July 22, 2022

Oregon Department of Environmental Quality
Northwest Region Portland Office
700 NE Multnomah Street, Suite 600
Portland, Oregon 97232

Attn: Mr. Kenneth Thiessen

Transmitted via email to: *Kenneth.Thiessen@deq.state.or.us*

Re: 2022 Well Decommissioning Work Plan
Boeing Portland – Troutdale Gravel Aquifer Remedy
Gresham, Oregon
Project No. 0025116.122.440
(ECSI #13)

Dear Mr. Thiessen:

Landau Associates, Inc. (Landau) has prepared this well decommissioning work plan on behalf of The Boeing Company (Boeing) as part of the Boeing Portland Troutdale Gravel Aquifer (TGA) remedy being conducted at the Portland facility (site; Figure 1). The TGA remedy is being implemented under the Oregon Department of Environmental Quality (ODEQ) Consent Order No. LQSR-NWR-04-12(h) (Consent Order).

The purpose of this work plan is to request authorization from ODEQ to decommission wells that meet Consent Order goals with volatile organic compound (VOC) concentrations below the cleanup levels and are no longer necessary for the remedy monitoring program. Six wells have been selected for possible decommissioning: former extraction well E-9 and injection wells IW-1 through IW-5. The locations of these wells are shown on Figure 2.

This work plan also outlines the well construction information, decommissioning methodologies, reporting requirements, and proposed schedule for decommissioning. Well decommissioning activities will be conducted in accordance with the site health and safety plan (Landau 2020).

Background

Well E-9 is located south of the 85-001 Building, as shown on Figure 2. The well was installed in 1989 as a groundwater extraction well for the groundwater extraction and treatment system (GETS) and operated until 2002. Well E-9 was installed to treat chlorinated VOC (cVOC) concentrations in the West Cleanup Action Area (CAA) and the East Yard CAA, respectively and was shut down in 2002 because of low mass removal rates and low groundwater yields (Landau 2001). The well did not contribute significantly to reduce the overall mass or extent of the TGA plume and did not provide

substantial added benefit to maintain hydraulic control of the VOC plume. After 2002, the well was maintained as a monitoring location. Historical concentrations measured at E-9 for compounds of potential concern (COPCs; trichloroethene [TCE]; 1,1 dichloroethene [1,1-DCE]; 1,1,1-trichloroethane [1,1,1-TCA]; cis-1,2-dichloroethene [cisDCE]; tetrachloroethene [PCE]; and vinyl chloride [VC]) are summarized in Table 1. As shown in Table 1, E-9 has been consistently below the maximum contaminant levels (MCLs) since November 2008. The well was removed from the groundwater monitoring program in 2020 with ODEQ approval (ODEQ 2020).

The TGA well network and the August 2021 TCE results are shown on Figure 2. Well E-9 is located outside the MCL concentration contour for TCE (5 micrograms per liter).

Wells IW-1 through IW-5 are located inside the 85-105 Building (Figure 2) and were installed in December 2007 in response to the 2006 coolant release. The injection wells were installed upgradient of monitoring well LAI-4, which was identified as the main source area for total petroleum hydrocarbons (TPH) from the coolant release and were designed to deliver oxygen-releasing components (EHC-O™) for aerobic biodegradation of TPH. Baseline groundwater samples for diesel- and oil- range TPH (TPH-D and TPH-O, respectively) concentrations were collected at the injection wells prior to the initial injection of mixture of EHC-O™ and are provided in Table 2 (Landau 2008). TPH concentrations were not detected above laboratory reporting limits except at IW-3 which had detectable TPH-O concentrations. For these samples, the total TPH concentrations were below the site-specific cleanup level of 1.35 milligrams per liter (mg/L; Landau 2008). To date, eight EHC-O™ injections have occurred in the coolant release area and a total of 11,000 pounds of EHC-O™ have been injected into these five wells. Injections have successfully reduced TPH concentrations at LAI-4 from 31,800 mg/L in September 2006 to 2.38 mg/L in August 2021. Although LAI-4 is still slightly above the site-specific cleanup level, injections can no longer be performed because the EHC-O™ slurry has solidified and clogged the injection well screens. Multiple unsuccessful attempts have been made to clear the injection well screens over the past several years. These wells are no longer useable as injection wells and other than the initial baseline sample collection, have never been part of the groundwater monitoring program for the site. Therefore, ODEQ approved decommissioning of IW-1 through IW-5 based on the request provided in the 2021 TGA Annual Report (Landau 2022).

Well Descriptions

Exploration logs and well as-builts are provided in Attachment 1, and descriptions of the wells are as follows with depth referring to feet (ft) below ground surface (bgs).

Well Identification	Borehole Outer Diameter (inches)	Total Borehole Depth (ft bgs)	Well Casing Diameter (inches)	Well Screen Depth (ft bgs)
E-9	10	20	6	10–15
IW-1	6	30	2	20–30
IW-2	6	30	2	20–30
IW-3	6	30	2	20–30
IW-4	6	30	2	20–30
IW-5	6	30	2	20–30

bgs = below ground surface
ft = feet

Methodology

Well decommissioning will follow applicable Oregon Administrative Rules (OARs) outlined in OAR 690-240 using overdrill methods and an Oregon-Certified Driller.

Prior to decommissioning activities, the following activities will be performed:

- Perform underground utility locate survey to determine the potential presence and location of buried utilities in the well vicinity.
- Submit a well decommissioning start card, as required by OAR 690-240-0385.
- Measure the depth to water and the total depth of the well.

Decommission in-Place

A decommissioning variance is being requested from the Oregon Water Resources Department (OWRD) for wells IW-1 through IW-5. If approved, decommissioning methods will be conducted in accordance with OAR 690-240-0510(2), or as defined in the OWRD Final Order, and will follow the general steps outlined below:

- The monument and concrete seal will be removed using an excavator or similar heavy equipment.
- The wells will be filled from the bottom up with a bentonite grout slurry that meets the requirements of OAR 690-240-0475.
- The well casings will be cut below grade, as compatible with the local site conditions and land practices.
- The holes/excavations at the ground surface (former monument area) will be backfilled with gravel and finished to match the surrounding areas.
- Upon completion of the well decommissioning, the materials and debris will be removed and disposed at a permitted landfill.

