEDURES

For an injury that is not life threatening, the following procedures should be used:

- Cease all work in the immediate area of the accident.
- Evaluate the accident and begin first aid, as needed.
- Initiate decontamination (see Section 13.0).
- Call hospital and ambulance.
- Notify the PM and HSM.
- Document the accident to the fullest extent possible and include interviews with witnesses.

For a life-threatening injury, the following procedures should be used:

- Cease all work at the project site.
- Call 911.
- Evaluate the accident and begin life-saving first aid.
- After trained personnel have taken over the emergency situation, call the PM and HSM.
- Document the accident to the fullest extent possible and include interviews with witnesses.

20.3 ON-SITE EMERGENCY EQUIPMENT

An industrial first-aid kit, mobile telephone, and a fire extinguisher will be kept in the construction office at all times and in the support field vehicle located near the exclusion zone, if established. A copy of the Emergency Information Sheet is presented as Figure 4. A map to the nearest hospital will be maintained in the construction office and support vehicle at all times during site field work.

20.4 EVACUATION

The SSO will be responsible for evaluating whether circumstances exist that require re-evaluation of the potential hazard and/or evacuation of the project site. The SSO will always assume the worst-case conditions until evidence suggests otherwise. Specific evacuation procedures, such as warning signals, will be covered during the tailgate health and safety meeting prior to beginning field activities. The two levels of evacuation that may need to be considered include (1) withdrawal from the immediate work area on site and (2) evacuation of the surrounding area. In the event that either level of evacuation is initiated, the SSO will notify the PM and HSM as soon as possible.

21.0 TRAINING

An initial orientation meeting will be held prior to beginning field activities. In addition, a tailgate meeting will be held every morning prior to starting activities for the day. The initial orientation meeting will be conducted by the SSO and will include the following:

- Overview of the project's scope
- Review of the health effects and hazards of chemicals identified or suspected to be on the project site
- Review of personal protection and decontamination requirements
- Review of the exclusion zone and accepted practices for entry and exit
- Review of emergency response procedures, as specified in Section 20.0
- Review of the specific job descriptions and assignments
- Review of medical requirements

Daily tailgate meetings will include the following:

- Review of planned activities for the day and individual responsibilities
- Review of potential new hazards that could be encountered
- Review of past activities as they relate to health and safety issues
- Review of personal protection and decontamination requirements

The initial orientation meeting and all subsequent tailgate meetings will be fully documented and recorded in project field reports.

All personnel performing on-site intrusive tasks related to hazardous waste shall have completed formal hazardous waste training that complies with OSHA 1910.120(e)(2). A certificate of the completed training will be made available to the SSO upon request. In addition, personnel shall demonstrate that they are trained to perform tasks they are assigned to perform during field activities, such as operating heavy equipment.

22.0 HEALTHCARE MONITORING

If contamination from hazardous substances is encountered, the SSO will evaluate contaminant conditions, establish an appropriate response, and identify appropriate personnel and training requirements. Personnel entering areas of suspected or known contamination to assess conditions or conduct remedial action may be required to have a baseline medical examination and receive annual updates unless otherwise directed by the SSO or HSM. If exposures are known or suspected to have occurred during activities in such areas, follow-up examinations may be appropriate. Documentation of medical examinations will be submitted to the SSO upon request, prior to the start of specific activities in areas of identified potential contamination by hazardous substances other than LFG, if encountered.

23.0 REFERENCES

American Conference of Governmental Industrial Hygienists. *TLVs and BEIs, Based on the Documentation of the Threshold Value Limits for Chemical Substances and Physical Agents and Biological Exposure Indices*, 2012.

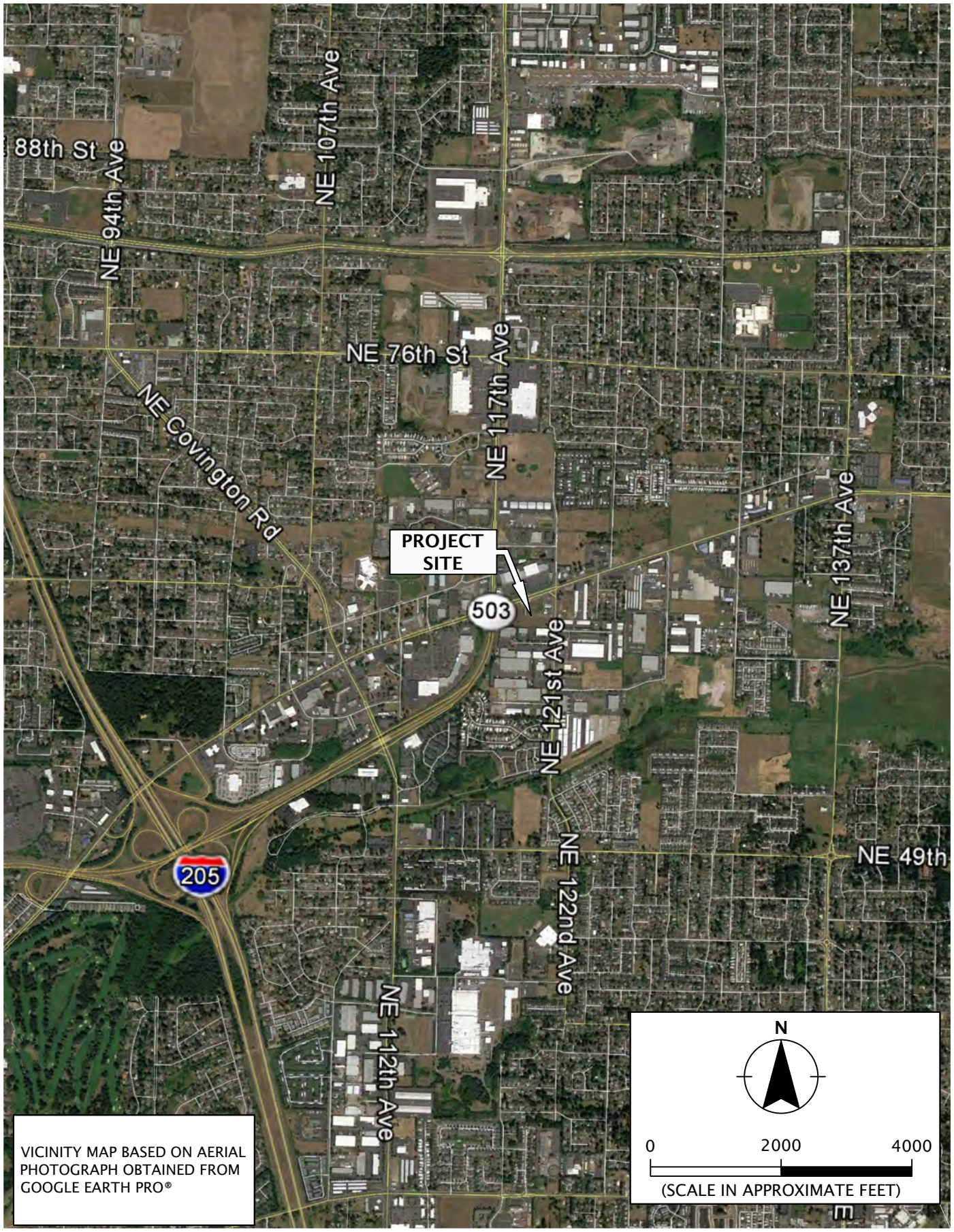
Department of Ecology, State of Washington, Final *Periodic Review Report; Turnbull Landfill; Facility Site ID#: 51658363, 12001 NE Fourth Plain Boulevard, Orchards, Washington,* dated January 2014.

Department of Health and Human Services. *NIOSH Pocket Guide to Chemical Hazards*, NIOSH Publications, Cincinnati, Ohio, Pub. No. 2005-149, September 2007.

Office of Solid Waste and Emergency Response (OSWER) Directive. *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA,* OSWER 9355.3-01, 1988.

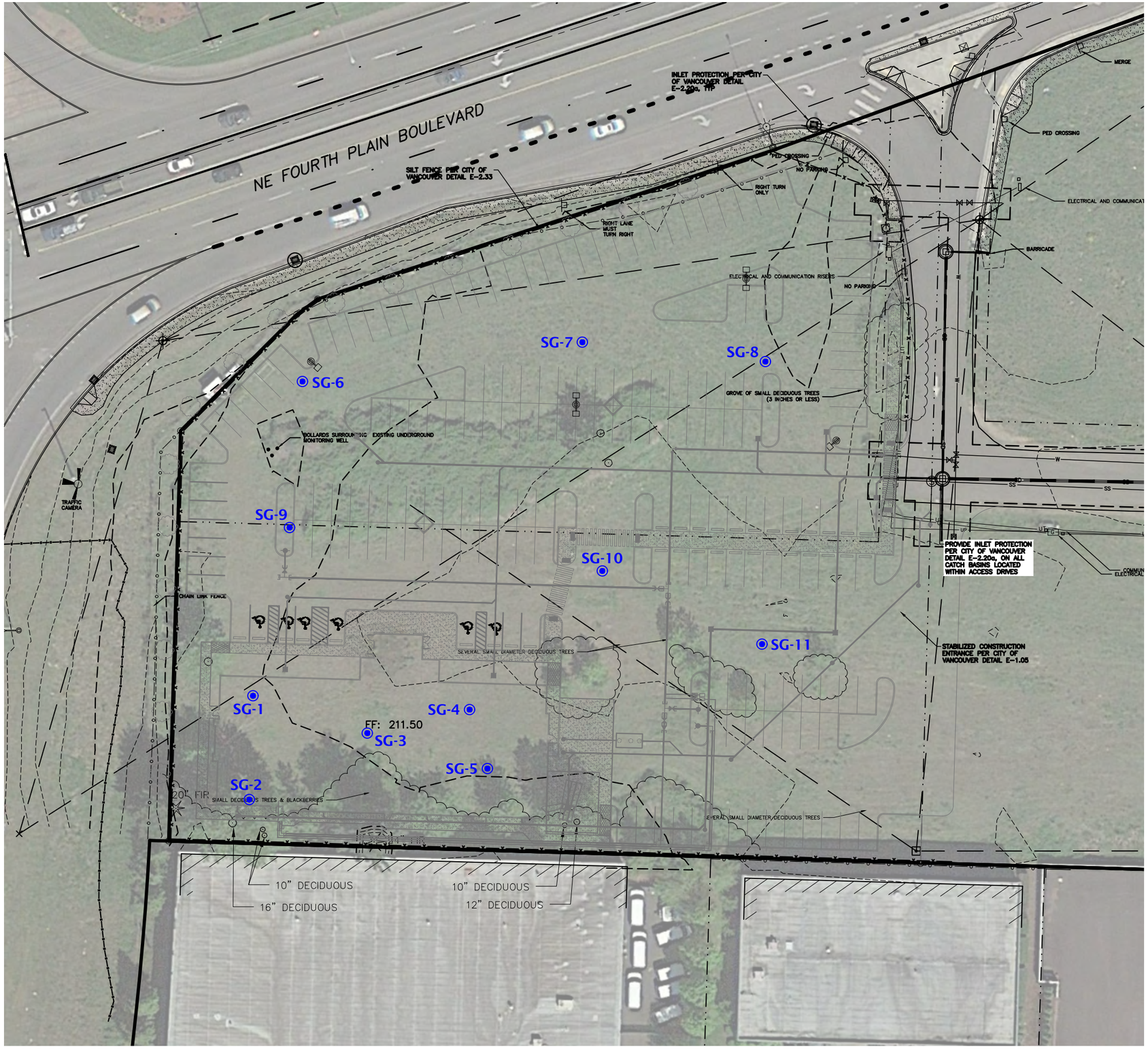
U.S Environmental Protection Agency Environmental Response Branch, Hazardous Support Division, *Standard Operating Safety Guides,* June 1992. Updated in June 1992

