Appendix K
Landfill Gas Probe Installation Technical Memorandum

VIKEK, March 15, 2022

March 15,2022

TECHNICAL MEMORANDUM

LANDFILL GAS PROBE INSTALLATION

GO EAST LANDFILL/BAKERVIEW, EVERETT, WASHINGTON

Project No.002292

PREPARED FOR:
MARTY PENHALLEGON
PACE ENGINEER, INC.
11255 KIRKLAND WAY, SUITE 300
KIRKLAND, WA 98033

PREPARED BY:
GARY ARNDT, P.E., PMP
VICTOR O. OKEREKE, PH.D., P.E., DEE, CLSSS
VIKEK ENVIRONMENTAL ENGINEERS, LLC
23309 100TH AVENUE WEST, EDMONDS, WA 98020-5075
TELEPHONE: 206 – 629 – 5934 DIRECT | 206 – 818 – 9104 MOBILE

03/15/2022

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

Vikek Environmental Engineers, LLC (Vikek) is pleased to present *this Landfill Gas (LFG) Probe Installation Technical Memorandum for the Go East Landfill/Bakerview Redevelopment Project.* Probe installations are completed in accordance with - Vikek's January 1, 2020 "LFG Probe Installation Process memorandum," Go East Landfill Closure and Redevelopment Project and WAC 173 requirements, and the following activities:

- **Predrilling activities**. Including initial site visit and siting boring locations;
- **Drilling and installation of LFG probes**, outside the cover system and each with appropriate screened interval;
- **Erosion control during construction**, by assuring standard temporary erosion and sediment control (TESC) facilities are maintained and functional; and
- **Recommendations,** for future regulatory compliance monitoring.

1.2 SITE LOCATION AND BACKGROUND

1.2.1 Site Location - The Go East Landfill site/Bakerview is located at 4330 108th Street SE, Everett, Washington.

1.2.2 Background - The site was operated as an excavation for a sand borrow site from 1969 through 1971. Between 1972 and 1977 the landfill operator (Rekoway) accepted wood waste debris that included partially burned trees and stumps, and concrete solid material that were compacted and placed in sealed cells before the site was closed in 1978. After reopening in 1979 with Go East as the Owner/Operator, the site accepted wood waste placed in enclosed cells from 1979 to 1983, after which the landfill ceased all operations.

The landfill has not accepted waste for more than 35 years and is now being closed in accordance with WAC 173-350 regulatory requirements. The landfill final closure system includes a high-density polyethylene geomembrane to prevent water from percolating into the waste mass. This geomembrane cover prevents LFG from venting, so a venting system is provided to allow LFG to escape. To ensure that LFG is venting, LFG probes were installed around the landfill to monitor for potential horizontal migration.

2.0 PREDRILLING ACTIVITIES

Prior to the start of field work, Vikek personnel completed a site review with PACE's construction manager and the drilling contractor (Holt Drilling Company). The driller, Holt, was selected by the Owner. The location of each probe installation was staked, and each stake noted with a number, surface elevation, and if there was cut or fill to achieve final grade. The surface elevation was measured from the top of a hub located adjacent to the stake.

3.0 DRILLING AND LANDFILL PROBE INSTALLATIONS

3.1 DRILLING METHODS

Twelve (12) LFG probes (GPs) were installed using a tracked drill rig with an eight (8)-inch diameter hollow stem auger. During drilling, soil was observed for type, moisture content, and trace amounts of gravel and wood pieces.

3.2 LANDFILL GAS PROBE INSTALLATION

The probe locations are shown on **Figure 1** and boring logs and completion forms for each probe in **Appendix A**. Note that Figure 1 is the as-built grading and drainage plan for the site. Daily observation reports are attached in **Appendix B**. All GPs were completed with a 1-inch-diameter Schedule 40 polyvinyl chloride (PVC) well casing, a 0.010-slot (10 slot) stainless steel screen, and a pea gravel filter pack. Drilling was advanced into native soil or to a perched water unit. Each probe has a five (5) foot, screened section. The top of the probe has a lab cock to allow for future vapor sampling. A summary of the probe depths and completion details is provided in **Table 1**.

Over drilled sections below bottom of refuse were backfilled with hydrated bentonite chips to seal the zone between the refuse and underlying soil. A minimum 3-foot bentonite-chip seal was placed above the filter pack, and the remainder of the annular space was backfilled with bentonite chips to fill the annular space around the GP casing to within approximately 2 to 3 feet below ground surface (bgs). The probes were installed with a lab cock fitting, which will remain closed to prevent unintended discharge of LFG to the atmosphere, and to allow for future vapor sampling.

The ground surface is not yet finished to final grade at several of the probe locations. In locations where the ground surface was not to final grade the probe was completed by extending the probe's PVC casing and labcock to within 1- to 3-inches of the final grade. A Sonotube was then placed over the PVC casing and filled with soil to within a foot of the final grade. A cast iron monument was placed over the PVC casing and the annulus filled with concrete. Photographs of a typical LFG probe completion above grade is provided in **Figure 2**.

GPs 6 and 7 both had a high perched water zone when installed on November 30, 2021. The decision was to place the screen and then observe the following day if the water level dropped. When observed the following day water was not found in either GP. Daily reports (Appendix A) were prepared to document each day's activities. GP logs (Appendix B) to document the soil and groundwater conditions for each probe, and well installation details.

4.0 TEMPORARY EROSION AND SEDIMENT CONTROL

During installation of the probes, the site required additional fill to achieve final grades. Where drilling occurred in areas where grass was growing the general contractor maintained standard temporary erosion and sediment control (TESC) facilities and applied straw over disturbed ground. In areas that have not been erosion protected, no additional work to cover bare ground was performed.

5.0 RECOMMENDATIONS

Final ground surface elevations should be updated after completion of final grading. The related LFG monitoring probe location tables and maps shall be updated prior to initiation of compliance monitoring and included in the As-Built Plans. All future permit and regulatory compliance monitoring shall be in accordance with a "Landfill Gas Monitoring Plan" that will be submitted and approved by the regulatory agencies.

TABLES

TABLE 1

SUMMARY OF LFG PROBE CONSTRUCTION DETAILS

Project No.002292, Go East Landfill /Bakerview Redevelopment Project

Gas Probe No.	Install Date	Location		Ground Surface Elevation	Top of Monument Elevation	Boring Depth (feet bgs)	Water Level Elevation (feet bgs)	Top of Screen Elevation (feet bgs)
		Northing	Easting					
GP-1	11/29/2021	330692.00	1312479.49	220.40	222.35	10	10	4
GP-2	11/29/2021	330543.64	1312353.98	225.50	229.39	10	-	4
GP-3	11/29/2021	330505.98	1312288.39	226.50	230.56	8.6	5	3
GP-4	11/30/2021	330447.39	1312184.50	226.30	230.97	10	-	4
GP-5	11/30/2021	330400.16	1312110.73	230.50	232.62	10	-	4
GP-6	10/30/2021	330424.41	1312030.73	237.00	237.84	20	4	15
GP-7	11/30/2021	330470.05	1311942.01	238.80	242.43	15	4	15
GP-8	12/01/2021	330485.30	1311891.07	241.20	243.22	10	10	4
GP-9	11/23/2021	330639.76	1311853.74	257.60	258.45	10	-	5
GP-10	11/23/2021	330729.69	1311928.98	262.70	260.16	17.5	-	12
GP-11	11/23/2021	330822.69	1311989.20	261.90	263.11	17.5	-	10
GP-12	11/24/2021	330913.46	1312013.66	262.30	261.57	30	-	24

Note:

1. bgs – below ground surface
2. Screen length is 5’ for all probes.
3. Ground surface elevations shown are not final and will be 1-ft higher after completion of final grading.