Overdrilling

If a decommissioning variance is not granted for IW-1 through IW-5, all six wells will be decommissioned by overdrilling using a rotosonic drill rig. Decommissioning methods will be conducted in accordance with OAR 690-240-0510(1) and will follow these general steps:

- The concrete surface seal, well monument or concrete pad and steel vault, and other surface items (e.g., bollards) will be removed using an excavator or similar heavy equipment. For extraction well E-9, the vault may be left in place if removal would be too obtrusive for the Boeing facility. If left in place, the vault bottom would be perforated and the vault would be filled with gravel or coarse rock.
- The stainless-steel (E-9) or polyvinyl chloride (PVC; IW-1 through IW-5) well casing and screen, and well seal materials (e.g., filter pack sand, bentonite) will be removed using the drilling rig by overdrilling the well from the ground surface to the total depth of each well. A minimum drill bit equal to the outside diameter of the boring will be used to overdrill the wells.
- The drill cuttings, sand filter pack, and other debris will be removed from the boring.
- The boring will be backfilled with bentonite grout slurry from the bottom of the boring to approximately 5 ft bgs. The bentonite grout slurry will meet the requirements of OAR 690-240-0475 for backfill materials. Grout mixture will be installed through a tremie pipe that is temporarily placed at the base of the well and raised as the well void space is filled with grout. Hydrated bentonite chips will be used to backfill the boring from 5 to 2 ft bgs. Concrete will be used to backfill the boring to the surface.
- The work area will be cleaned up, decommissioning materials and debris removed, and the ground surface restored to match surrounding terrain.

Site Cleanup and Waste Management

Solid wastes generated during decommissioning activities will be contained in either 55-gallon drums or a roll-off bin and placed into temporary storage at the Boeing facility pending permitting and transport to the proper disposal facility. The well vaults and stainless-steel casing/screens will be removed, decontaminated, and recycled at the appropriate facility.

Wastewater collected will be temporarily stored in a holding tank and decanted into the Boeing GETS.

Notification and Schedule

ODEQ will be notified via email prior to and upon the completion of the well decommissioning. Notification information will include the following, in accordance with OAR 690-240-0510(6) (notification requirements):

1) Well identification information
2) Decommissioning methodology
3) Amount and type of sealant/backfill material (i.e., bentonite grout) used
4) Any other information required by ODEQ.

Well decommissioning activities will also be summarized in the upcoming 2022 annual report. Decommissioning of E-9 and IW-1 through IW-5 is scheduled to begin in the summer/fall of 2022 and is expected to require 5–6 days to complete if a variance is not granted for IW-1 through IW-5.

The completion notification email will be sent to ODEQ within 2 weeks after decommissioning activities are completed.

* * * * * * * *

We look forward to your review and approval of this work plan. Please contact Evelyn Ives, Landau Associates, at (425) 329-0289 with any questions regarding this work plan or if you need additional information.

LANDAU ASSOCIATES, INC.

Jesikah Cavanaugh, EIT
Senior Staff EIT

Evelyn Ives, PE
Associate

JEC/EMW/EHI/ljl
[P:\025\116\FILERM\R\TGA\WORK PLANS\WELL DECOM 2022_WP\BOEING PORTLAND LANDAU_TGA WELL DECOMM_WP_FINAL 072222.DOCX]

Attachments

Figure 1	Boeing Portland Site Map
Figure 2	2022 Well Decommissioning
Table 1	Historic Compounds of Potential Concern Data for E-9
Table 2	Baseline Injection Well Groundwater Results
Attachment 1	Exploration Logs and Well As-builts

References

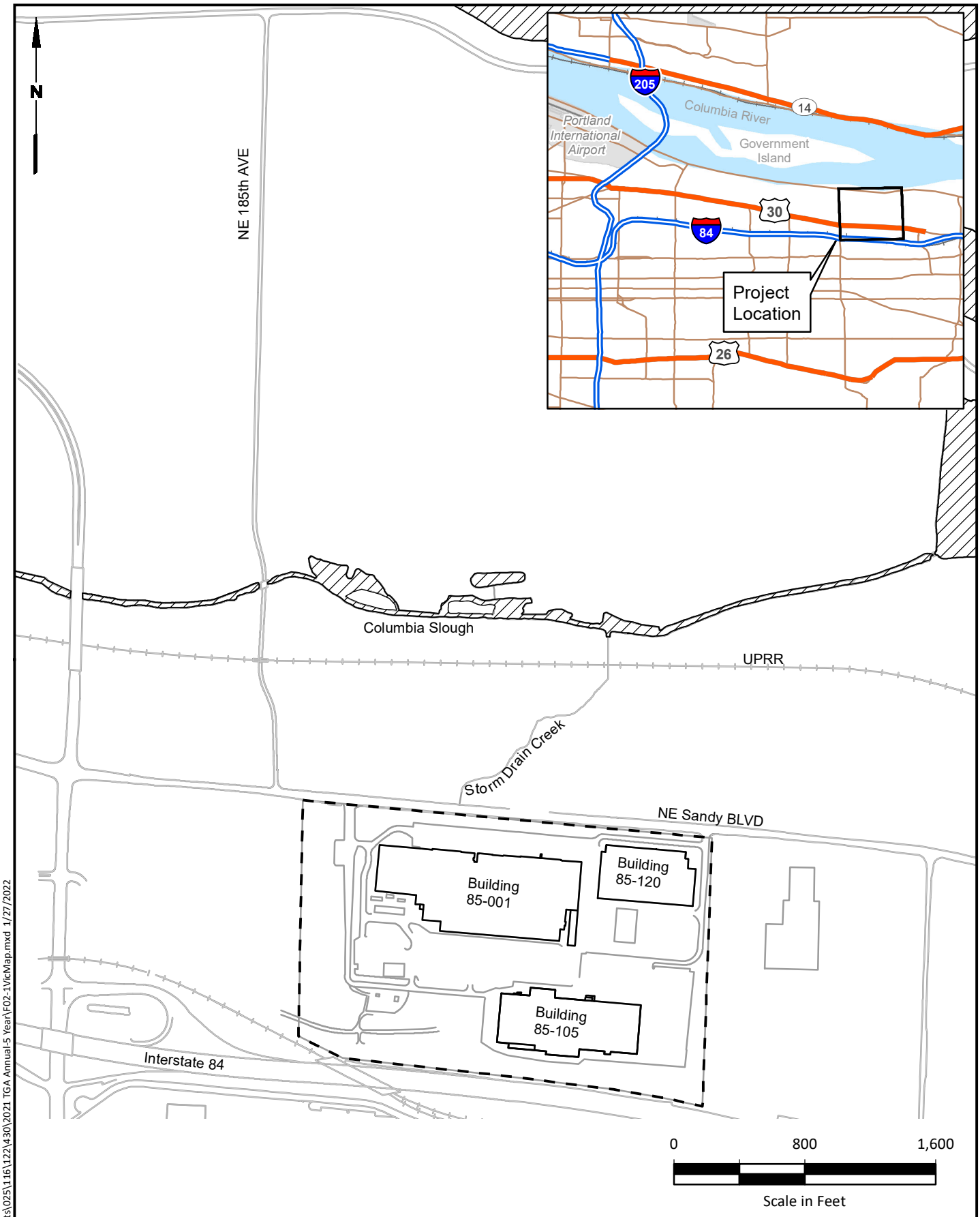
Landau. 2001. Report: Troutdale Gravel Aquifer Corrective Measure Annual Performance Evaluation January 1, 2000 through December 31, 2000. Landau Associates, Inc. March 14.