FIGURES



GeoDesign Inc 9450 SW Commerce Circle - Suite 300 Wilsonville OR 97070 503.968.8787 www.geodesigninc.com	ORCHARD-1-01	**VICINITY MAP**	
	DECEMBER 2016	PROPOSED DEV. - FORMER TURNBULL LANDFILL VANCOUVER, WA	**FIGURE 1**

Printed By: mmiller | Print Date: 12/19/2016 8:32:07 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\HSP\Orchard-1-01-VM01.dwg | Layout: FIGURE 1



LEGEND:

SG-1◉ SOIL GAS SAMPLING POINT

N

0 50 100

(SCALE IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY PACE AND IMAGE OBTAINED FROM GOOGLE EARTH PRO ON AUGUST 24, 2016

SITE PLAN

PROPOSED DEV. - FORMER TURNBULL LANDFILL
VANCOUVER, WA

FIGURE 2

ORCHARD-1-01

DECEMBER 2016

GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

Printed By: mmiller | Print Date: 12/19/2016 8:32:09 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\HSP\Orchard-1-01-SP03.dwg | Layout: FIGURE 2

FIGURE 3

HEALTH AND SAFETY ACKNOWLEDGEMENT FORM

NAME OF FIRM	DATE OF VISIT	SIGNATURE

FIGURE 4

EMERGENCY INFORMATION SHEET

HOSPITAL
PeaceHealth Southwest Medical Center
400 NE Mother Joseph Place
Vancouver, WA 98664
(360) 514-2000

DIRECTIONS
Leave the project site to the north and turn right onto NE Fourth Plain Boulevard. Turn left onto NE 121st Avenue and turn left onto NE 65th Street. Turn left on NE 117th Avenue and continue straight onto SR 500. After approximately 1.5 miles, take the I-205 South exit toward Salem. After approximately 2.2 miles, take Exit 28 for Mill Plain Boulevard. Turn right on SE Mill Plain Boulevard. After approximately 0.9 mile, turn right onto NE Mother Joseph Place.

GENERAL EMERGENCY

Fire, Police, Ambulance	911

EMERGENCY NUMBERS

PeaceHealth Southwest Medical Center	(360) 514-2000
Police Non-Emergency Calls	(360) 693-3111
Fire Non-Emergency Calls	(360) 487-7212
DOE (Panjini Balaraju)	(360) 407-6335

<u>In the event of an emergency:</u>

- Call 911 and give the following information:
  - Where the emergency is located
  - Phone number you are calling from
  - What happened
  - How many people were involved
  - What is being done
  - Hang up after all information is given
- If the victim can be moved, transport the victim to PeaceHealth Southwest Medical Center.
- Notify the SSO, PM, and HSM.

FIGURE 5

HEALTH AND SAFETY SIGNATURE PAGE

SITE: PROPOSED DEVELOPMENT – FORMER TURNBULL LANDFILL
LOCATION: SOUTHEAST OF SR 500 AND NE FOURTH PLAIN BOULEVARD; VANCOUVER, WA

Plan approved:

PM	Date
HSM	Date

Plan revised:

Name	Date

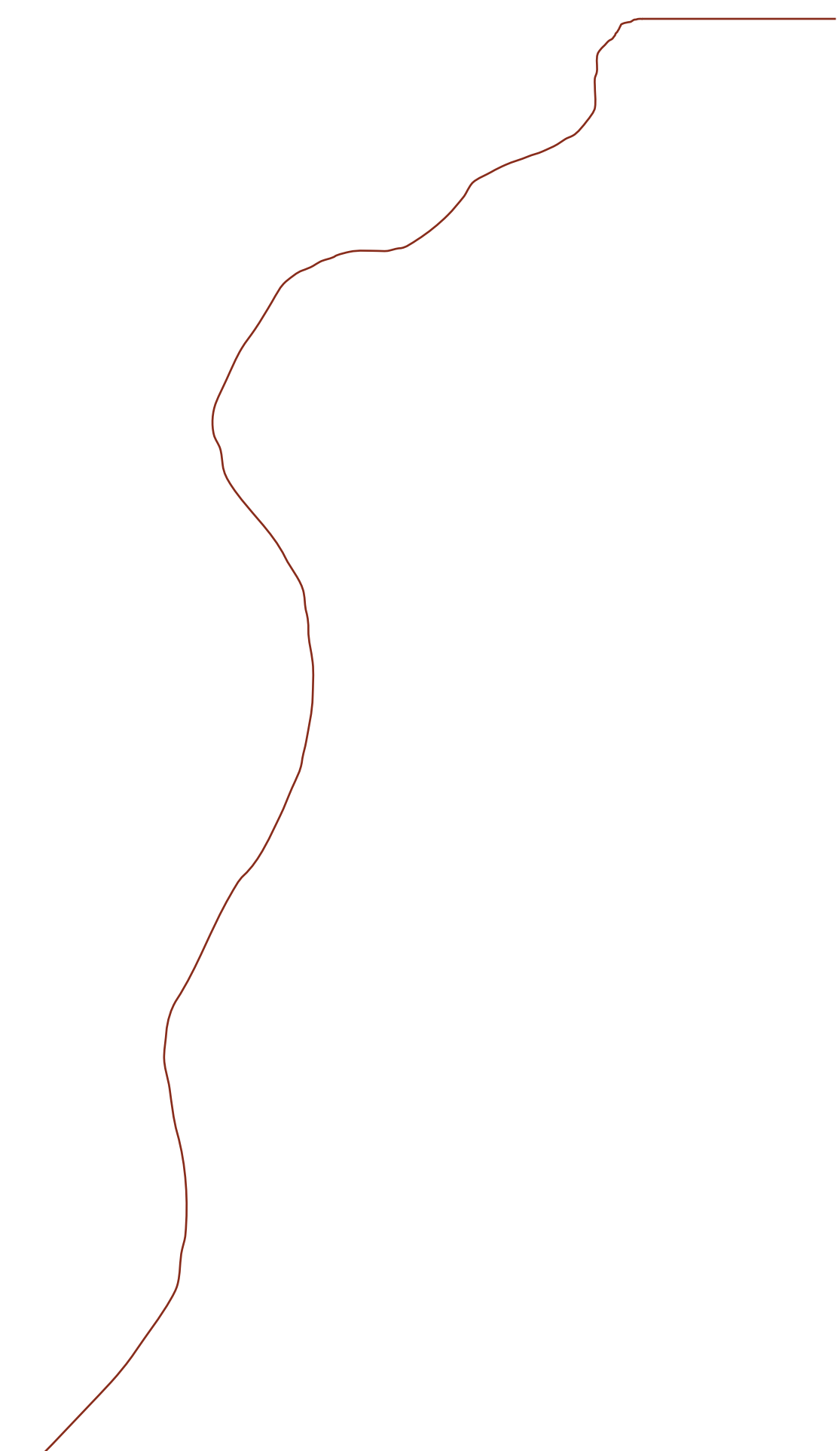
Revision approved:

Name	Date

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

ACM	asbestos-containing material(s)
BGS	below ground surface
DOE	Washington State Department of Ecology
HSM	health and safety manager
HSP	Health and Safety Plan
IDLH	immediately dangerous to life or health
LEL	lower explosive limit
LFG	landfill gas
NFA	No Further Action
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
pbv	percent by volume
PCB	polychlorinated biphenyl
PID	photoionization detector
PM	project manager
PPE	personal protective equipment
ppm	part per million
PVC	polyvinyl chloride
SSO	site safety officer
STEL	short-term exposure limit
TLV	threshold limit value
TPH	total petroleum hydrocarbon
VOC	volatile organic compound



APPENDIX F

PROPOSED DEV. - FORMER TURNBULL LANDFILL

SOUTHEAST OF SR 500 AND NE FOURTH PLAIN BOULEVARD
VANCOUVER, WA
METHANE MITIGATION SYSTEM

SHEET INDEX

GENERAL NOTES:

1. PERFORATED HORIZONTAL VENTILATION PIPES SHALL BE PLACED NO MORE THAN 25 FEET FROM THE BUILDING PERIMETER.
2. THE TOTAL PIPE PERFORATION AREA SHALL BE AT LEAST EQUAL TO OR GREATER THAN 5% OF THE PIPE SURFACE AREA.
3. LIQUID BOOT GEOVENT OR ENGINEER/WASHINGTON STATE DEPARTMENT OF ECOLOGY (DOE)-APPROVED EQUIVALENT SHALL BE CONNECTED TO VERTICAL VENTILATION RISER. THE VERTICAL VENTILATION RISER SHALL BE 3 INCHES IN DIAMETER, SCHEDULE 80 PVC PIPE. VENTILATION RISER PIPE SHALL BE PROTECTED WITH NAIL-GUARDED STUDS WHERE APPLICABLE.
4. VENTILATION RISER OUTLETS SHALL BE LOCATED AT LEAST:
   - 10 FEET ABOVE GRADE.
   - 10 FEET AWAY FROM ANY WINDOW, DOOR, ROOF HATCH, OR AIR INTAKE INTO THE BUILDING.
   - 3 FEET AWAY FROM ANY PARAPET.
   - 4 FEET AWAY FROM PROPERTY LINE.
   - 5 FEET AWAY FROM ANY ELECTRICAL DEVICE.
   - 3 FEET ABOVE HIGHEST POINT OF ROOF WITHIN A 10-FOOT RADIUS OF OUTLET (IF VENTED TO ROOF).
5. ANY VENTILATION RISER LOCATED WITHIN AN OPEN YARD SHALL TERMINATE AT A HEIGHT OF NOT LESS THAN 10 FEET ABOVE ADJACENT GRADE, UNLESS NOTED OTHERWISE.
6. CONTRACTOR SHALL VERIFY EXACT TYPE OF CONSTRUCTION AT EACH VENT RISER. RISERS MUST AVOID WINDOWS AND MUST NOT BE INSTALLED WHERE STRUCTURAL MEMBERS PROHIBIT.
7. THE TERMINATION OF ALL VENTILATION PIPES SHALL BE PROVIDED WITH A TEE CONNECTION OR OTHER APPROVED RAIN CAP TO HELP PREVENT THE INTRUSION OF RAIN WATER. RAIN GUARDS SHALL BE NON-RESTRICTING.
8. VENTILATION RISERS SHALL BE CLEARLY MARKED TO INDICATE THAT THE PIPE MAY CONTAIN COMBUSTIBLE GAS. PIPES SHALL BE MARKED 6 INCHES BELOW THEIR TERMINATION POINT AND AT 5-FOOT INTERVALS ALONG THE REMAINDER OF THE VENTILATION RISER. THIS INCLUDES SECTIONS ENCASED WITHIN THE WALLS OR OTHER ENCLOSURES. THE IDENTIFIER SHOULD INCLUDE THE WORDS "CAUTION METHANE GAS IN PIPE NO SMOKING OR ELECTRICAL EQUIPMENT WITHIN 10 FEET." THE PLACARD SIGN SHALL BE 3 INCHES HIGH BY 4 INCHES WIDE WITH 1/4-INCH-HIGH, BLACK LETTERS ON WHITE BACKGROUND AND BE PLASTIC WITH ADHESIVE BACKING, UNLESS OTHERWISE SPECIFIED BY ENGINEER.
9. ALL UNDERGROUND ELECTRICAL, PLUMBING, AND SIMILAR CONDUITS PENETRATING THE LOW-PERMEABLE MEMBRANE SHALL BE PROVIDED WITH A BOOT PER THE MANUFACTURER'S SPECIFICATIONS.
10. ALL ELECTRICAL CONDUITS ENTERING OR LEAVING THE INTERIOR BUILDING OR EXTERIOR ELECTRICAL BOXES SHALL BE COMPLETED IN ACCORDANCE WITH LOCAL ELECTRICAL CODES. ALL CONDUITS SHALL BE SEALED WITH A CLOSED CELL EXPANDING POLYURETHANE FOAM SEALANT OR EQUIVALENT.
11. ALL SHOWER OR TUB BOXES MUST BE SET ABOVE THE LOW-PERMEABLE MEMBRANE. IF NECESSARY, OVER-EXCAVATE SOIL BENEATH BOXES TO PROVIDE NECESSARY CLEARANCE FOR THE LOW-PERMEABLE MEMBRANE.
12. THE LOW-PERMEABLE MEMBRANE MUST MEET ASTM STANDARDS D 6392, D 4068-88, D 1434-82, D 543-87, AND D 1693-78. INSTALL THE LOW-PERMEABLE MEMBRANE PER MANUFACTURER'S SPECIFICATIONS. FINAL PRODUCT APPROVAL MAY BE SUBJECT TO DOE REVIEW AND APPROVAL.
13. CONCRETE FORMING, PLACEMENT, AND FINISHING SHALL BE CONDUCTED SUCH THAT THE INTEGRITY OF THE LOW-PERMEABLE MEMBRANE IS MAINTAINED. INTERNAL FORM STAKING SHALL BE COMPOSED OF STEEL AND SHALL BE BELOW THE SURFACE OF THE FINISHED CONCRETE. REPAIR SLAB AS NECESSARY WITH NON-SHRINK GROUT. UNDER NO CIRCUMSTANCES SHALL THE LOW-PERMEABLE MEMBRANE BE PENETRATED WITH FINISHING APPARATUS DURING CONCRETE PLACEMENT. IF THE LOW-PERMEABLE MEMBRANE IS DAMAGED, CONTRACTOR'S WORK SHALL STOP UNTIL THE APPROPRIATE REPAIRS TO THE LOW-PERMEABLE MEMBRANE ARE MADE. REINFORCING STEEL, PIPING, FORMS, ETC. SHALL NOT BE SUPPORTED DIRECTLY ON THE LOW-PERMEABLE MEMBRANE OR PROTECTIVE COVERING, AND EQUIPMENT SHALL NOT BE DRIVEN OVER THE LOW-PERMEABLE MEMBRANE OR ITS PROTECTIVE COVERING.
14. A QUALIFIED PROFESSIONAL KNOWLEDGEABLE IN THE INSTALLATION OF METHANE MITIGATION SYSTEMS SHALL BE PRESENT DURING CONSTRUCTION AND TESTING OF THE METHANE MITIGATION SYSTEM FOR THIS PROJECT. THE QUALIFIED PROFESSIONAL SHALL OBSERVE AND DOCUMENT THE DESIGN ELEMENTS AS DESCRIBED HEREIN WERE INSTALLED IN GENERAL ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS. DOCUMENTED OBSERVATIONS AND/OR REPORTS GENERATED BY THE QUALIFIED PROFESSIONAL MAY BE SUBJECT TO DOE REVIEW AND DOE APPROVAL OF THE METHANE MITIGATION SYSTEM INSTALLATION MAY BE NECESSARY BEFORE OCCUPANCY OF THE BUILDING IS ALLOWED.
15. COPIES OF THIS PLAN SET SHALL BE DISTRIBUTED TO AND RECEIVED BY BOTH THE EARTHWORK, ELECTRICAL, AND PLUMBING CONTRACTORS AT A MINIMUM. ALL ELECTRICAL AND PLUMBING INSTALLATIONS FOR BUILDINGS WITH SUB-SLAB VENTING SHALL COMPLY WITH NOTES 8, 9, AND 10 ABOVE.

VICINITY MAP

N

0 1500 3000

(SCALE IN FEET)

SITE PLAN BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®, AUGUST 15, 2016

VICINITY MAP
SHEET INDEX
GENERAL NOTES

H0.1

PROPOSED DEV. - FORMER TURNBULL LANDFILL
VANCOUVER, WA

ORCHARD-1-01

DECEMBER 2016

DESIGNED BY: GDI ENG
DRAWN BY: GDI CAD
CHECKED BY:
APPROVED BY:

NO.	DATE	REVISION DESCRIPTION	BY	APPR.

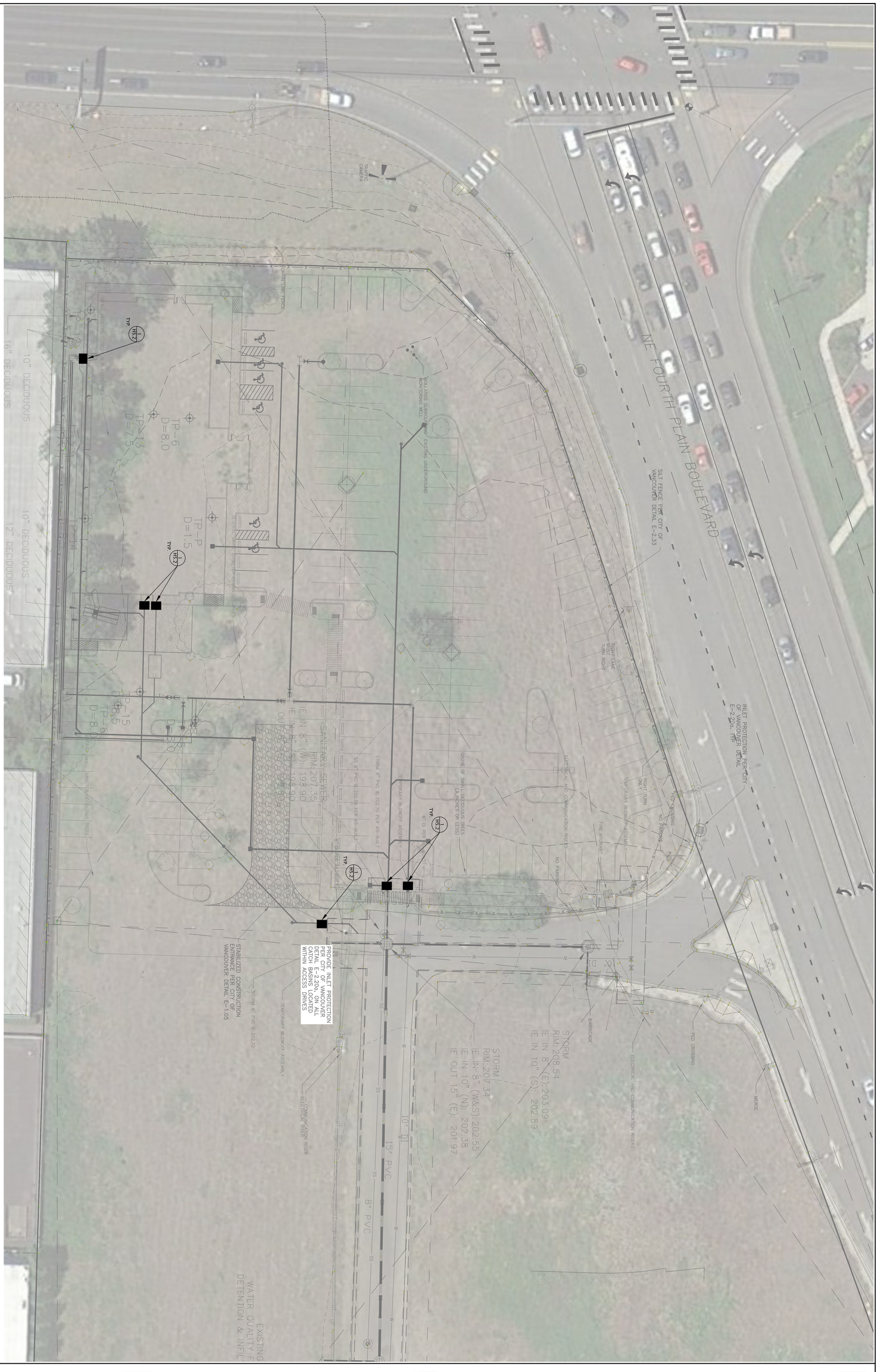
GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

MICHAEL F. CORREN
STATE OF WASHINGTON
17321
REGISTERED
PROFESSIONAL ENGINEER

REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF GEODESIGN, INC., AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF GEODESIGN, INC.