FIGURES

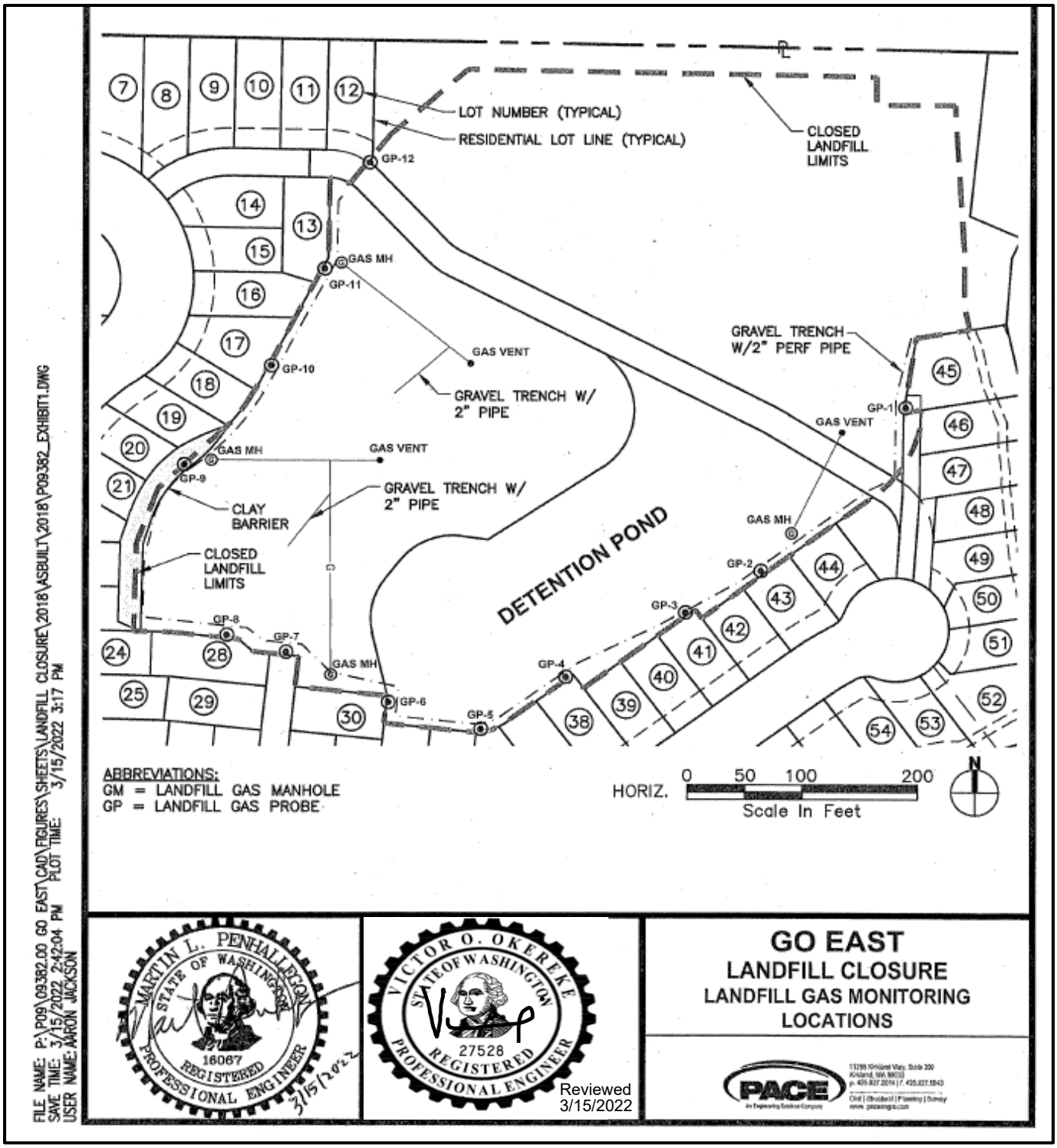


Figure 1. Landfill Gas Monitoring Locations (location data is provided in Table 1)

Figure 2. Typical LFG Probe Completion Above Grade

APPENDICES

APPENDIX A
PROBE LOGS AND COMPLETION FORMS

VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview)
Project Location: 4330 108th St SE, Everett, WA
Project Number: 002292

Log of Boring GP-1
Sheet 1 of 1

Date(s) Drilled: 11/29/2021	Logged By: G. ARNDT	Checked By: V. Okereke
Drilling Method: 8" Auger	Drill Bit Size/Type:	Total Depth of Borehole: 15'
Drill Rig Type: Mobile Track Drill Rig B-57	Drilling Contractor: Holt	Approximate Surface Elevation: 220.4
Groundwater Level and Date Measured: trace at bottom	Sampling Method(s):	Top of Casing: 222.35
Borehole Backfill:	Location: N. 330692.00 E. 1312479.49	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0							2'-3" top of monument
	0						0-15' tan silty sand	
	5							--
							7-10 trace gravel w/ bits of wood	bentonite
	10							--
								5', 1", 10 slot SS screen
							gravel size to 3/4"	
	15						14 -15 silt content increase	--
							bottom, trace water in boring	--
	20							
	25							

[fieldlog.tpl]

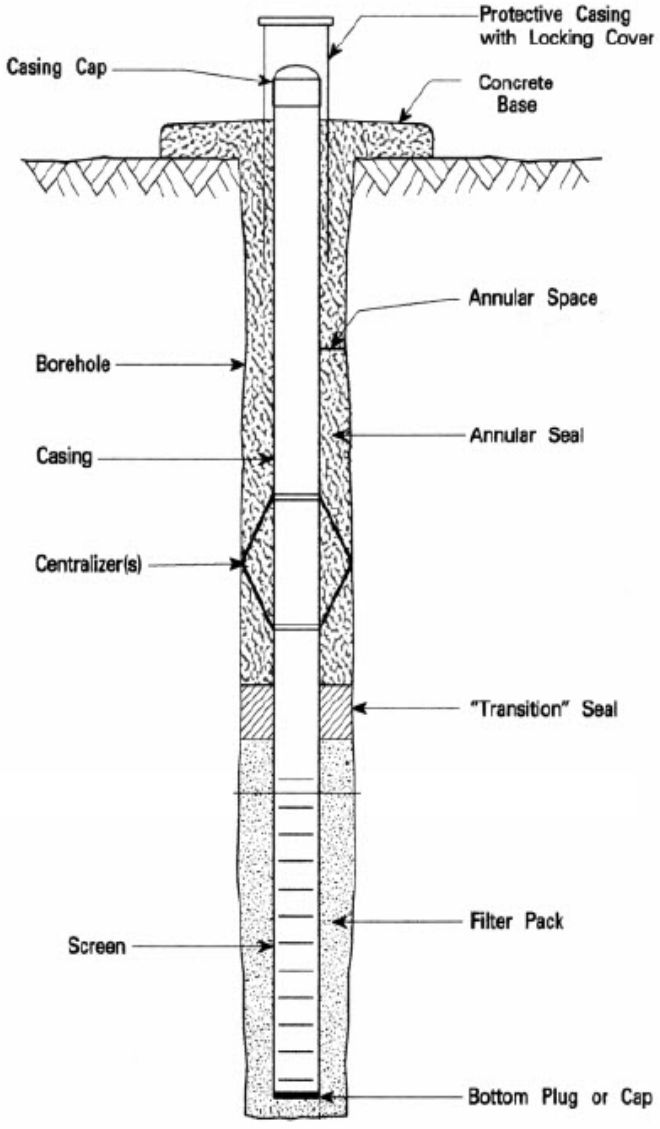
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-1	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 220.4	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: G. Arndt	
Water Level: ~205.5	Start: 10:45am	Finish: 11:30am

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~219-220
Annular Seal: Bentonite ~214-211 Soil ~219-211
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~ 211-205.5
Screen: 5', 1", 10 slot SS 215.5 - 205.5
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~205.5

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-2 **Sheet 1 of 1**

Date(s) Drilled	11/29/2021	Logged By	G. ARNDT	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	10'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	225.5
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	229.39
Borehole Backfill		Location	N. 330543.64 E. 1312353.98		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0							3'-6" top of monument
0							Ground Surface 0-10' tan silty sand w/ trace gravel	--
	5							bentonite 5', 1", 10 slot SS screen
	10						bottom	
	15							
	20							
	25							

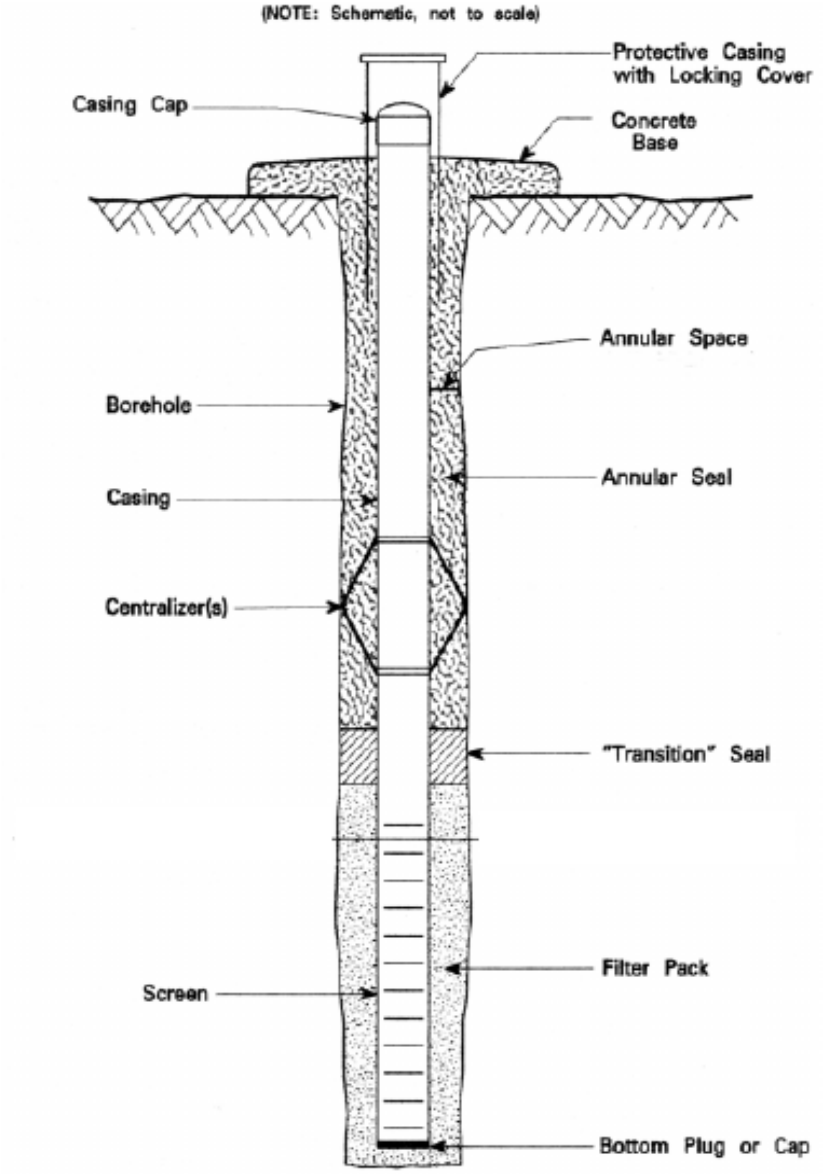
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-2	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 225.5	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: G. Arndt	
Water Level:	Start: 1:20pm	Finish: 2:00pm