Landau. 2008. 1st Quarter 2008 Progress Report, Building 85-105 Coolant Investigation, Boeing Portland Facility, Gresham, Oregon. Landau Associates, Inc. June 10.

Landau. 2020. Health and Safety Plan, Boeing Portland, Gresham, Oregon. Landau Associates, Inc. Revised December 11.

Landau. 2022. 2021 Annual Progress and Five-Year Performance Evaluation Report, Troutdale Gravel Aquifer, Boeing Portland, Gresham, Oregon. Landau Associates, Inc. March 15.

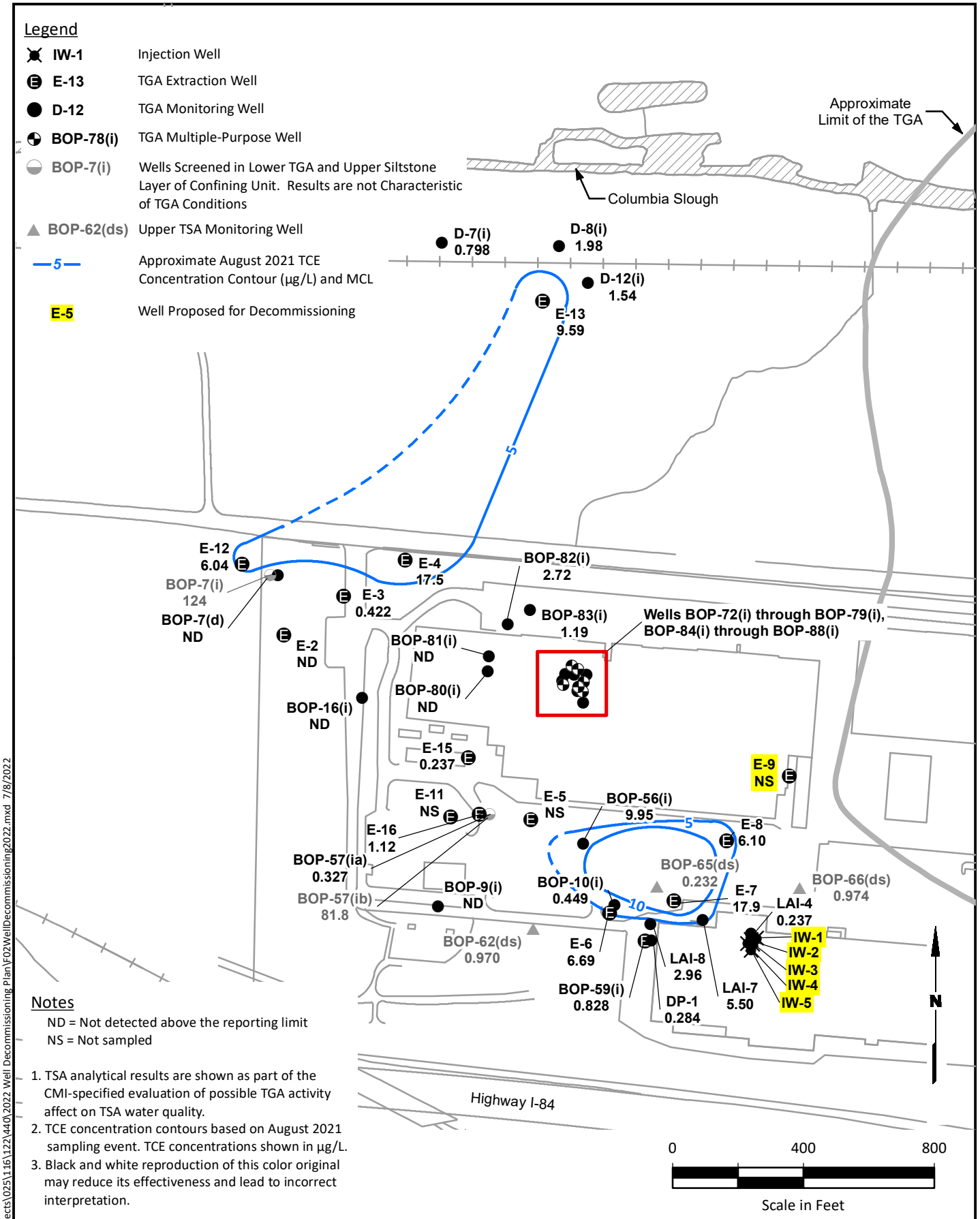
ODEQ. 2020. Letter: 2019 Annual Progress & Performance Report, Troutdale Gravel Aquifer, Boeing Portland Facility, Gresham, Oregon. ECSI #13. From Kenneth Thiessen, Oregon Department of Environmental Quality, to Chris Kimmel and Erin Waibel, Landau Associates, Inc. April 15.



G:\Projects\025\116\122\430\2021 TGA Annual-5 Year\F02-1VicMap.mxd 1/27/2022

LANDAU ASSOCIATES

Boeing Portland Gresham, Oregon	**Boeing Portland Site Map**	Figure 1



Notes

ND = Not detected above the reporting limit
NS = Not sampled

1. TSA analytical results are shown as part of the CMI-specified evaluation of possible TGA activity affect on TSA water quality.
2. TCE concentration contours based on August 2021 sampling event. TCE concentrations shown in µg/L.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

G:\Projects\025\116\122\440\2022 Well Decommissioning Plan\F02WellDecommissioning2022.mxd 7/8/2022

LANDAU ASSOCIATES

Boeing Portland
Gresham, Oregon

2022 Well Decommissioning

Figure
2

Table 1
Historic Compounds of Potential Concern Data for E-9
Boeing Portland - Troutdale Gravel Aquifer Remedy
Gresham, Oregon