Printed By: mmiller | Print Date: 12/16/2016 11:03:16 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\Orchard-1-01-H0.1.dwg | Layout: H0.1

Printed By: mmiller | Print Date: 12/16/2016 11:03:37 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\Orchard-1-01-H1.1.dwg | Layout: H1.1



LEGEND:

TRENCH DAM

H1.2 TYP — REFERENCE NUMBER OF DRAWING WHERE DETAIL IS SHOWN/TAKEN; DETAIL NUMBER OR SECTION LETTER

(SCALE IN FEET) 0 20 40 N

NOTES:
1. AERIAL PHOTOGRAPH DATED JULY 23, 2016
2. SITE PLAN BASED ON DRAWING PROVIDED BY PACE ENGINEERS, INC. AUGUST 10, 2016
3. SITE WORK NOT SHOWN ON THIS DRAWING SHOWN ON CIVIL DRAWINGS PREPARED BY PACE ENGINEERS, INC.

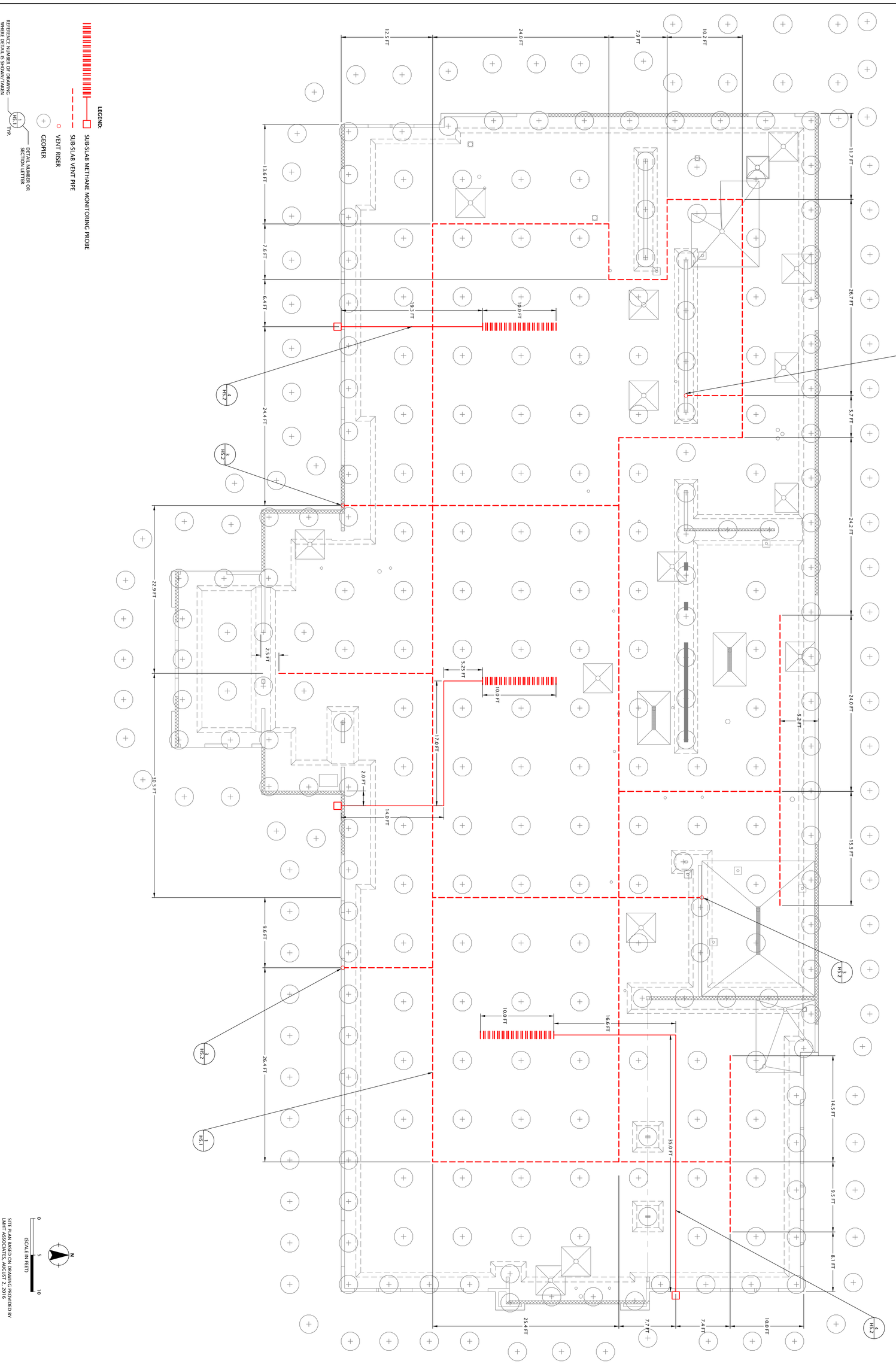
GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

DESIGNED BY:	GDI ENG	CHECKED BY:		
DRAWN BY:	GDI CAD	APPROVED BY:		
NO.	DATE	REVISION DESCRIPTION	BY	APPR.

ORCHARD-1-01	**SITE PLAN - TRENCH DAMS**	
DECEMBER 2016	PROPOSED DEV. - FORMER TURNBULL LANDFILL VANCOUVER, WA	**H1.1**

REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF GEODESIGN, INC., AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF GEODESIGN, INC.

Printed By: mmiller | Print Date: 12/16/2016 11:11:27 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\Orchard-1-01-H2.1_H2.2.dwg | Layout: H2.1

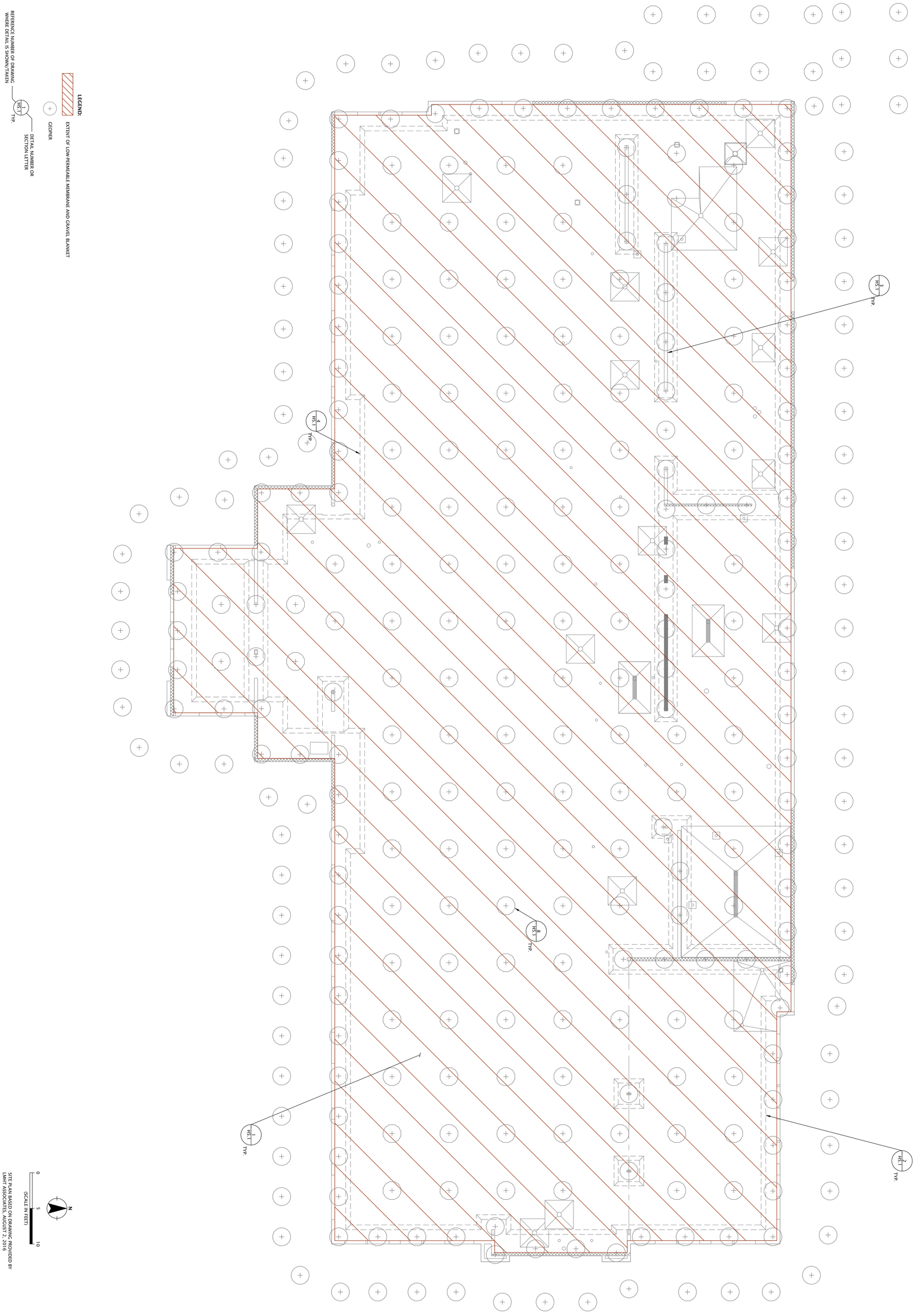


GEODESIGN INC 9450 SW Commerce Circle - Suite 300 Wilsonville OR 97070 503.968.8787 www.geodesigninc.com	DESIGNED BY: GDI ENG DRAWN BY: GDI CAD	CHECKED BY: APPROVED BY:

NO.	DATE	REVISION DESCRIPTION	BY	APPR.

ORCHARD-1-01	METHANE MITIGATION SYSTEM - LOW-PERMEABLE MEMBRANE AND GRAVEL BLANKET	
DECEMBER 2016	PROPOSED DEV. - FORMER TURNBULL LANDFILL VANCOUVER, WA	H2.1

REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF GEODESIGN, INC., AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF GEODESIGN, INC.

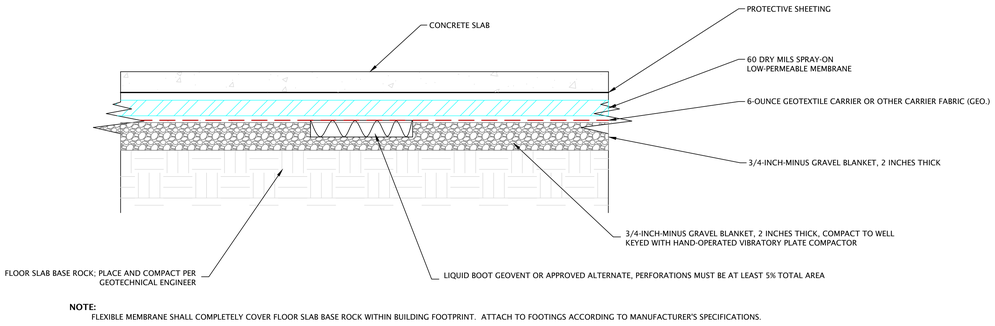


GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

DESIGNED BY:	GDI ENG	CHECKED BY:		
DRAWN BY:	GDI CAD	APPROVED BY:		
NO.	DATE	REVISION DESCRIPTION	BY	APPR.