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~227-229
Annular Seal: bentonite ~ 221.5-223.5 Soil ~223.5-227
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~216.5-223.5
Screen: 5',1", 10 slot SS ~217.5-222.5
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~216.5

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-3 **Sheet 1 of 1**

Date(s) Drilled	11/29/2021	Logged By	G. ARNDT	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	8'-7"
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	226.5
Groundwater Level and Date Measured	221.5 (11/29/21)	Sampling Method(s)		Top of Casing	230.56
Borehole Backfill		Location	N. 330505.98 E. 1312288.39		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0						--monument	--3'-6" monument
	0	Ground Surface					0-8'-7" tan silty sand	-- 2' bentonite
	5						water level	5', 1" 10 Slot SS screen
	10						--Bottom	
	15							
	20							
	25							

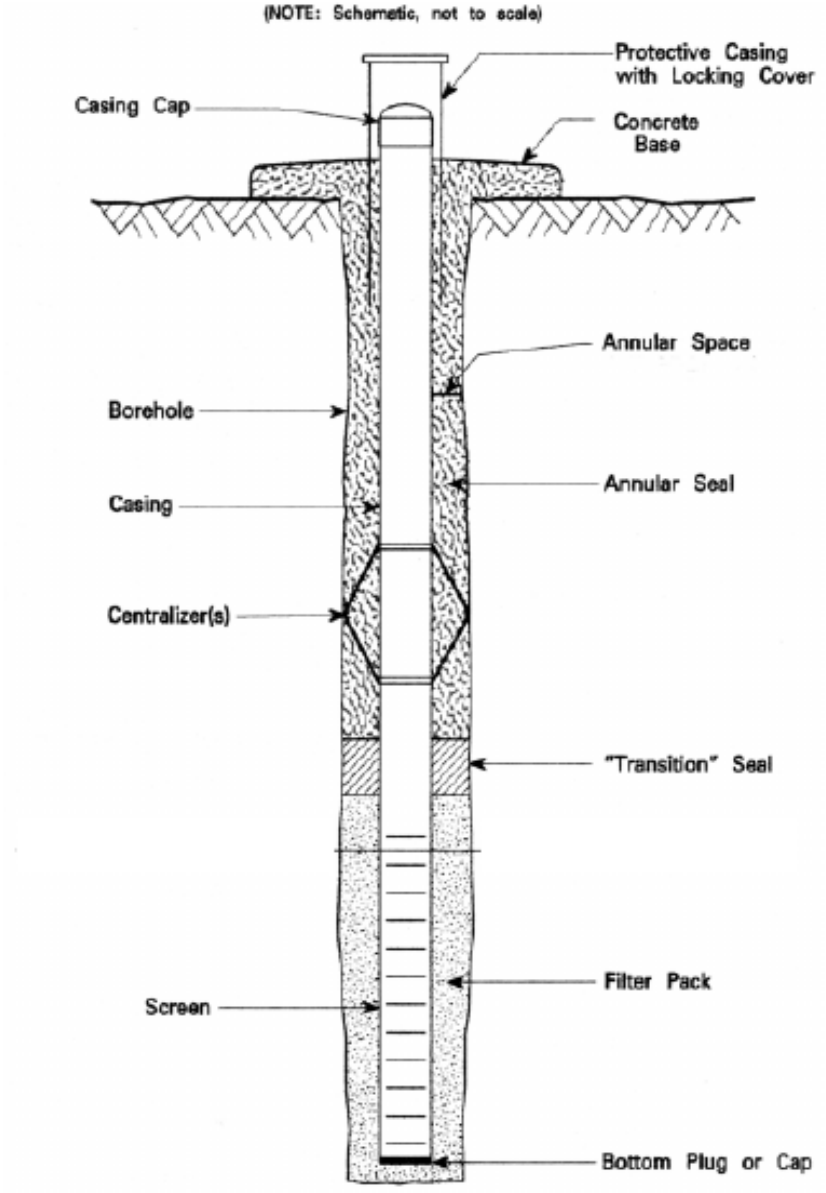
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-3	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 226.5	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: G. Arndt	
Water Level: ~221.5	Start: 2:05pm	Finish: 3:15pm

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~228-230
Annular Seal: 2' bentonite ~224-226 Soil ~ 226-228
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~217-224
Screen: 5', 1", 10 slot SS ~218-223
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~217

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-4 **Sheet 1 of 1**

Date(s) Drilled	11/30/2021	Logged By	G. ARNDT	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	10'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	226.34
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	230.97
Borehole Backfill		Location	N. 330447.39 E. 1312184.5		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0							--4.77 top of monument
	0		Ground Surface				0-10' tan silty sand w/ a few gravel pieces	-- bentonite
	5							5', 1", 10 slot SS screen
	10						bottom boring	
	15							
	20							
	25							

field.gpj

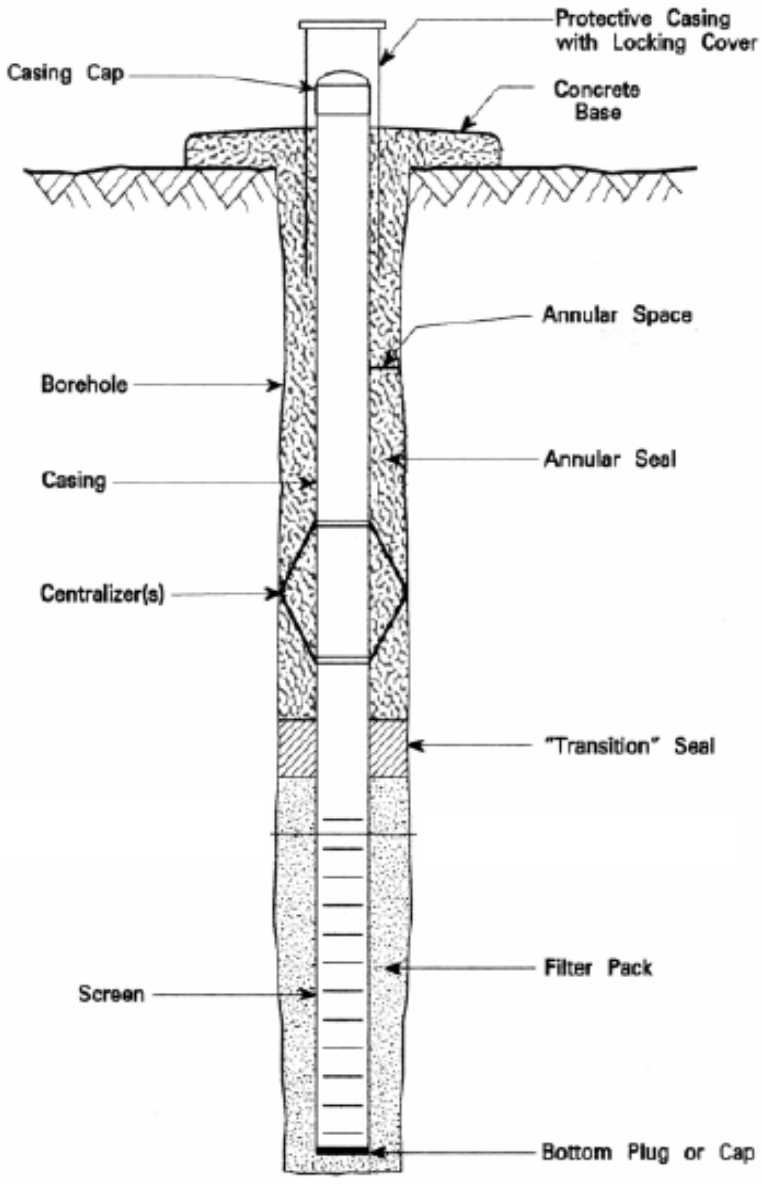
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-4	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 226.30	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: G. Arndt	
Water Level:	Start: 9:10am	Finish: 9:30am

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~229.5-230.5
Annular Seal: 2' bentonite ~222-224 Soil ~224-229.5
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~215-222
Screen: 5', 1", 10 slot SS ~216-221
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~215