Sample Location	Sample Date	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	1,1,1-TCA
Cleanup Standards:		5	5	2	7	70	200
E-9	3/28/1989	56	1	--	25	12	210
	4/6/1989	49	ND	--	28	13	250
	4/12/1989	64	--	--	26	12	190
	4/18/1989	75	--	--	28	13	180
	4/25/1989	71	--	--	29	16	170
	5/2/1989	68	--	--	28	13	170
	5/9/1989	63	--	--	25	11	140
	5/16/1989	70	--	--	31	14	170
	5/23/1989	64	--	--	26	11	140
	5/30/1989	65	--	--	28	13	150
	6/7/1989	62	--	--	27	10	140
	6/13/1989	73	4	--	32	14	150
	6/20/1989	60	3	--	28	11	130
	6/27/1989	52	2	--	22	7	110
	7/5/1989	43	2	--	19	7	110
	7/11/1989	39	1	--	19	7	110
	7/18/1989	37	1	--	20	6	95
	7/25/1989	51	2	--	27	7	130
	8/1/1989	36	1	--	20	5	96
	8/8/1989	31	1	--	17	6	81
	8/15/1989	31	1	--	18	9	97
	8/22/1989	27	1	--	14	6	73
	8/29/1989	25	3	--	12	6	69
	9/5/1989	34	1	--	13	4	47
	12/19/1989	33	0	--	9	4	110
	1/4/1990	50	1	--	18	5	73
	1/17/1990	62	2	--	20	6	67
	1/31/1990	61	2	--	20	6	60
	2/14/1990	68	4	--	21	8	62
	2/28/1990	77	3	--	18	8	73
	3/14/1990	49	1	--	15	3	35
	3/28/1990	49	--	--	21	4	68
	4/11/1990	66	1	--	26	4	63
	4/25/1990	78	3	--	26	6	79
	5/8/1990	76	3	--	33	7	75
	5/22/1990	68	2	--	30	6	82
	6/6/1990	76	3	--	31	5	67

Table 1
Historic Compounds of Potential Concern Data for E-9
Boeing Portland - Troutdale Gravel Aquifer Remedy
Gresham, Oregon

Sample Location	Sample Date	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	1,1,1-TCA
Cleanup Standards:		5	5	2	7	70	200
E-9	6/19/1990	64	2	--	23	5	58
	7/3/1990	59	1	--	26	5	62
	7/17/1990	47	1	--	25	4	61
	7/31/1990	46	1	--	28	4	64
	8/14/1990	70	2	--	33	--	64
	8/28/1990	65	2	--	32	5	63
	9/11/1990	56	1	--	27	4	52
	9/27/1990	37	1	--	22	4	55
	10/9/1990	51	1	--	29	4	56
	10/29/1990	37	1 J	--	24	4	56
	11/14/1990	40	1	--	24	3	63
	11/28/1990	30	--	--	21	5	79
	12/11/1990	25	--	--	18	3	77
	1/2/1991	39	1	ND	24	4	66
	1/15/1991	36	1 J	ND	24	4	65
	2/5/1991	31	1	ND	24	4	97
	3/5/1991	55	2	ND	27	4	62
	4/2/1991	71	3	ND	28	6	57
	5/7/1991	39	1 J	ND	24	3	88
	6/3/1991	55	2	ND	25	4	64
	7/1/1991	47	2	ND	25	3	55
	8/5/1991	57	2	ND	28	4	50
	9/3/1991	50	2	ND	24	4	48
	10/2/1991	32	1 J	ND	14	3	47
	11/4/1991	39	1	ND	14	3	45
	12/4/1991	59	1	ND	20	3	43
	1/6/1992	37	1 J	ND	17	3	50
	2/4/1992	50	1	ND	24	3	38
	3/3/1992	55	2	ND	19	4	32
	4/6/1992	50	2	ND	21	3	41
	5/4/1992	24	ND	ND	14	2	53
	6/2/1992	48	2	ND	17	3	34
	7/6/1992	38	1	ND	17	2	32
	8/10/1992	39	ND	ND	18	2	36
	9/1/1992	36	ND	ND	16	2	34
	10/1/1992	32	ND	ND	13	2	33
	11/2/1992	23	ND	ND	14	2	35
	12/1/1992	29	ND	ND	16	2	34
	1/1/1993	36	1 J	ND	16	2	37
	2/1/1993	40	1 J	ND	14	2	40
	3/3/1993	52	1 J	ND	18	3	43
	3/29/1993	42	1	ND	14	2	30
	4/28/1993	43	1	ND	15	2	28
	5/25/1993	42	1	ND	16	2	28
	6/23/1993	23	ND	ND	7	2	21
	7/30/1993	31	1 J	ND	11	1	24
	8/25/1993	29	ND	ND	10	1	25
	9/29/1993	33	1 J	ND	13	2	24
	10/27/1993	28	ND	ND	11	1	19
	11/22/1993	26	ND	ND	9	1	15
	12/27/1993	30	ND	ND	10	1	15

Table 1
Historic Compounds of Potential Concern Data for E-9
Boeing Portland - Troutdale Gravel Aquifer Remedy
Gresham, Oregon

Sample Location	Sample Date	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	1,1,1-TCA
Cleanup Standards:		5	5	2	7	70	200
E-9	1/26/1994	22	ND	ND	6	ND	9
	2/23/1994	34	ND	ND	10	2	14
	4/4/1994	36	ND	ND	9	2	14
	4/26/1994	32	ND	ND	9	2	14 J
	10/26/1994	7	ND	ND	2	1	29
	12/21/1994	22	ND	ND	8	1	22
	3/3/1995	22	ND	ND	7	1	20 J
	6/1/1995	22	ND	ND	7	1	31
	8/29/1995	25	ND	ND	8	1	12
	11/9/1995	23	ND	ND	8	1	6
	3/4/1996	20	ND	ND	6	1	24
	5/31/1996	21	ND	ND	5	ND	9
	8/26/1996	21	ND	ND	7	ND	6
	11/20/1996	24	ND	ND	7	ND	4
	3/6/1997	19	ND	ND	5	1	15
	5/27/1997	17	ND	ND	4	1	12
	9/2/1997	9	ND	ND	2	3	2
	5/5/1998	18	ND	ND	4	ND	3 J
	8/3/1998	3	ND	ND	ND	ND	10
	11/2/1998	13	ND	ND	2	ND	4
	2/1/1999	19	ND	ND	4	ND	2
	5/3/1999	5	ND	ND	11	ND	7
	8/2/1999	6	ND	ND	ND	ND	5
	11/1/1999	10	ND	ND	2	ND	1
	2/4/2000	15	ND	ND	3	ND	2
	5/1/2000	14	ND	ND	3	ND	2
	8/2/2000	13	ND	ND	3	ND	1
	11/1/2000	10	ND	ND	2	ND	ND
	2/1/2001	11	ND	ND	2	ND	ND
	5/1/2001	11	ND	ND	2	ND	ND
	8/6/2001	8	ND	ND	1	ND	ND
	11/1/2001	6	ND	ND	1	ND	ND
	2/24/2002	10	ND	ND	2	ND	1
	5/8/2002	10	ND	ND	2	ND	ND
	8/1/2002	7	ND	ND	ND	ND	ND
	11/4/2002	7	ND	ND	1	ND	1
	12/4/2002	4	ND	ND	ND	ND	1
	2/6/2003	2	ND	ND	ND	ND	1
	5/7/2003	3	ND	8	ND	1	ND
	8/13/2003	2	ND	10	ND	2	ND
	11/5/2003	3	ND	6 J	ND	ND	ND
	2/3/2004	2	ND	4	ND	ND	ND
	5/6/2004	3	ND	6	ND	ND	ND
	8/3/2004	1	ND	3	ND	ND	ND
	11/1/2004	3	ND	9	ND	1	ND
	2/3/2005	2	ND	8	ND	ND	ND
	5/3/2005	2	ND	3	ND	ND	ND
	8/2/2005	ND	ND	15	ND	ND	ND
	12/16/2005	8	ND	ND	ND	1	ND
	2/6/2006	3	ND	ND	ND	ND	2
	5/9/2006	20	2	ND	ND	3	ND