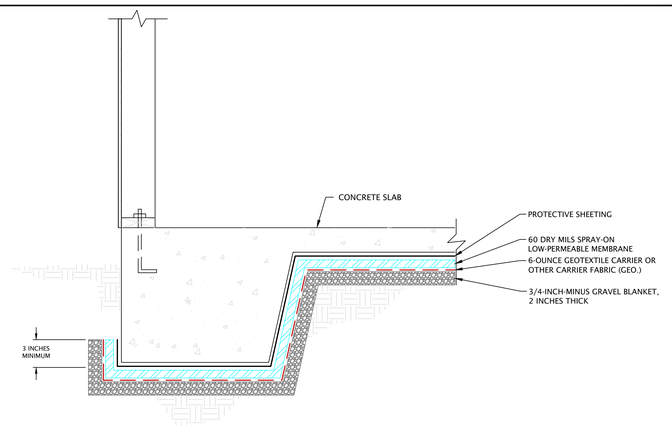
ORCHARD-1-01	**METHANE MITIGATION SYSTEM - VENT PIPING**	
DECEMBER 2016	PROPOSED DEV. - FORMER TURNBULL LANDFILL VANCOUVER, WA	**H2.2**

REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF GEODESIGN, INC., AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF GEODESIGN, INC.

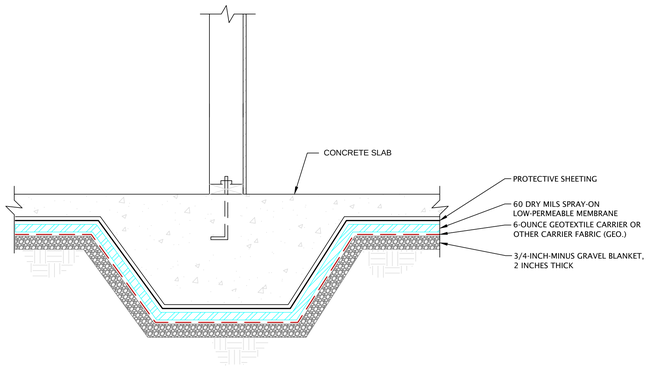


NOTE:
FLEXIBLE MEMBRANE SHALL COMPLETELY COVER FLOOR SLAB BASE ROCK WITHIN BUILDING FOOTPRINT. ATTACH TO FOOTINGS ACCORDING TO MANUFACTURER'S SPECIFICATIONS.

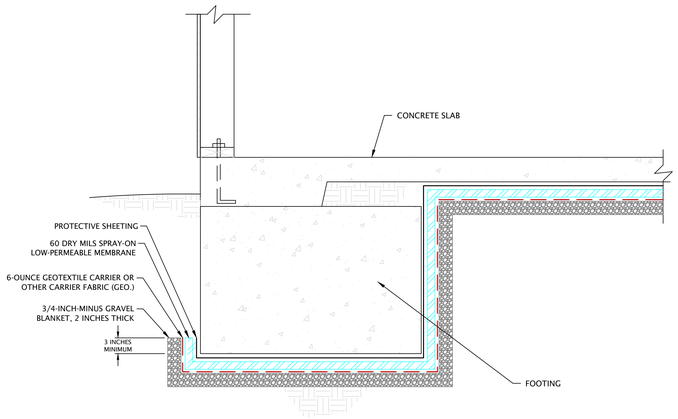
1 / H5.1 **TYPICAL LOW-PERMEABLE MEMBRANE AND VENT PIPE DETAIL**



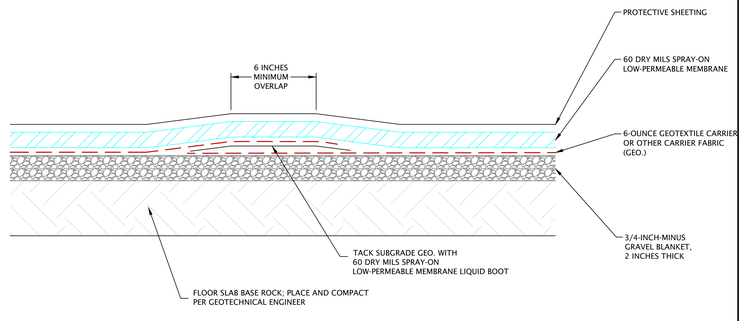
2 / H5.1 **TYPICAL SPRAY-ON LOW-PERMEABLE MEMBRANE AT PERIMETER FOOTING**



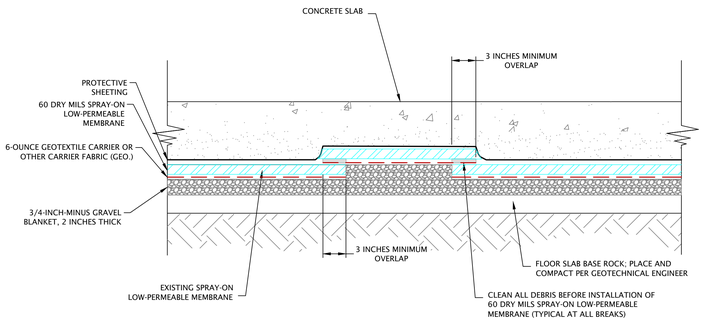
3 / H5.1 **TYPICAL SPRAY-ON LOW-PERMEABLE MEMBRANE AT INTERIOR FOOTING/THICKENED SLAB**



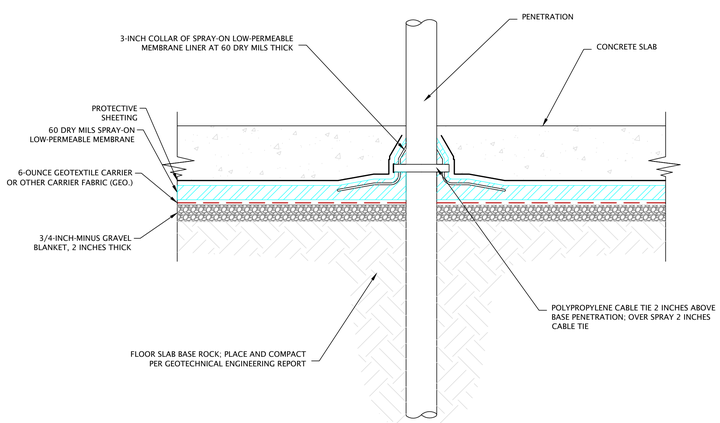
4 / H5.1 **TYPICAL SPRAY-ON LOW-PERMEABLE MEMBRANE, FOOTING AT SHEAR WALL**



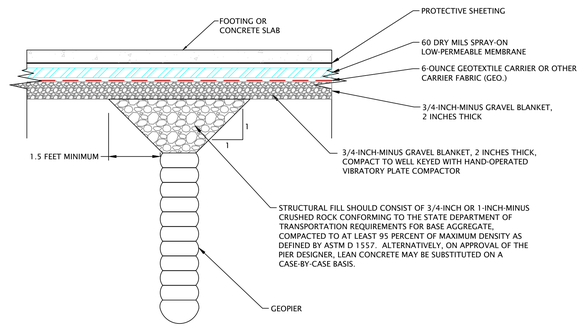
5 / H5.1 **SPRAY-ON LOW-PERMEABLE MEMBRANE LAP JOINTS**



6 / H5.1 **TYPICAL PATCH DETAIL**



7 / H5.1 **TYPICAL SPRAY-ON LOW-PERMEABLE MEMBRANE PENETRATION DETAIL**



8 / H5.1 **TYPICAL SPRAY-ON LOW-PERMEABLE MEMBRANE OVER GEOPIER**

DETAILS — H5.1

PROPOSED DEV. - FORMER TURNBULL LANDFILL
VANCOUVER, WA

ORCHARD-1-01

DECEMBER 2016

NO.	DATE	REVISION DESCRIPTION	BY	APPR.

DESIGNED BY: GDI ENG
DRAWN BY: GDI CAD
CHECKED BY:
APPROVED BY:

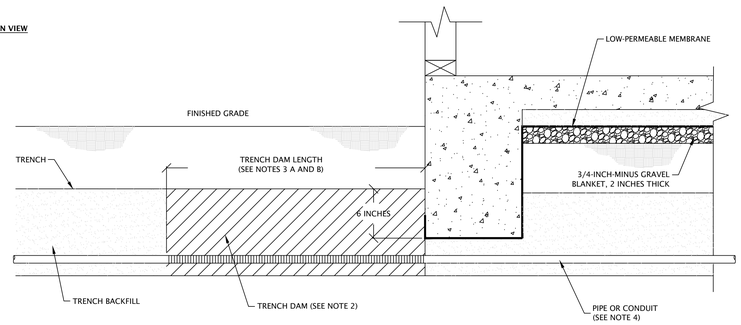
GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

PROFESSIONAL ENGINEER — MICHAEL F. GORMAN — STATE OF WASHINGTON — 47321 — REGISTERED

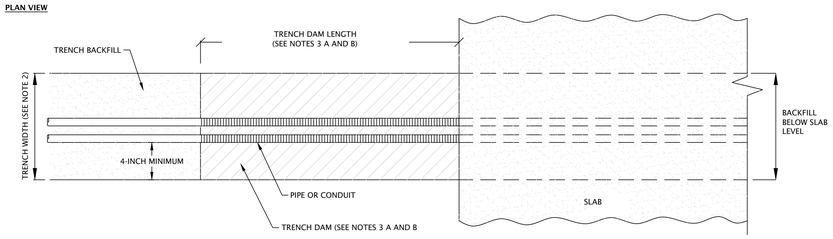
REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF GEODESIGN, INC., AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF GEODESIGN, INC.