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview)
Project Location: 4330 108th St SE, Everett, WA
Project Number: 002292

Log of Boring GP-5
Sheet 1 of 1

Date(s) Drilled	11/30/2021	Logged By	G. ARNDT	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	10'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	230.54
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	232.62
Borehole Backfill		Location	N. 330400.16 E. 1312110.73		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0						monument	-- ~232.6 top of monument
0							Ground Surface 0-2' grey sand w/ gravel	
							2'-10' tan silty sand w/ silt layers	-- bentonite
5								5', 1", 10 slot SS screen
	10						bottom boring	
15								
20								
	25							

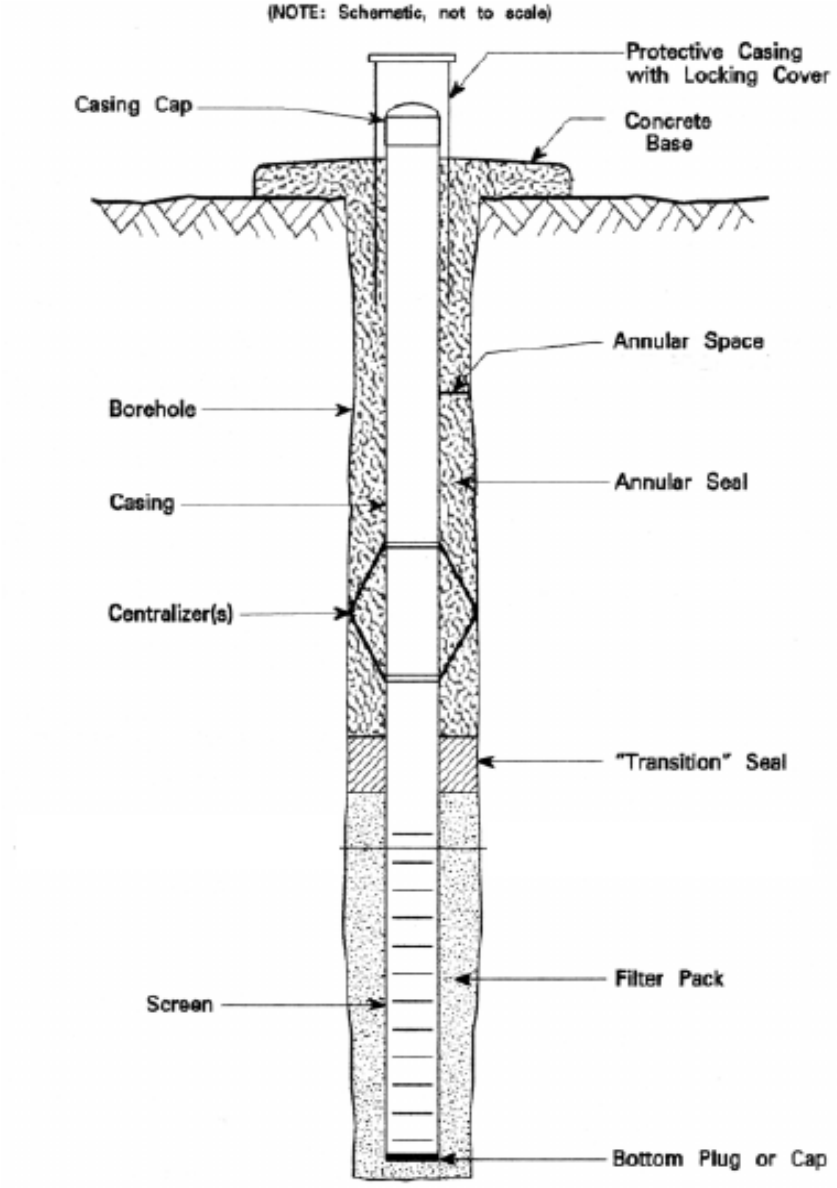
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-5	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 230.50	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: G. Arndt	
Water Level:	Start: 9:40am	Finish: 10:10am

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~230-232
Annular Seal: 2' bentonite ~227-229 Soil ~229-230
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~220-227
Screen: 5', 1", 10 slot SS ~221-226
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~220

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview)
Project Location: 4330 108th St SE, Everett, WA
Project Number: 002292

Log of Boring GP-6
Sheet 1 of 1

Date(s) Drilled	11/30/2021	Logged By	D. Hawk	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8" Auger CFA	Total Depth of Borehole	20'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	237.0
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	237.84
Borehole Backfill		Location	N. 330424.41 E. 1312030.73		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0						Brown gray sand w/ gravel	
							more gravel	perched water
	5						organic silty sand	
							brown silty sand	
								bentonite to surface
	10						sand w/ some silt - very moist	
							slightly silty sand	
	15						--	
							silty sand	screen
	20						--	
	25							
	30							

Bexfdog.tpl

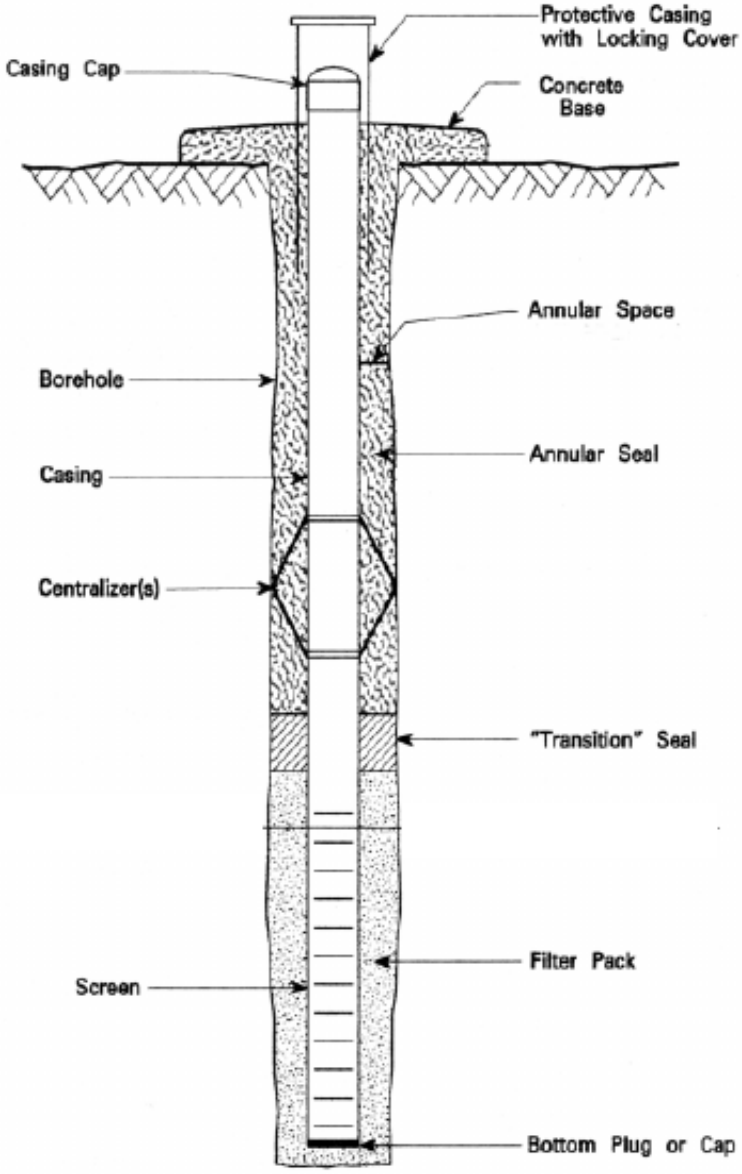
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-6	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 237	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: D. Hawk	
Water Level: ~233	Start: 12:15pm	Finish: 1:30pm

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~236-237
Annular Seal: Bentonite ~223-237 Soil ~235-236
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~216-223
Screen: 5', 1", 10 slot, SS ~217-222
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~216

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview)
Project Location: 4330 108th St SE, Everett, WA
Project Number: 002292

Log of Boring GP-7
Sheet 1 of 1

Date(s) Drilled	11/30/2021	Logged By	D.Hawk	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8" Auger CFA	Total Depth of Borehole	15'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	238.80
Groundwater Level and Date Measured	7.5' 11/30/21 3.0' 11/30/21	Sampling Method(s)		Top of Casing	242.43
Borehole Backfill		Location	N. 330470.05 E. 1311942.01		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft.	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0						silty brown sand	bentonite
							gravelly sand, wet, silty	perched water
	5						very moist silty sand brown/tan	screen
	10						slightly brown sand	*caved to 10'
							wet at 14'	checked for depth and then placed a couple inches of gravel and then placed screen
	15						BoH	
	20						water rose to a depth of 3.5' in gas probe after installation	
	25							
	30							

[Boring Log]