Table 1
Historic Compounds of Potential Concern Data for E-9
Boeing Portland - Troutdale Gravel Aquifer Remedy
Gresham, Oregon

Sample Location	Sample Date	TCE	PCE	Vinyl Chloride	1,1-DCE	cis-1,2-DCE	1,1,1-TCA
Cleanup Standards:		5	5	2	7	70	200
E-9	8/8/2006	47	2	ND	2	9	10
	11/9/2006	3	1	1	ND	0	ND
	2/6/2007	3	0	0	ND	0	ND
	5/10/2007	45	3	0	7	10	9
	8/22/2007	5	1	3	ND	1	1
	11/8/2007	2	0	1	ND	0	ND
	2/12/2008	4	ND	2	ND	ND	ND
	5/12/2008	1	ND	ND	ND	ND	ND
	8/11/2008	4	ND	2	ND	ND	ND
	11/5/2008	1	ND	ND	ND	ND	1
	2/3/2009	5	ND	ND	ND	ND	ND
	8/6/2009	ND	ND	ND	ND	ND	ND
	8/6/2010	2	ND	ND	ND	ND	ND
	8/3/2011	2	ND	2	ND	ND	ND
	8/8/2012	ND	ND	ND	ND	ND	ND
	8/2/2013	0	0	1	ND	ND	ND
	8/14/2014	1	1	1	ND	ND	ND
	8/13/2015	1	0	ND	ND	ND	ND
	8/12/2016	0.6	0.3	ND	ND	ND	ND
	8/11/2017	0.6	0.3	ND	ND	ND	ND
	8/14/2018	0.6	0.3	ND	ND	ND	ND
	8/7/2019	1	0	ND	ND	ND	ND

Notes:

All data presented in micrograms per liter (µg/L).

Yellow shading indicates concentration above the cleanup level.

-- = not analyzed

J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

Abbreviations and Acronyms:

1,1,1-TCA = 1,1,1-trichloroethane

1,1-DCE = 1,1-dichloroethene

cis-1,2-DCE = cis-1,2-dichloroethene

ND = nondetect

PCE = tetrachloroethene

TCE = trichloroethene

Table 2
Baseline Injection Well Groundwater Results
Boeing Portland - Coolant Release Area Troutdale Gravel Aquifer
Gresham, Oregon

	Sample Location and Sampling Date				
	IW1 MH73D 2/5/2008	**IW2 MH73D 2/5/2008**	**IW3 MH73C 2/5/2008**	**IW4 MH73B 2/5/2008**	**IW5 MH73A 2/5/2008**
NWTPH-Dx (mg/L) Silica and Acid Cleaned					
Diesel Range Organics	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Motor Oil	0.50 U	0.50 U	1.2	0.50 U	0.50 U
CONVENTIONALS (mg/L)					
N-Nitrate	2.15	2.01	1.76	1.66	1.24
N-Nitrite	0.017	0.017	0.010 U	0.014	0.027
Nitrate + Nitrite	2.17	2.03	1.76	1.67	1.27
Sulfate	5.7	5.6	5.8	5.3	5.7

Notes:
U = Indicates compound was analyzed for, but was not detected at the given reporting limit.

Abbreviations and Acronyms:
mg/L = milligrams per liter
NWTHP-DX = Northwest total petroleum hydrocarbon diesel-range extended

ATTACHMENT 1

Exploration Logs and Well As-builts

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL[1]	TYPICAL DESCRIPTIONS [2][3]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. USCS letter symbols correspond to symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM for sand or gravel) indicate soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.
2. Soil descriptions are based on the general approach presented in the Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the Standard Test Method for Classification of Soils for Engineering Purposes, as outlined in ASTM D 2487.
3. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent:	> 50%	"GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50%	"very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30%	"gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15%	"with gravel," "with sand," "with silt," etc.
	≤ 5%	"with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

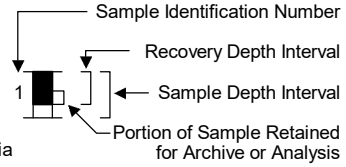
4. Soil density or consistency descriptions are based on judgement using a combination of sampler penetration blow counts, drilling or excavating conditions, field tests, and laboratory tests, as appropriate.

Drilling and Sampling Key

SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Single-Tube Core Barrel
f	Double-Tube Core Barrel
g	2.50-inch O.D., 2.00-inch I.D. WSDOT
h	3.00-inch O.D., 2.375-inch I.D. Mod. California
i	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Vibrocore (Rotosonic/Geoprobe)
5	Other - See text if applicable

SAMPLE NUMBER & INTERVAL



Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

Groundwater

▽ Approximate water level at time of drilling (ATD)