Printed By: mmiller | Print Date: 12/16/2016 11:03:58 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\Orchard-1-01-H5.1.dwg | Layout: H5.1

SECTION VIEW



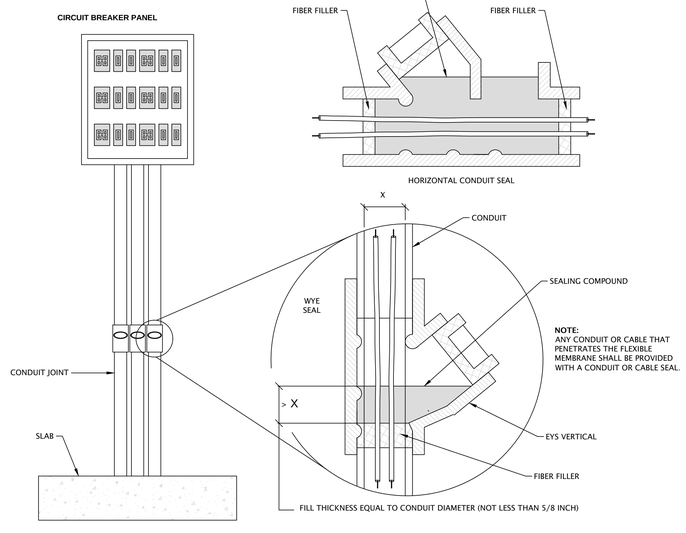
PLAN VIEW



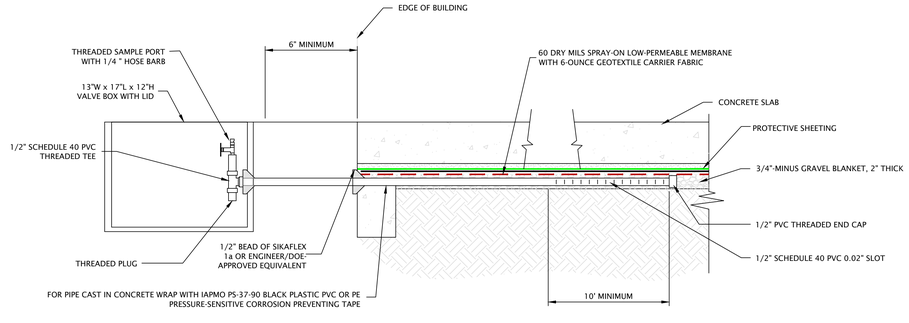
NOTES: TRENCH DAMS

1. ALL TRENCH DAMS SHALL BE INSTALLED IN TRENCHES CONTAINING PIPING AND CONDUIT THAT CONNECTS DIRECTLY FROM THE UTILITY LINES IN THE STREET.
2. THE WIDTH OF A TRENCH DAM SHALL BE ONE-HALF THE LENGTH.
3. TRENCH DAMS SHALL BE CONSTRUCTED OF ONE OF THE FOLLOWING:
   A. BENTONITE CEMENT SLURRY 3 FEET LONG: A MIXTURE OF 4% TYPE II CEMENT AND 2% POWDERED BENTONITE.
   B. CONCRETE MIXES OTHER THAN BENTONITE CEMENT SLURRY MAY BE USED PROVIDED CONDUIT OR PIPING IS WRAPPED WITH HIGH DENSITY PVC FOAM TAPE, CLOSED CELLS, ADHESIVE BACKED, 1/4-INCH THICK BY 1/2-INCH WIDE SHALL BE APPLIED TO CLEAR SURFACE WITH ENDS BUTTED TOGETHER AT MOST VISIBLE LOCATIONS IN TRENCH DAM.
4. PIPING AND CONDUIT SHALL BE PROTECTED FROM CORROSION AND STRUCTURAL SETTLEMENT AS FOLLOWS:
   A. TAPE SHALL BE APPLIED ON CONDUIT AND PIPING ENCASED IN CEMENT SLURRY OR CONCRETE.
   B. TAPE SHALL BE PS-37-90, BLACK PLASTIC PVC OR PE PRESSURE-SENSITIVE CORROSION PREVENTIVE TAPE.

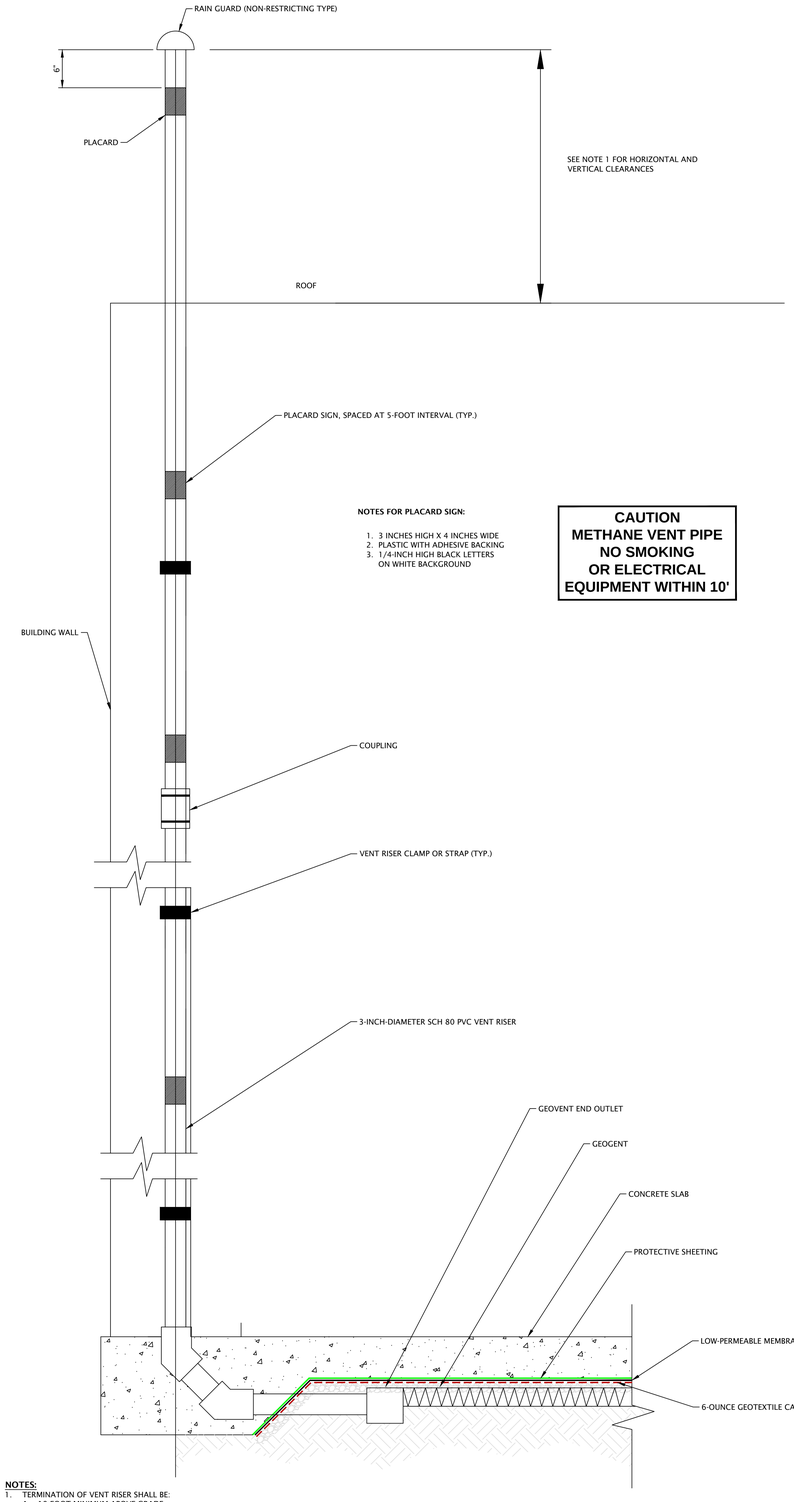
1 / H5.2 **UTILITY TRENCH DAM**



2 / H5.2 **CONDUIT SEAL**



4 / H5.2 **TYPICAL SUB-SLAB MONITORING PROBES**



NOTES FOR PLACARD SIGN:

1. 3 INCHES HIGH X 4 INCHES WIDE
2. PLASTIC WITH ADHESIVE BACKING
3. 1/4-INCH HIGH BLACK LETTERS ON WHITE BACKGROUND

CAUTION
METHANE VENT PIPE
NO SMOKING
OR ELECTRICAL
EQUIPMENT WITHIN 10'

NOTES:

1. TERMINATION OF VENT RISER SHALL BE:
   A. 10-FOOT MINIMUM ABOVE GRADE;
   B. 10-FOOT MINIMUM AWAY FROM ANY WINDOW, DOOR, DOOR HATCH, OPENING, OR AIR INTAKE INTO THE BUILDING;
   C. 3-FOOT MINIMUM ABOVE HIGHEST POINT OF ROOF WITHIN A 10-FOOT RADIUS OF OUTLET;
   D. 4-FOOT MINIMUM AWAY FROM PROPERTY LINE,
   E. 5-FOOT MINIMUM AWAY FROM ELECTRICAL DEVICES; AND
   F. 3-FOOT AWAY FROM ANY PARAPET.
2. WRAP AND PROTECT ALL PIPING THROUGH CONCRETE SLAB OR FLOOR.
3. SUPPORT ALL PIPNG ACCORDING TO APPLICABLE CODES.
4. CONTRACTOR SHALL VERIFY EXACT TYPE OF CONSTRUCTION AT EACH VENT RISER CALLED OUT ON THE PLANS. RISER MUST AVOID WINDOWS AND MUST NOT BE INSTALLED WHERE STRUCTURAL MEMBERS PROHIBIT.

3 / H5.2 **VERTICAL VENT RISER**

DETAILS

H5.2

PROPOSED DEV. - FORMER TURNBULL LANDFILL
VANCOUVER, WA

ORCHARD-1-01

DECEMBER 2016

NO.	DATE	REVISION DESCRIPTION	BY	APPR.

DESIGNED BY: GDI ENG
DRAWN BY: GDI CAD
CHECKED BY:
APPROVED BY:

GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

PRELIMINARY
MICHAEL F. COREN
STATE OF WASHINGTON
47321
REGISTERED
PROFESSIONAL ENGINEER

REUSE OF DOCUMENTS: THIS DOCUMENT, AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, IS THE PROPERTY OF GEODESIGN, INC., AND IS NOT TO BE USED, IN WHOLE OR IN PART, FOR ANY OTHER PROJECT WITHOUT THE WRITTEN AUTHORIZATION OF GEODESIGN, INC.

Printed By: mmiller | Print Date: 12/16/2016 11:04:04 AM
File Name: J:\M-R\Orchard\Orchard-1\Orchard-1-01\Figures\CAD\Orchard-1-01-H5.2.dwg | Layout: H5.2

SPECIFICATIONS

SUB-SLAB VENTING AND
SPRAY-ON FLEXIBLE MEMBRANE/LINER

Prepared for:

Orchard Crossings, LLC
Proposed Development - Former Turnbull Landfill
Southeast of SR 500 and NE Fourth Plain Boulevard
Vancouver, Washington

Prepared: December 2016

GeoDesign Project: Orchard-1-01

SECTION 1
SUB-SLAB VENTING SYSTEM INSTALLATION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work shall consist of furnishing and installing a sub-slab venting system as described herein and as shown on the Drawings.