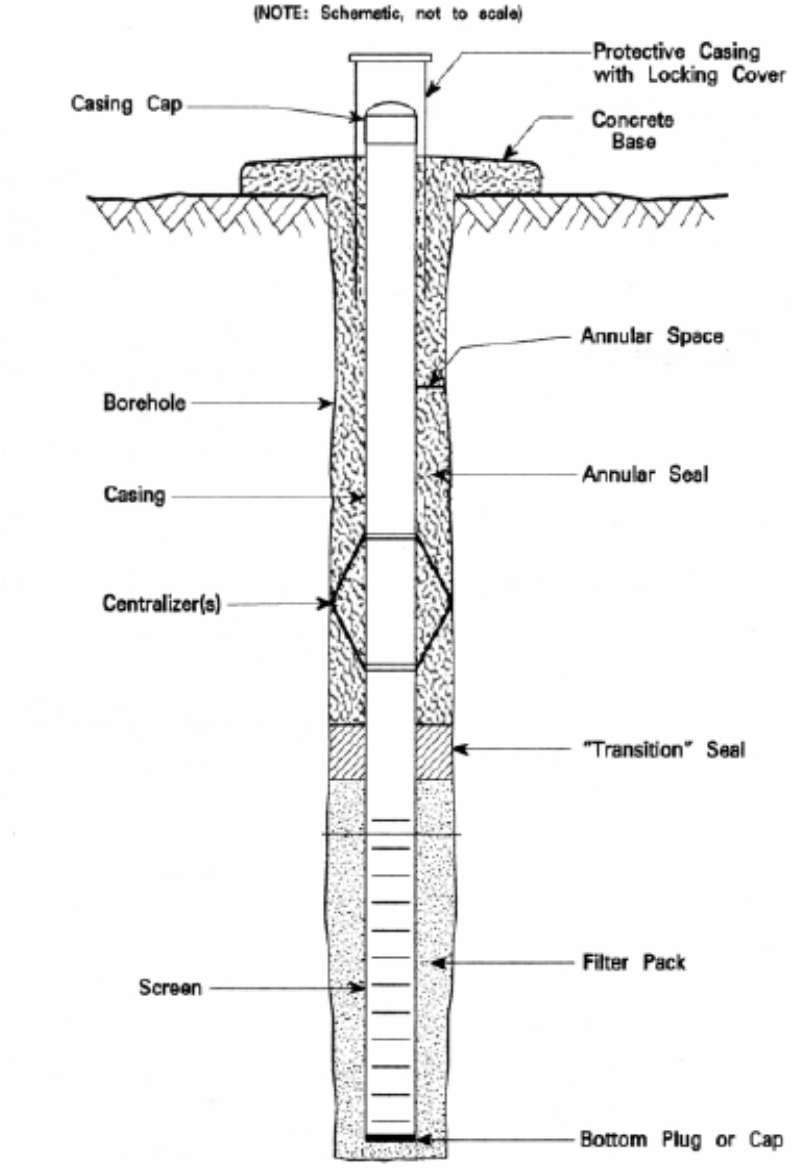
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-7	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 238.78	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: D. Hawk	
Water Level: ~232	Start: 1.35pm	Finish: 1.55pm

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~240- 242
Annular Seal: bentonite ~234.8-237 Soil 237-240
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~227.8-234.8
Screen: 5', 1", 10 slot, SS ~228.8 – 233.8
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~228.8

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview)
Project Location: 4330 108th St SE, Everett, WA
Project Number: 002292

Log of Boring GP-8
Sheet 1 of 1

Date(s) Drilled: 12/01/2021	Logged By: G. ARNDT	Checked By: V. Okereke
Drilling Method: 8" Auger	Drill Bit Size/Type:	Total Depth of Borehole: 10'
Drill Rig Type: Mobile Track Drill Rig B-57	Drilling Contractor: Holt	Approximate Surface Elevation: 241.20
Groundwater Level and Date Measured: ~231 (12/01/21)	Sampling Method(s):	Top of Casing: 243.22
Borehole Backfill:	Location: N. 330485.3 E. 1311891.07	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0						--top monument	2.15 monument
	0		Ground Surface				0-10' tan silty sand w/ trace gravel & wood	--
							moisture increasing	bentonite
	5							--
								5', 1", 10 slot SS screen
	10						water tricking into boring	--
								--
	15							
	20							
	25							

VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-8 - Abandoned **Sheet 1 of 1**

Date(s) Drilled	11/29/2021	Logged By	G. ARNDT	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	25'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	241.23
Groundwater Level and Date Measured	6' BGS	Sampling Method(s)		Top of Casing	
Borehole Backfill	Bentonite	Location			

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0						0-25' tan silty sand w/ trace gravel and wood	Abandoned boring, back-filled w/ bentonite
	5						moisture increasing	
	10							
	15							
	20							
	25						bottom	
	30							

field log.tpl

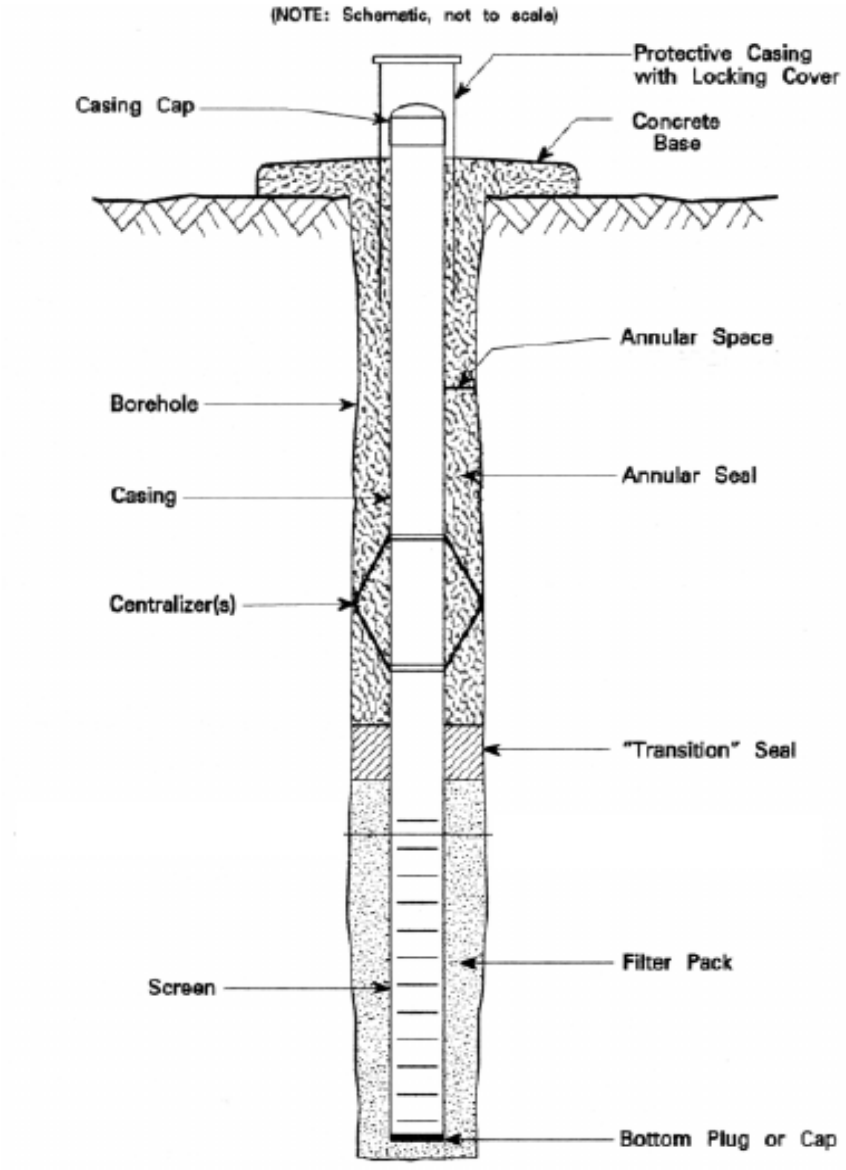
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-8	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 241	Drilling Contractor: Holt	
Drilling Method:	Logged by: G. Arndt	
Water Level:	Start: 9:15am	Finish: 9:50am

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~240-241
Annular Seal: bentonite ~238-240
Transition Seal: Not Used
Filter Pack: 7' pea gravel ~231-238
Screen: 5', 1", 10 slot, SS ~231-236
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~231

(NOTE: Schematic, not to scale)



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-9 **Sheet 1 of 1**

Date(s) Drilled	11/23/2021	Logged By	Bill Hillmann	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type		Total Depth of Borehole	10'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	257.60'
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	258.45
Borehole Backfill		Location	N. 330639.76 E. 131853.74		