▼ Approximate water level at time after drilling/excavation/well

LANDAU ASSOCIATES

Boeing Portland
Gresham, Oregon

Soil Classification System and Key

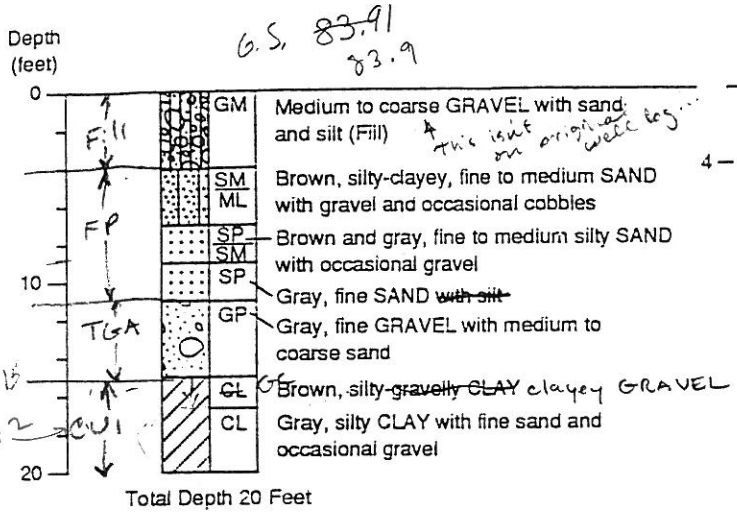
Figure 1-1

Well E-9

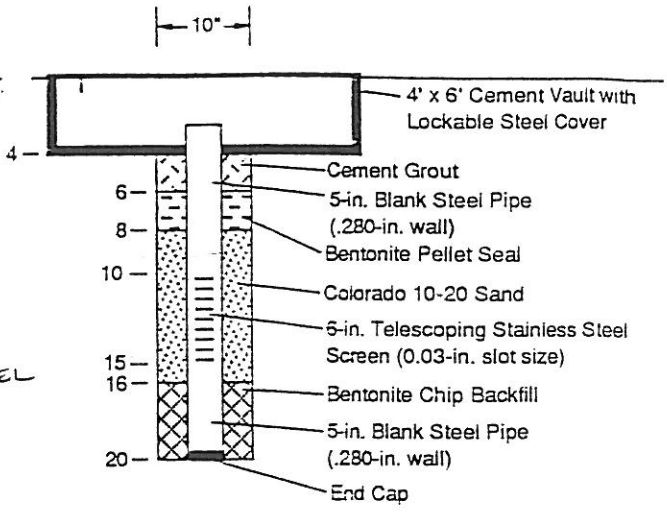
(Preliminary)

2-12-89

Soil Profile



As-Built



Revised from original well log
JNB - 2/18/93

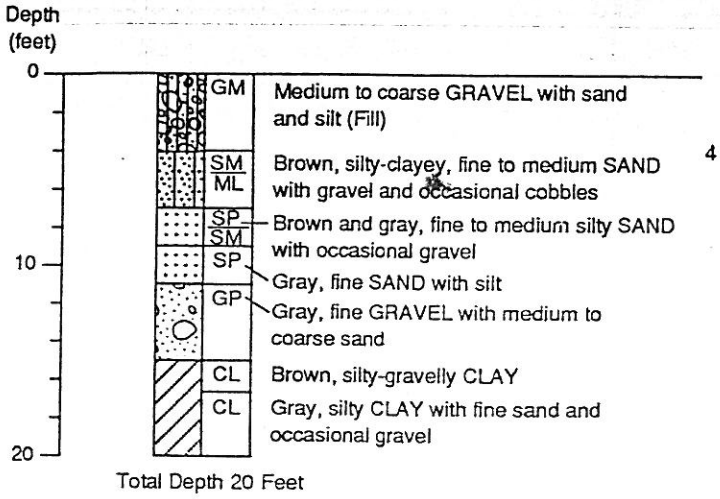
50206549

LANDAU ASSOCIATES, INC.	Soil Profile and Well Log for E-9

Figure A-7

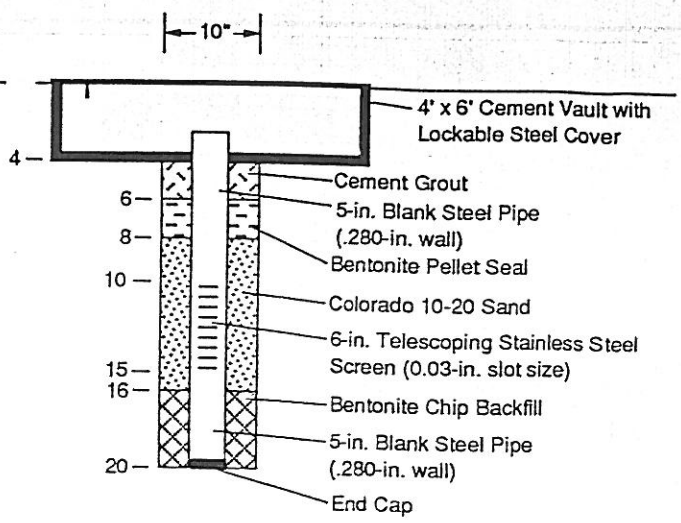
Well E-9
(Preliminary)