B. Work in this section – principal items include:
   1. Installation of sub-slab venting Liquid Boot® GeoVent or approved equivalent
   2. Installation of 3-inch-diameter, Schedule 80 polyvinyl chloride (PVC) riser pipe

1.02 DEFINITIONS

A. Quality Assurance (QA) Observer – Party, independent from MANUFACTURER and INSTALLER, that is responsible for observing and documenting activities related to QA during the installation of the spray-on flexible membrane and sub-slab venting system. GeoDesign, Inc. shall provide QA observation services.

B. ENGINEER – The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications. GeoDesign, Inc. is the responsible ENGINEER for this sub-slab venting and membrane project.

C. CONTRACTOR – The individual or firm responsible for contracting and overseeing the services provided by the installer and other subcontractors for the duration of construction at the site.

D. SUBGRADE – Surface that immediately underlies the base rock material (per geotechnical report) and spray-on flexible membrane system.

E. DOE – Washington Department of Ecology.

1.03 QUALITY ASSURANCE

A. Construction Quality Assurance (CQA) observation will be conducted by the QA Observer during the installation of the sub-slab venting system. The QA Observer should verify the dimensions and location of the vent piping, observe the covering or backfilling of the vent piping, and observe vent riser pipes prior to the pipes being covered within exterior or interior walls.

1.04 JOB CONDITIONS

A. The sub-slab vent piping shall only be installed on approved subgrade. The sub-slab vent piping shall not be installed if ponding water is present.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Vent Pipe – Liquid Boot® GeoVent pipe, or DOE/ENGINEER-approved equivalent. Connection pipe through concrete masonry unit walls are to be 3-inch-diameter Schedule 80 PVC or Geovent® sleeve.

B. BASE ROCK – shall meet the specifications in the geotechnical engineering report.

C. RISER PIPE – 3-inch-diameter Schedule 80 PVC.

D PIPE CONNECTORS – Universal Plumbing Code (UPC) approved.

E. GEOTEXTILE CARRIER FABRIC – BASEFABRIC™ T-60 non-woven geotextile shall be used, unless otherwise specified and approved by the Engineer.

PART 3 – EXECUTION

3.01 INSTALLATION

A. CONTRACTOR shall notify ENGINEER a minimum of one week prior to starting construction of sub-slab venting system and spray-on flexible membrane.

B. Base rock shall be placed per the geotechnical engineering report recommendations on a compacted subgrade. The subgrade shall be free of ponding water.

C. Roll out GeoVent pipe or approved equivalent as indicated on the Drawings. Sub-slab vent piping installation must be observed by the QA Observer prior to covering.

D. Install approved connectors where required. All connections shall be in accordance with the Manufacturer's instructions. No improvised joining methods are allowed.

E. CONTRACTOR shall exercise all due caution throughout the duration of construction to protect the vent pipe from damage or displacement. If displaced or damaged, it shall be restored to its original location and/or condition. Repaired or restored sub-slab vent piping shall be observed and documented as such by the QA Observer.

3.02 FIELD QUALITY CONTROL

A. The QA Observer must verify the dimensions and approximate location of the sub-slab vent piping before the pipe(s) are covered. Prior to covering the pipe(s), the QA Observer must also verify that ponding water is not present.

B. The QA Observer must document that the sub-slab vent piping is:
   1. placed as shown on the Drawings.
   2. connected at intersections, sleeves, and/or terminations using manufacturer-approved connectors or methods; fully engaged in the connectors; and is not glued at snap-on fittings.
   3. free of taping or other improvised joining methods.
   4. capped at dead-end lines.
   5. free of defects and not damaged.

C. The QA Observer must observe and document the vent riser pipe(s) prior to covering the vent riser pipe(s) with exterior or interior walls. The QA Observer shall observe and document that the vent riser pipe(s) are connected with UPC-approved connectors and methods.

LIQUID BOOT® or EQUIVALENT
SPRAY-ON FLEIXIBLE MEMBRANE/LINER

PART 1 – GENERAL

1.01 DESCRIPTION

General and Supplementary Conditions and Division 1 – General Requirements applies to this section. Provide spray-on flexible membrane as indicated, specified, and required.

A. Work in this section – principal items include:
   1. Spray-on flexible membrane providing protection from methane under site structures.

B. Related work not in this section:
   1. Excavation and backfilling
   2. Parge coat on masonry to receive spray-on flexible membrane
   3. Mortar beds or concrete toppings over spray-on flexible membrane
   4. Latex waterproofing
   5. Damp-proofing
   6. Flashing and sheet metal
   7. Joint sealers
   8. Soil sterilant
   9. Sub-slab venting system
   10. Drainage

1.02 DEFINITIONS

A. QA Observer – Party, independent from MANUFACTURER and INSTALLER that is responsible for observing and documenting activities related to QA during the installation of the spray-on flexible membrane and ventilation system. GeoDesign, Inc. shall provide QA observation services.

B. ENGINEER – The individual or firm responsible for the design and preparation of the project's Contract Drawings and Specifications. GeoDesign, Inc. is the responsible ENGINEER for this project.

C. MANUFACTURER – The manufacturer of the spray-on flexible membrane material. The material specified for this project is LIQUID BOOT® by Remediation Technologies (CETCO) or a DOE/ENGINEER-approved equivalent.

D. CONTRACTOR – The individual or firm responsible for contracting and overseeing the services provided by the INSTALLER and other subcontractors for the duration of construction at the site.

E. INSTALLER – Party responsible for field handling, transporting, storing, applying, and testing of the spray-on flexible membrane.

F. SUBGRADE – Surface that immediately underlies the base rock material (per geotechnical report) and spray-on flexible membrane system.

1.03 QUALITY ASSURANCE

A. QA observation will be conducted by the QA Observer during the installation of the spray-on flexible membrane. Spray-on flexible membrane INSTALLER shall be trained and approved by spray-on flexible membrane MANUFACTURER. For other vapor barrier materials, equivalent quality control is required.

B. A pre-installation meeting shall be held prior to application of spray-on flexible membrane to assure proper substrate and installation conditions. At a minimum, the CONTRACTOR, INSTALLER, and QA Observer shall be present at the meeting.

C. QA Observer shall observe subgrade prior to installing the spray-on flexible membrane.

D. QA Observer shall observe the condition of the spray-on flexible membrane prior to placement of the approved protective sheeting, on top of the spray-on flexible membrane (see Section 3.04.30).

1.04 SUBMITTALS

A. Product Data – Submit MANUFACTURER'S product data and installation instructions for specific application.

B. Samples – Submit representative samples of the following materials for approval by ENGINEER:

1. Spray-on flexible membrane material
2. Geotextile Carrier Fabric
3. Base rock – sieve analysis results for gravel (per geotechnical engineering report)

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in original unbroken packages bearing MANUFACTURER'S label showing brand, weight, volume, and batch number. Materials shall be stored at the site in strict compliance with the MANUFACTURER'S instructions.

1.06 JOB CONDITIONS

A. Protect all adjacent areas not to receive spray-on flexible membrane. Where necessary, apply masking to prevent staining of surfaces to remain exposed wherever the spray-on flexible membrane abuts to other finish surfaces.

B. Perform work only when existing and forecasted weather conditions are within MANUFACTURER'S recommendations for the material and product used.

C. Minimum clearances required for application of product:
- 90-degree spray wand – 2 feet
- Conventional spray wand – 4 feet

D. Ambient temperature shall be within MANUFACTURER'S specifications.

E. All plumbing, electrical, mechanical, and structural items underneath or passing through the spray-on flexible membrane shall be positively secured in their proper positions and appropriately protected prior to membrane application.

F. Spray-on flexible membrane shall be installed before placement of reinforcing steel. When not possible, all exposed reinforcing steel shall be masked prior to membrane application.

G. Expansion joints shall be filled with a conventional waterproof expansion joint material as specified by Architect or Structural Engineer.

H. Surface preparation shall be per MANUFACTURER'S specification.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Fluid applied spray-on flexible membrane – LIQUID BOOT® (manufactured CETCO of Santa Ana, CA, (714) 384-0111) or equivalent as approved by ENGINEER. The membrane shall be water-borne and spray-applied at ambient temperatures as specified herein. The applied membrane shall be a minimum thickness of 60 dry mils.

B. Protection – On horizontal surfaces, installation of geotextile carrier fabric and protective sheeting as specified. On vertical surfaces, no protection is required, provided the surface is formed and poured in a timely manner.

C. Geotextile Carrier Fabric – BASEFABRIC™ T-60 non-woven geotextile carrier fabric shall be used, unless otherwise specified and approved by MANUFACTURER and ENGINEER. The heat-rolled side shall be used as the application surface and placed face up.

D. Cold joints, cracks, form tie holes – Shall be covered with Hardcast CRT 1602 Tape 3 inches wide.

E. Spray-on flexible membrane protection: LIQUID BOOT® Ultrashield P-150 or approved protective layer on horizontal surfaces; LIQUID BOOT® Ultrashield P-150 or approved protective layer on vertical surfaces.

PART 3 – EXECUTION

3.01 EXAMINATION

All surfaces to receive spray-on flexible membrane shall be inspected and approved by the INSTALLER and observed and documented by the QA Observer at least 1 day prior to commencing work.

3.02 SURFACE PREPARATION

Provide 24-inch minimum clearance out from surfaces to receive the spray-on flexible membrane. The application surface shall be prepared and provided to the INSTALLER in accordance with MANUFACTURER'S specifications listed below.

A. Concrete/Shotcrete/Masonry

If applicable, where the membrane is applied to concrete/shotcrete/masonry surfaces, the surfaces shall be light broom-finished or smoother and free of any dirt, debris, loose material, release agents, or curing compounds. Fill all voids more than ¼-inch deep and ¼-inch wide. Voids shall be filled with a trowelable quickset mortar or other suitable material as approved by the MANUFACTURER and ENGINEER. Masonry joints, cold joints, and form joints shall be struck smooth.

All cracks or cold joints greater than ¼-inch shall be completely grouted with non-shrink grout as approved by ENGINEER.

Install Hardcast reinforcing tape over all cold joints, cracks, and form tie holes (after holes and cracks are grouted).

B. Subgrade, Gravel, Geotextile

The subgrade shall be moisture conditioned and compacted in accordance with the geotechnical engineering report. Natural soil shall be free of loose or otherwise unsuitable materials. The finished surface shall be smooth, uniform, and free of debris and standing water. Remove all stones or dirt clods greater than ½ inch.

The geotextile shall be placed over the compacted base rock (per the geotechnical report) in accordance with the MANUFACTURER'S specifications.

Trenches shall be cut oversize to accommodate spray-on flexible membrane and protection course with perpendicular to sloped sides and maximum obtainable compaction. Adjoining grade shall be finish graded and compacted. Excavated walls shall be vertical or sloped back and free of roots and protruding rocks.