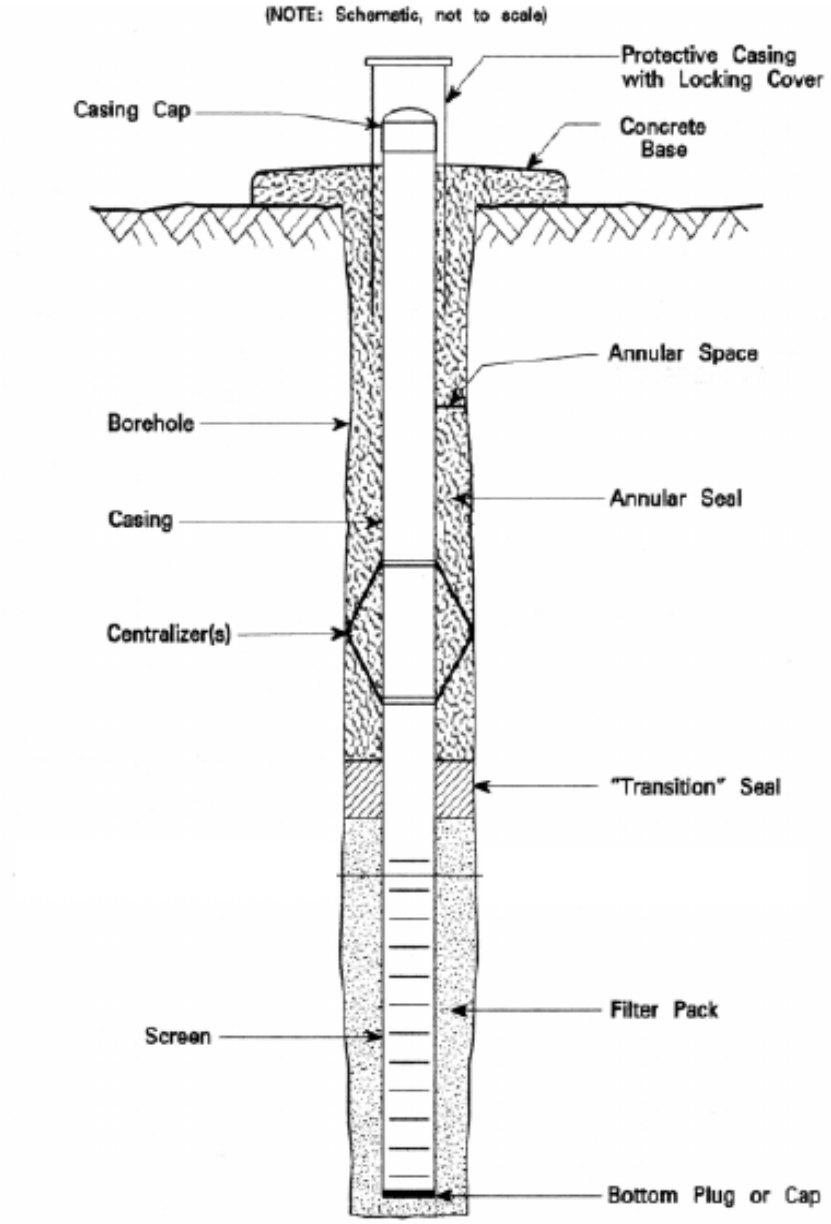
Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0				SM		0-10' silty sand,moist, native soil	--
								5' bentonite
	5							--
								5', 1", 10 slot SS
	10				SM		to 10.0'	--
	15							
	20							
	25							
	30							

VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-9	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 257.60	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: B. Hillman	
Water Level:	Start: 1230	Finish: 1315

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~256-257
Annular Seal: bentonite chips ~254-256
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~247-254
Screen: 5.0', 1", 10 slot, SS ~248 – 253
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: ~247- capped



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** PACE 01	**Log of Boring** GP-10 **Sheet 1 of 1**

Date(s) Drilled 11/23/2021	Logged By B. Hillman	Checked By
Drilling Method 8" Auger	Drill Bit Size/Type 8"	Total Depth of Borehole 17.5'
Drill Rig Type Mobile Track Drill Rig B-57	Drilling Contractor Holt	Approximate Surface Elevation 262.72
Groundwater Level and Date Measured	Sampling Method(s)	Hammer Data
Borehole Backfill	Location	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0				SM SW		sand w/ minor silt + gravel, brown, dry	
	5							
	10				SM		silty sand, brown, slightly moist	
							sandy silt, grey, moist, minor debris (brick), native	Hole drilled to 15' an 11-23, will complete on 11-24
	15				SM			
							silty sand, brown, dry, depth 17.5	17.5 T.D. silty sand
	20						no odor	
	25							
	30							

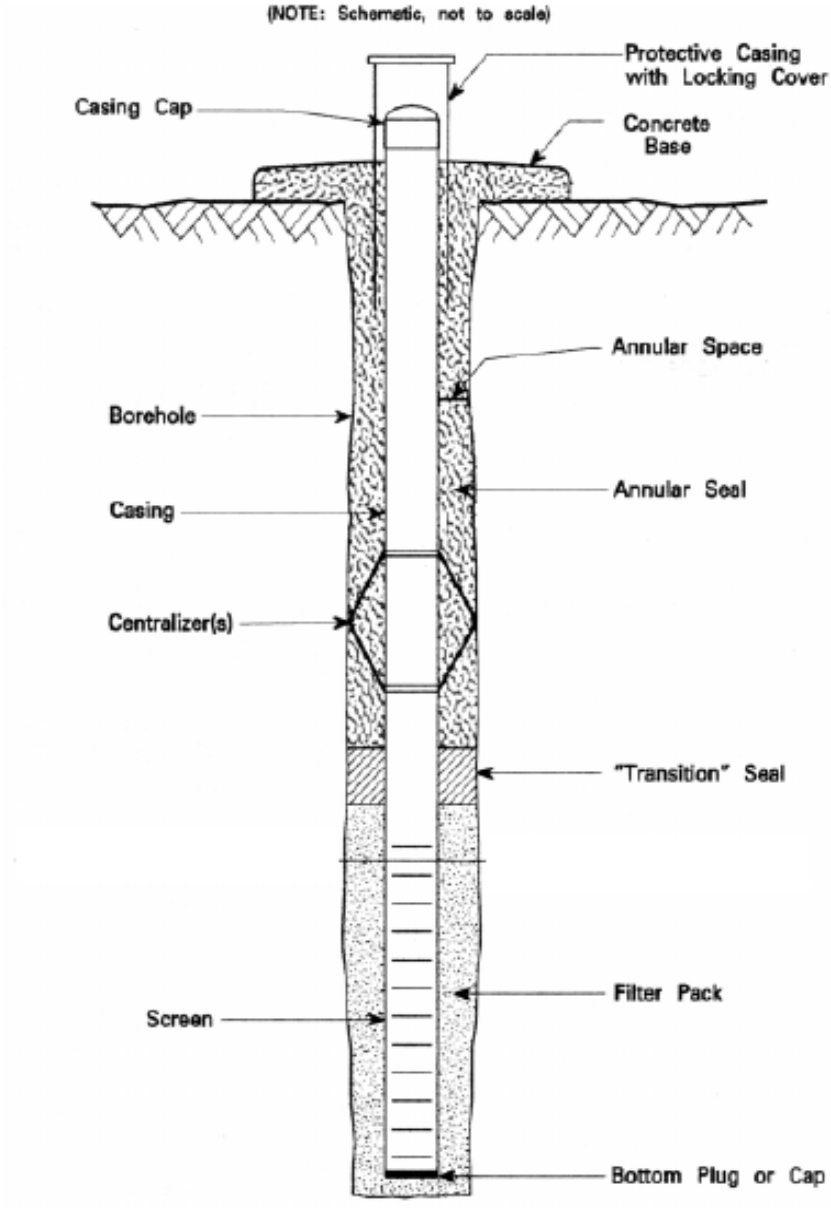
[fieldlog.tpl]

VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-10	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 262.70	Drilling Contractor: Holt	
Drilling Method: H.S. Auger 8"	Logged by: B. Hillman	
Water Level:	Start: 1425 (11-23-21)	Finish: 0910 (11-24-21)

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete:
Annular Seal: 11.0' 3/8" bentonite to surface
Transition Seal: Not Used
Filter Pack: 11-17.5' 3/8 pea gravel
Screen: 12.0 – 17.0' 1", 10slot, SS
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: 17.5' capped



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-11 **Sheet 1 of 1**

Date(s) Drilled	11/23/2021	Logged By	B. Hillman	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	17.5'
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	261.90
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	261.74
Borehole Backfill		Location	N. 330817.39 E. 1311974.87		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0				SW		1-7 sand w/ minor gravel, brown, slightly moist	
					SM			
	5						7-11 sand, brown, dry, minor woody debris	
	10				SM		silty sand, increasing woody debris 11-15 sandy silt, gray-brown	
	15						16 -17.5 sand, gray, very moist	16' very moist, wet
					SW		T.D. 17.5	
	20						No odor	
	25							
	30							