Soil Profile



Total Depth 20 Feet

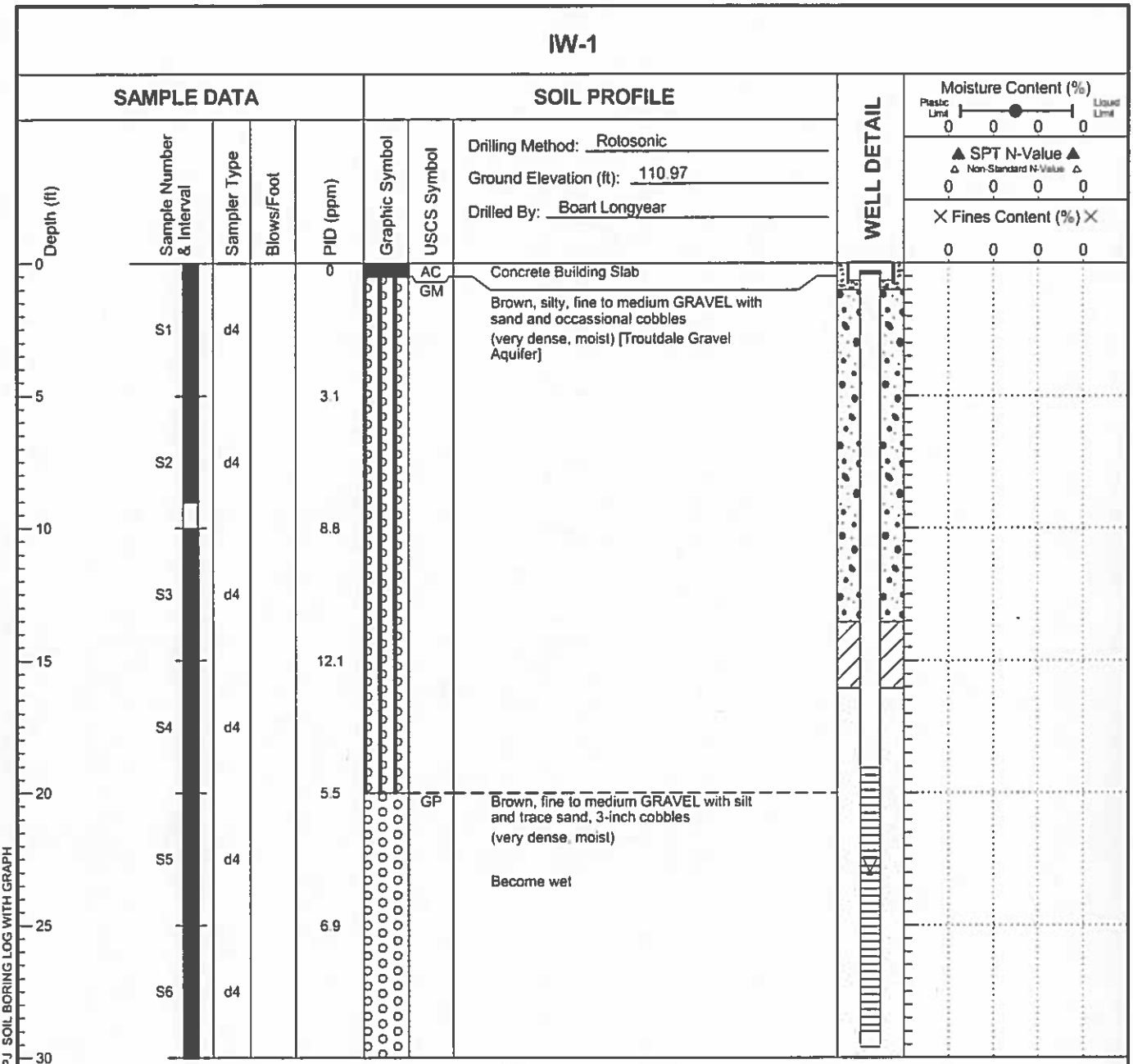
As-Built



LANDAU ASSOCIATES, INC.	Soil Profile and Well Log for E-9

Figure A-7

IW-1



Boring Completed 12/26/07
Total Depth of Boring = 30.0 ft.

Injection Well Completed 12/26/07
Elevation at Top of Protective Casing = 110.67 ft.
Total Depth of Injection Well = 30.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

25116.147 5/5/10 N:\PROJECTS\025116_INJECTION.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

Boeing Portland Injection Well Installation Portland, OR	Log of Boring IW-1	Figure A-

MULT 92265

01-11-2008

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 89466

START CARD # 197754

(1) LAND OWNER

Owner Well I.D. I-1

First Name _____ Last Name _____

Company THE BOEING CO.

Address 19000 NE SANDY BLVD

City GRESHAM State OR Zip 97030

(2) TYPE OF WORK

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

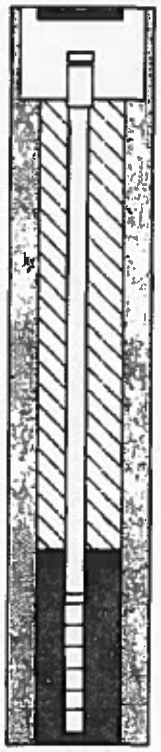
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other SONIC

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 30 ft. Special Standard ☐



MONUMENT/VAULT Below Ground
From 0 To 1

BORE HOLE
Diameter 6 From 0 To 30

CASING
Dia. 2 From 0 To 20
Gauge SCH 40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER
Dia. _____ From ☐ _____ To _____
Gauge _____ Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL
From 1 To 18
Material Bentonite Chips
Amount 5.00 S Grout weight _____

SCREEN
Casing/Liner _____ Material PVC
Diameter 2 From 20 To 30
Slot Size .010

FILTER
From 18 To 30 Material SAND Size of pack 10/20

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

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

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SW 1/4 of the NE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ° ' " or _____ DMS or DD
Long ° ' " or _____ DMS or DD
◉ Street address of well ○ Nearest address

19000 NE SANDY BLVD

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+	SWL(ft)
Existing Well / Predeepening				
Completed Well	12-26-2007			22

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+	SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
SILTY GRAVELS WITH BOULDERS	0	30

Date Started 12-26-2007 Completed 12-26-2007

(unbonded) Monitor Well Constructor Certification

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

License Number 10581 Date 01-11-2008

Electronically Submitted

Signed BRIAN OWENS (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10408 Date 01-11-2008

Electronically Submitted

Signed PETER S LARSEN (E-filed)