All penetrations shall be prepared in accordance with MANUFACTURER'S specifications. All form stakes that penetrate the membrane shall be of rebar, which shall be bent over and left in the slab.

3.03 INSTALLATION

3.03.10 INSTALLATION OF SPRAY-ON FLEXIBLE MEMBRANE ON CONCRETE/SHOTCRETE/MASONRY (if necessary)

A. Refer to Section 3.03.30 "Sealing Around Penetrations" for procedures to seal around penetrations.

B. Provide a ¾-inch minimum cant of LIQUID BOOT®, or other suitable material as approved by MANUFACTURER, at all horizontal to vertical transitions and other inside corners of 120 degrees or less. **Allow to cure overnight before the application of LIQUID BOOT® or equivalent.**

C. Spray-apply LIQUID BOOT® or equivalent to a 60-mil minimum dry thickness. Increase thickness to 120 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required, remove any standing water from the membrane before proceeding with the second application.

D. Do not penetrate membrane. Keep membrane free of dirt and debris and traffic until a protective cover is in place. **It is the responsibility of the CONTRACTOR to ensure that the membrane and the protection system are not penetrated.**

E. After membrane has cured and is checked for proper thickness and/or other flaws by the QA Observer, install protection material. The approved protective sheeting layer shall be spread across the entire membrane. The protective sheeting shall not be placed with equipment that may cause damage to the membrane.

NOTE: All tests or inspections shall be performed prior to placing protection course.

NON-HORIZONTAL SURFACES: Spray on non-horizontal surfaces shall begin at the bottom and work towards the top. This method allows the product to adhere to the surface before hitting catalyst runoff.

NOTE: Due to the nature of concrete as a substrate, it is normal for some blistering to occur. This is caused by either the concrete's tendency to off-gas or water that is temporarily trapped between the concrete and the membrane. With time and the applied pressure of backfill or over-slab, blisters will absorb into the concrete without detriment to the membrane.

As determined by the ENGINEER a small number of blister heads shall be sampled and checked for proper membrane thickness. If the samples have the minimum required membrane thickness, then the remaining blisters should not be punctured or cut. If the samples have less than the minimum required membrane thickness, then the area can either be re-sprayed to obtain the proper thickness or the blisters shall be cut out and the area re-sprayed or patched with LIQUID BOOT® Trowel Grade.

3.03.20 INSTALLATION ON GEOTEXTILE CARRIER FABRIC AND SPRAY-ON FLEXIBLE MEMBRANE ON GRAVEL SUBGRADE

A. Line trenches with geotextile carrier fabric extending at least 6 inches onto adjoining subgrade if slab and footings are to be sprayed separately. Overlap seams a minimum of 6 inches. Lay geotextile carrier fabric tight at all inside corners. Apply a thin (10-mil) tack coat of LIQUID BOOT® "A" side or equivalent without catalyst within the seam overlap.

B. Roll out geotextile carrier fabric on subgrade with the heat-rolled side facing up. Overlap seems a minimum of 6 inches. Lay geotextile carrier fabric tight at all inside corners. Apply a thin (10-mil) tack coat of LIQUID BOOT® "A" side or equivalent without catalyst within the seam overlap.

C. Minimize the use of nails to secure the geotextile carrier fabric to the subgrade. Remove all nails before spraying membrane, if possible. Nails that cannot be removed from the subgrade are to be patched with geotextile carrier fabric or Hardcast reinforcing tape overlapping the nail head by a minimum of 2 inches. Apply a thin tack coat of LIQUID BOOT® or equivalent under the geotextile patch when patching with geotextile carrier fabric.

D. Refer to Section 3.03.30 "Sealing Around Penetrations" for procedures to seal around penetrations.

E. Spray-apply LIQUID BOOT® or equivalent onto geotextile to a 60-mil minimum dry thickness. Increase thickness to 120 dry mils if shotcrete is to be applied directly to membrane. If a second coat is required, remove any standing water from the membrane before proceeding with the second application.

F. Do not penetrate membrane. Keep membrane free of dirt, debris, and traffic until a protective cover is in place.

G. After membrane has cured and checked for proper thickness and flaws by the QA Observer, install approved protective barrier across the entire membrane. The protective barrier shall not be placed with equipment that may cause damage to the membrane.

NOTE: All tests or inspections shall be performed prior to placing protection course.

3.03.30 SEALING AROUND PENETRATIONS

A. Clean all penetrations. All metal penetrations shall be sanded clean with emery cloth.

B. For applications requiring geotextile carrier fabric, roll out geotextile carrier fabric on subgrade with the heat-rolled side facing up, overlapping seams a minimum of 6 inches. Cut the geotextile carrier fabric around penetrations so that it lays flat on the subgrade. Lay geotextile carrier fabric tight at all inside corners. Apply a thin (10-mil) tack coat of LIQUID BOOT® "A" side or equivalent without catalyst within the seam overlap.

C. Spray-apply LIQUID BOOT® or equivalent to surrounding areas as specified for the particular application to a 60-mil minimum dry thickness. At the base of penetration install a minimum ¾-inch-thick membrane cant of LIQUID BOOT® or other suitable material as approved by manufacturer. Extend the membrane at a 60-mil thickness up the penetration a minimum of 3 inches. **Allow to cure overnight before proceeding to step D.**

D. Spray-apply LIQUID BOOT® or equivalent to the membrane at a 60-mil thickness three inches around the base of the penetration and up the penetration, completely encapsulating the collar assembly, to a height of 1 ½ inches minimum above the membrane as described in Section 3.03.30 C.

E. Allow LIQUID BOOT® or equivalent to cure completely before proceeding to step "F."

F. Wrap penetration with polypropylene cable tie at a point 2 inches above the base of the penetration. Tighten the cable tie firmly so as to squeeze, but not cut, the cured membrane collar.

3.04 FIELD QUALITY CONTROL

A. **INSTALLER should check their own work for coverage, thickness, and all around good workmanship before calling for inspections.** Areas suspected of being too thin to the touch should be measured with gauges to determine the exact thickness.

B. The membrane must be cured at least overnight before inspecting for dry thickness, holes, shadow shrinkage, and any other membrane damage. If water testing is to be performed, allow the membrane to cure at least 72 hours prior to the water test.

C. The membrane should meet specifications based on the observations of the QA Observer.

3.04.10 ON CONCRETE/SHOTCRETE/MASONRY AND OTHER HARD SURFACES

A. Membrane shall be checked for proper thickness with a blunt-nose depth gauge, taking one reading every 500 square feet. Record the readings. Mark the test area for repair, if necessary.

B. If necessary, test areas are to be patched over with LIQUID BOOT® or equivalent to a 60-mil minimum dry thickness, extending a minimum of 3 inches beyond the test perimeter.

C. Membrane thickness at repaired areas shall be checked for proper thickness with a blunt-nose depth gauge. If area does not meet the minimum thickness requirements, the areas shall be repaired in accordance with Section 3.04.10.B.

3.04.20 ON DIRECT AND OTHER SOFT SUBSTRATES

A. Destructive testing shall be performed as specified by the ENGINEER. Samples shall be cut from the membrane and geotextile sandwich to maximum area of 2 square inches. Measure the thickness with a mil-reading caliper at a minimum frequency of one reading per 500 square feet but no greater than one reading per 2,500 square feet. Deduct the plain geotextile carrier fabric thickness to determine the thickness of LIQUID BOOT® or equivalent membrane. Mark the test area for repair.

B. Voids left by sampling shall be patched with geotextile carrier fabric overlapping the void by a minimum of 2 inches. Apply a thin tack coat of LIQUID BOOT® under the geotextile patch, then spray or trowel-apply LIQUID BOOT® to a 60-mil minimum dry thickness, extending at least 3 inches beyond geotextile patch.

C. Membrane thickness at repaired areas shall be checked for proper thickness using a non-destructive tactile test. Additional cut samples may be collected at the discretion of the QA Observer. If area does not meet the minimum thickness requirements, the area shall be repaired in accordance with 3.04.20.B.

3.04.30 SMOKE TESTING FOR HOLES

A. All spray applied membranes shall be smoke tested in accordance with the following protocol:

1. The membrane shall be visually observed. Any apparent deficiencies and/or installation problems shall be corrected prior to smoke testing.
2. Smoke testing of the LIQUID BOOT® membrane to be conducted by Approved LIQUID BOOT® INSTALLER and observed by QA Observer.
3. The date, time, testing reference area, temperature, wind speed/direction, and cloud cover shall be recorded on the Smoke Testing Record. The ambient air temperature at the time of testing should be greater than 45 degrees F and the wind speed at ground level should be less than or equal to 15 miles per hour. (Note: visual identification of leaks becomes more difficult with increasing wind speed.)
4. Delineate a smoke testing area of 2,000 to 5,000 square feet (maximum). Assemble and situate smoke testing system to inject smoke beneath membrane. Only inert, non-toxic smoke is to be utilized for membrane Smoke Test.
5. Designate testing control areas by cutting openings in an “X” pattern (minimum 4 inches by 4 inches) in the membrane at selected locations. Mark testing control areas for identification prior to conducting the smoke test.
6. Activate smoke generator/blower system (nominal 150 to 950 cubic feet per minute). Apply sufficient pressure as to ensure that smoke will permeate the designated testing area. For verification, ensure that smoke is leaking through testing control areas.
7. Pump smoke beneath the membrane (minimum 1 to 2 minutes). Observe for leaks in the membrane. Reduce pressure/flow rate if excessive lifting of the membrane occurs.
8. Thoroughly inspect entire membrane surface within area delineated for testing. Use marking device as approved by MANUFACTURER to mark/label any leak

locations. Mark/label locations on floor plan and corresponding testing reference area.

9. Repair leak locations marked in Step 7 by spraying LIQUID BOOT® or using trowel grade LIQUID BOOT®.
10. Repeat steps 7 and 8 as necessary to confirm integrity of the membrane.
11. Once the spray-on flexible membrane has passed the smoke test inspection, the successful completion should be documented and signed off by the QA Observer.

ACRONYMS AND ABBREVIATIONS

ACRONYMS AND ABBREVIATIONS

AHERA	Asbestos Hazard Emergency Response Act
ASTM	American Society for Testing and Materials
BGS	below ground surface
CMMP	Contaminated Media Management Plan
DOE	Washington State Department of Ecology
EDR	Engineering Design Report
EPA	U.S. Environmental Protection Agency
HAZWOPER	hazardous waste operations and emergency response
HSP	Health and Safety Plan
HVAC	heating, ventilation, and air conditioning
I.D.	identification
inHg	inches of mercury
iow	inches of water
MRL	method reporting limit
NFA	No Further Action
Pa	pascal
pbv	percent by volume
ppmv	parts per million by volume
QA	quality assurance
QC	quality control