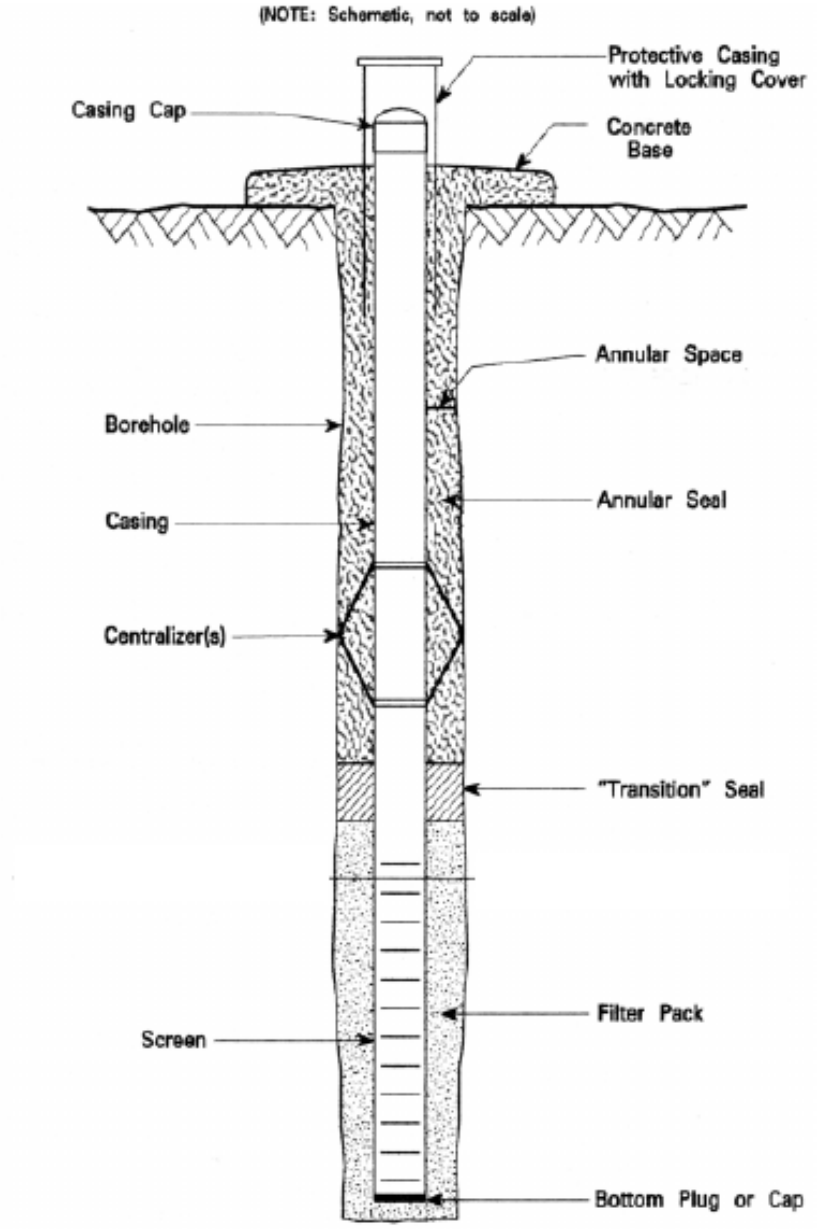
Bedrog.tpl

VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-11	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 261.90	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: B. Hillman	
Water Level: NA	Start: 1015	Finish: 1055

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~259-261
Annular Seal: bentonite ~253-257 Soil ~257-259
Transition Seal: Not Used
Filter Pack: 3/8" pea gravel ~247-253
Screen: 5', 1", 10 slot, SS ~247-252
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: capped ~ 246.9



VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project: Go East Landfill (Bakerview) **Project Location:** 4330 108th St SE, Everett, WA **Project Number:** 002292	**Log of Boring** GP-12 **Sheet 1 of 1**

Date(s) Drilled	11/24/2021	Logged By	B. Hillman	Checked By	V. Okereke
Drilling Method	8" Auger	Drill Bit Size/Type	8"	Total Depth of Borehole	
Drill Rig Type	Mobile Track Drill Rig B-57	Drilling Contractor	Holt	Approximate Surface Elevation	262.30
Groundwater Level and Date Measured		Sampling Method(s)		Top of Casing	261.57
Borehole Backfill		Location	N. 330913.46 E. 1312013.66		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	REMARKS AND OTHER TESTS
	0				GM		0-2' sand, gravel, brown, moist	
					SM		2-6 silty sand, brown	
	5						6-10 sand, w/ gravel, slightly moist brown-gray	
	10				SM		10 -17.5 sand, brown, slightly moist, minor gravel	
	15							
	20						17.5-27.5 silty sand, brown, w/wood, debris, native	
	25						27-30 silty sand, light brown, very moist	
	30							

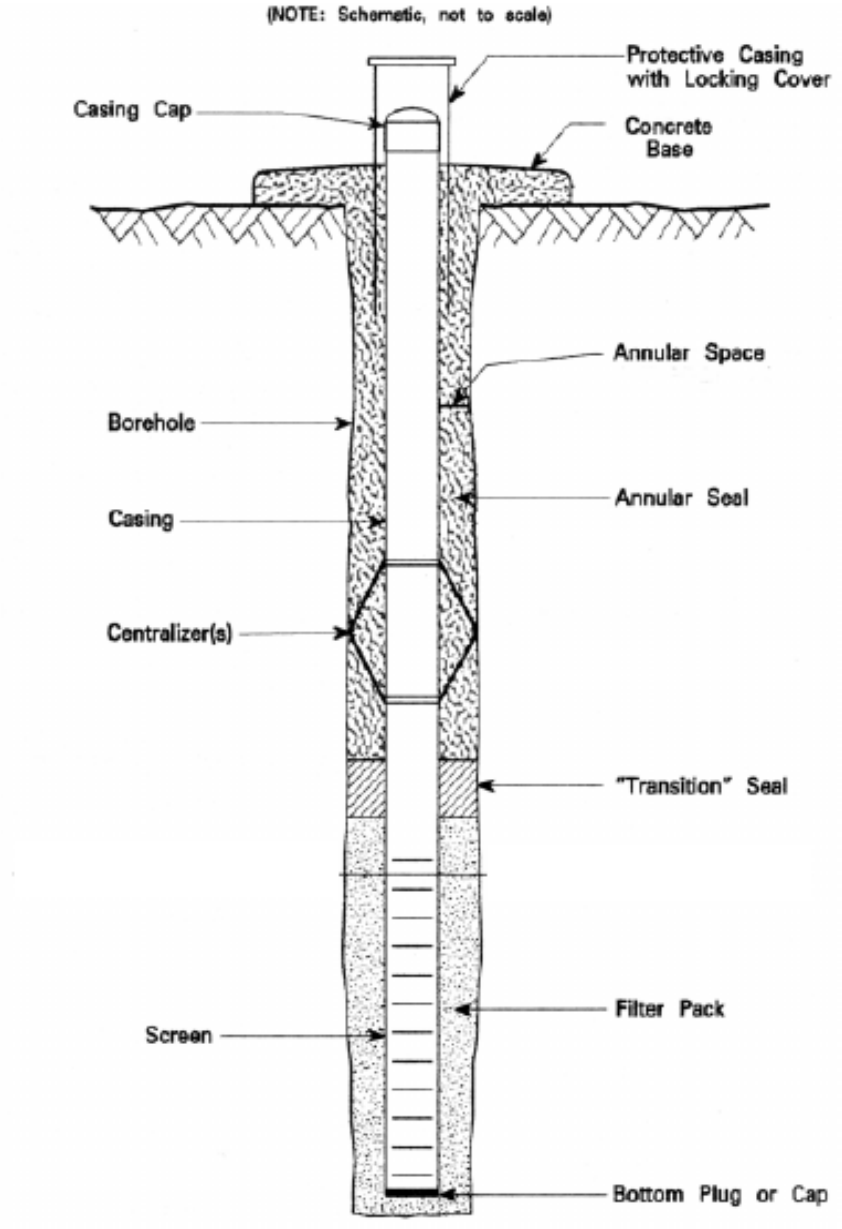
VIKEK Environmental Engineers, LLC

Excellence – Sustainability - Integrity

Project Number: 002292	Boring/Monitoring Well Number: GP-12	
Project: Go East LF (Bakerview)	Location: 4330 108th St SE, Everett, WA	
Approximate Surface Elevation: 262.30	Drilling Contractor: Holt	
Drilling Method: H.S. Auger	Logged by: B. Hillman	
Water Level:	Start: 12:30pm	Finish: 2:20pm

Casing Cap: Labcock valve
Casing Type: 1" Sch 40 PVC
Concrete: ~260-262
Annular Seal: bentonite ~238-260
Transition Seal: Not Used
Filter Pack: pea gravel ~232-238
Screen: 5", 1", 10 slot, SS ~232-237
Centralizer: Not Used
Borehole Diameter: 8"
Sump: Not Used
Bottom of Boring: Cap ~232

(NOTE: Schematic, not to scale)



APPENDIX B
DAILY OBSERVATION REPORTS

CONSTRUCTION OBSERVATION DAILY REPORT

DATE: 11/23/2021	**PROJECT NO.** 002292	**WEATHER:** Cloudy. 45°F
PROJECT NAME: Go East Landfill/ Bakerview Closure & Redevelopment		**CLIENT:** PACE Engineers Inc. (PACE)
VIKEK EQUIPMENT USED: Camera		**PROJECT LOCATION:** 4330 108th Street SE Everett, WA 98208

NOTES

Arrival Time: 9:50 AM

Activities: Landfill Gas (LFG) Monitoring Probe Installation

Personnel/Visitors: Gary Arndt (Vikek), Bob Hillman (Vikek), Victor O. Okereke (Vikek) Jay Pullen (Pace), and Clay Grace (Aero)

Reference Documents: LFG Probe Installation Process Rev 1 Nov. 22, 2021 (Vikek)

Observation Time: Nov. 23, 2021 Start Time:10 AM . End Time: 1:30 PM

T**emperature** AM:45°F PM: 45°F

Equipment Condition/Calibration Status: Tracked drill rig in acceptable operating condition

Observation and Comments: Walked site with Holt personnel. Observed access to each of the 12 LFG probes. Noted that LFG probe No. 11 required anchor trench to be filled in to provide access. There are other probes that need access, and Pace and Aero were all informed.

The ground surface is not final. For each LFG probe there will be cut, or fill required. For probes that are in locations to be filled , the probe will be left either to final elevation if possible or to an elevation that is acceptable to Holt. This approach was discussed with both Pace and Aero personnel and accepted.

At 1 PM Bob Hillman arrived to relieve Gary. Walked the site with Bob and reviewed the probe installation plan. Noted that probes are to be installed a minimum of 5' into native soil. For locations where native soil is encountered a few feet below ground surface, make sure the probe is installed deep enough to have a foot or more bentonite above the pea gravel.

Daily report by Bob Hillman is enclosed.

Action Items Requiring Correction: None

Observer: Gary Arndt

Closed by QA Manager: Victor O. Okereke . Date: 11/24/2021

Action Item Closure Date: None.

Comments: none

CONSTRUCTION OBSERVATION DAILY REPORT

DATE: 11/24/2021	**PROJECT NO.** 002292	**WEATHER:** Cloudy. 40s°F
PROJECT NAME: Go East Landfill/ Bakerview Closure & Redevelopment		**CLIENT:** PACE Engineers Inc. (PACE)
VIKEK EQUIPMENT USED: None		**PROJECT LOCATION:** 4330 108th Street SE Everett, WA 98208

NOTES

Arrival Time: 7:45 AM

Activities: Landfill Gas (LFG) Monitoring Probe Installation

Personnel/Visitors: Jay Pullen (Pace)

Reference Documents: LFG Probe Installation Process Rev of Nov. 23, 2021 (Vikek)

Observation Time: Nov. 24, 2021 Start Time:7:45 AM End Time: 3:30 PM

T**emperature** AM:35°F cloudy; PM 45 cloudy

Equipment Condition/Calibration Status: Tracked drill rig in acceptable operating condition

Observation and Comments: Holt arrives at 8:10. Preparation to begin drilling probe 10. Finish drilling at 9:10 and begin probe completion.

Aero begins working at 9:30 to complete the surface at probe 9.

Setup and drilling for probe 11 from 10:30 to noon.

Setup and drilling for probe 12 from 12:30 to 2:20. The area is not graded to the final surface. Holt will finish the probe with a monument later that will stick up above ground surface.

Move drill rig to south near probe 8. Leave site at 3:30.

Action Items Requiring Correction (use extra sheets as required): None

Observer: Bob Hillmann

Closed by QA Manager: Victor O. Okereke . Date: 12/01/2021

Action Item Closure Date: None.

Comments: none_

CONSTRUCTION OBSERVATION DAILY REPORT

DATE: 11/29/2021	**PROJECT NO.** 002292	**WEATHER:** Cloudy. 52°F
PROJECT NAME: Go East Landfill/ Bakerview Closure & Redevelopment		**CLIENT:** PACE Engineers Inc. (PACE)
VIKEK EQUIPMENT USED: Camera		**PROJECT LOCATION:** 4330 108th Street SE Everett, WA 98208

NOTES

Arrival Time: 8:50 AM

Activities: Landfill Gas (LFG) Monitoring Probe Installation

Personnel/Visitors: Gary Arndt (Vikek), Jay Pullen (Pace) and Josh (Aero)

Reference Documents: LFG Probe Installation Process Rev 1 Nov. 22, 2021 (Vikek)

Observation Time: Nov. 29, 2021 Start Time:8:15 AM End Time: 3:30 PM

T**emperature** AM:51°F PM: 53°F

Equipment Condition/Calibration Status: Tracked drill rig in acceptable operating condition

Observation and Comments: Holt set up on LFG probe 8 at 8:50 AM. Ground surface elevation 241.23. Bored 20'. Soil began to appear moist at 10'. Moisture increased to bottom of boring at 20'. When the auger was removed water was observed at 16' and within a few minutes water level stabilized at 6'. The boring collapsed below the water level filling the boring to 6' below ground surface. A decision was made to abandon the hole. The boring was filled with bentonite.

Moved to LFG probe 1 location. Set up at 10:45 AM. Ground surface elevation 220.04. Bored 15'. There was a trace of water in the bottom of the boring. Completed the boring by placing 1' pea gravel in boring. Placed screen and PVC pipe. Filled to elevation 8' below ground surface with pea gravel then filled boring with bentonite chips to 1' below ground surface. Placed Sonotube over probe to approximately 2'-3" above ground surface. Filled Sonotube with silty sand to 1' below top and then placed monument cover and filled to top of Sonotube with concrete.

Moved to LFG probe 2 location. Set up at 1:20 PM. Ground surface elevation 225.87. The hub location for the boring was in a pit and was not accessible. Moved the boring 10' west. Bored 10'. There was no water in the boring. Completed the boring by placing 1' pea gravel in boring. Placed screen and PVC pipe. Filled to elevation 3' below ground surface with pea gravel then filled boring with bentonite chips to 6" below ground surface. Placed Sonotube over probe to approximately elevation 229.9. Filled Sonotube with silty sand to 1' below top and then placed monument cover and filled to top of Sonotube with concrete.

Moved to LFG probe 3 location. Set up at 2:05 AM. Ground surface elevation 223.48. The hub location for the boring was in a pit and was not accessible. Moved the boring 15' east. Bored 8'-7". Water was measured at 5' below ground surface and the boring held. Completed the boring by placing 1' pea gravel in boring. Placed screen and PVC pipe. Filled to elevation 2' below ground surface with pea gravel then filled boring with bentonite chips to ground surface. Placed Sonotube over probe to approximately 3'-6"

above ground surface. Filled Sonotube with silty sand to 1' below top and then placed monument cover and filled to top of Sonotube with concrete.

Discussion with Victor Okereke about high perched water table found. Decision was to place probe if there is at least 1' screen above the observed high seasonal water level and 3' to ground surface.

Discussion with Jay Pullen and Marty Pennhallegon at approximately 12:30 PM regarding high perched water table and the abandoned probe 8 boring. Told Marty that probe 1 was installed. Marty encouraged that we drill probes 2 to 5 as this fill may be dry. Told Marty and Jay that Vikek was developing a plan to modify the detail but that the modification is currently in development.

Action Items Requiring Correction (use extra sheets as required): None

Observer: Gary Arndt

Closed by QA Manager: Victor O. Okereke . Date: 11/29/2021

Action Item Closure Date: None.

Comments: none_

Probe 1 setup

Probe 1 complete

Probe 3 lath and hub moved boring 15’ east of this location

Probe 8 setup

Probe 8 abandoned

CONSTRUCTION OBSERVATION DAILY REPORT

DATE: 12/01/2021	**PROJECT NO.** 002292	**WEATHER:** Cloudy. 54°F
PROJECT NAME: Go East Landfill/ Bakerview Closure & Redevelopment		**CLIENT:** PACE Engineers Inc. (PACE)
VIKEK EQUIPMENT USED: Camera		**PROJECT LOCATION:** 4330 108th Street SE Everett, WA 98208

NOTES

Arrival Time: 8:05 AM

Activities: Landfill Gas (LFG) Monitoring Probe Installation

Personnel/Visitors: Gary Arndt (Vikek) and Jay Pullen (Pace)

Reference Documents: LFG Probe Installation Process Rev of Nov. 29, 2021 (Vikek)

Observation Time: Nov. 30, 2021 Start Time:8:05 AM End Time: 10:00 AM

T**emperature** AM:55°F cloudy

Equipment Condition/Calibration Status: Tracked drill rig in acceptable operating condition

Observation and Comments: Holt set up on LFG probe 8 at 9:10 AM. The new boring is approximately 3' from the boring abandoned on 11/29/21.Ground surface elevation 241.23. Bored 10'. Water was observed slowly flowing into the boring at bottom (10'). Completed the boring by placing 1' pea gravel in boring. Placed screen and PVC pipe. Filled to elevation 4' below ground surface with pea gravel then filled boring with bentonite chips to 1' below ground surface. The probe was left sticking in the air as the segment above ground is 2.15'. A Sonotube will be placed over the pipe, filled with soil and monument installed.

Probe 7 was left open as after installation on November 30, 2021, water rose to near the ground surface after installation. When observed on December 1, 2021, water was not visually observed to the well screen. The probe will be completed.

Action Items Requiring Correction (use extra sheets as required): None

Observer: Gary Arndt

Closed by QA Manager: Victor O. Okereke . Date: 12/01/2021

Action Item Closure Date: None.

Comments: none_

Probe 8 setup within 3’ of boring made on 11/29/2021

This page intentionally left blank