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

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

Form Version: 0.32

Map of well

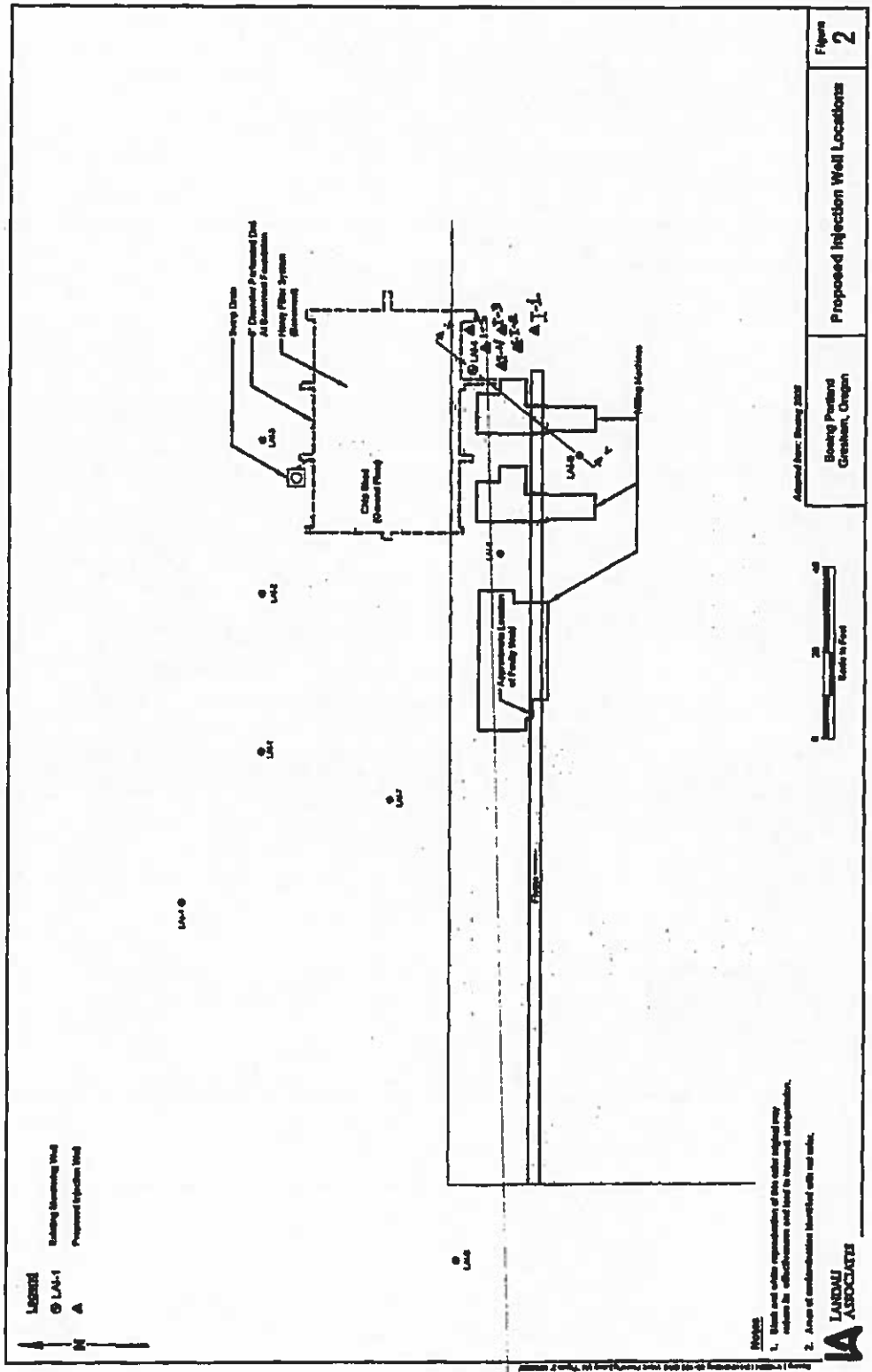
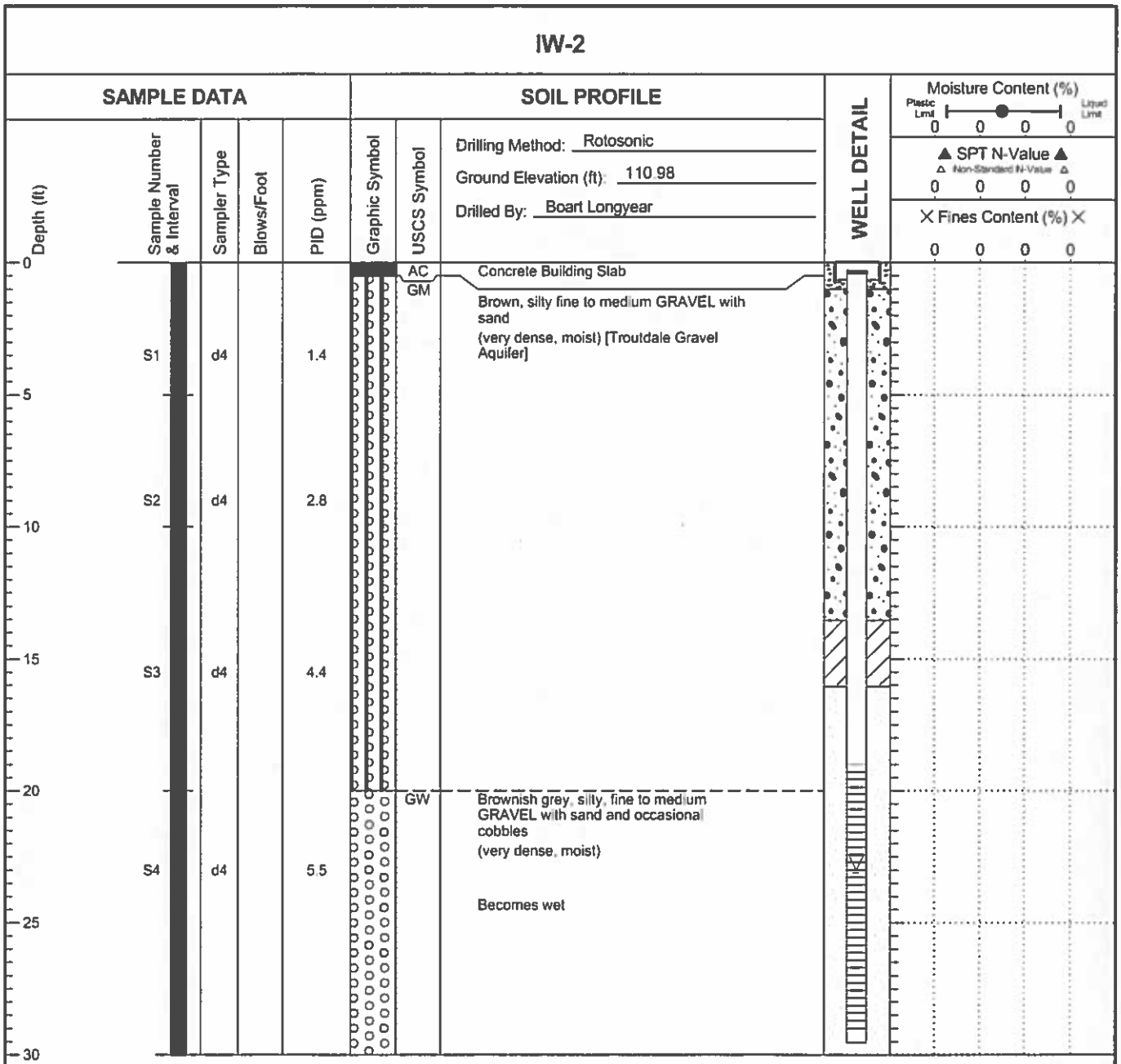


Figure 2
Proposed Injection Well Locations
Boeing Portland Gresham, Oregon
Legend
Existing Monitoring Well
Proposed Injection Well
Notes
LANDAU ASSOCIATES



Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

LANDAU ASSOCIATES

Boeing Portland Injection Well Installation Portland, OR	Log of Boring IW-2	Figure A-

MULT 92266

01-11-2008

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 89467

START CARD # 197755

(1) LAND OWNER

Owner Well I.D. I-2

First Name _____ Last Name _____

Company THE BOEING CO.

Address 19000 NE SANDY BLVD

City GRESHAM State OR Zip 97030

(2) TYPE OF WORK

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

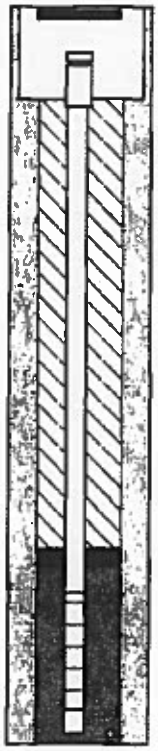
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other SONIC

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 30 ft. Special Standard ☐



MONUMENT/VAULT Below Ground
From 0 To 1

BORE HOLE
Diameter 6 From 0 To 30

CASING
Dia. 2 From 0 To 20
Gauge SCH 40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER
Dia. _____ From _____ To _____
Gauge _____ Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL
From 1 To 18
Material Bentonite Chips
Amount 5.00 S Grout weight _____

SCREEN
Casing/Liner _____ Material PVC
Diameter 2 From 20 To 30
Slot Size .010

FILTER
From 18 To 30 Material SAND Size of pack 10/20

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

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

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SW 1/4 of the NE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ___ ° ___ ' ___ " or _____ DMS or DD
Long ___ ° ___ ' ___ " or _____ DMS or DD

◉ Street address of well ○ Nearest address

19000 NE SANDY BLVD

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	12-27-2007		22

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
SILTY GRAVELS WITH BOULDERS	0	30

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

(unbonded) Monitor Well Constructor Certification

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

License Number 10581 Date 01-11-2008

Electronically Submitted

Signed BRIAN OWENS (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10408 Date 01-11-2008

Electronically Submitted

Signed PETER S LARSEN (E-filed)

Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

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

Form Version: 0.32

Map of well

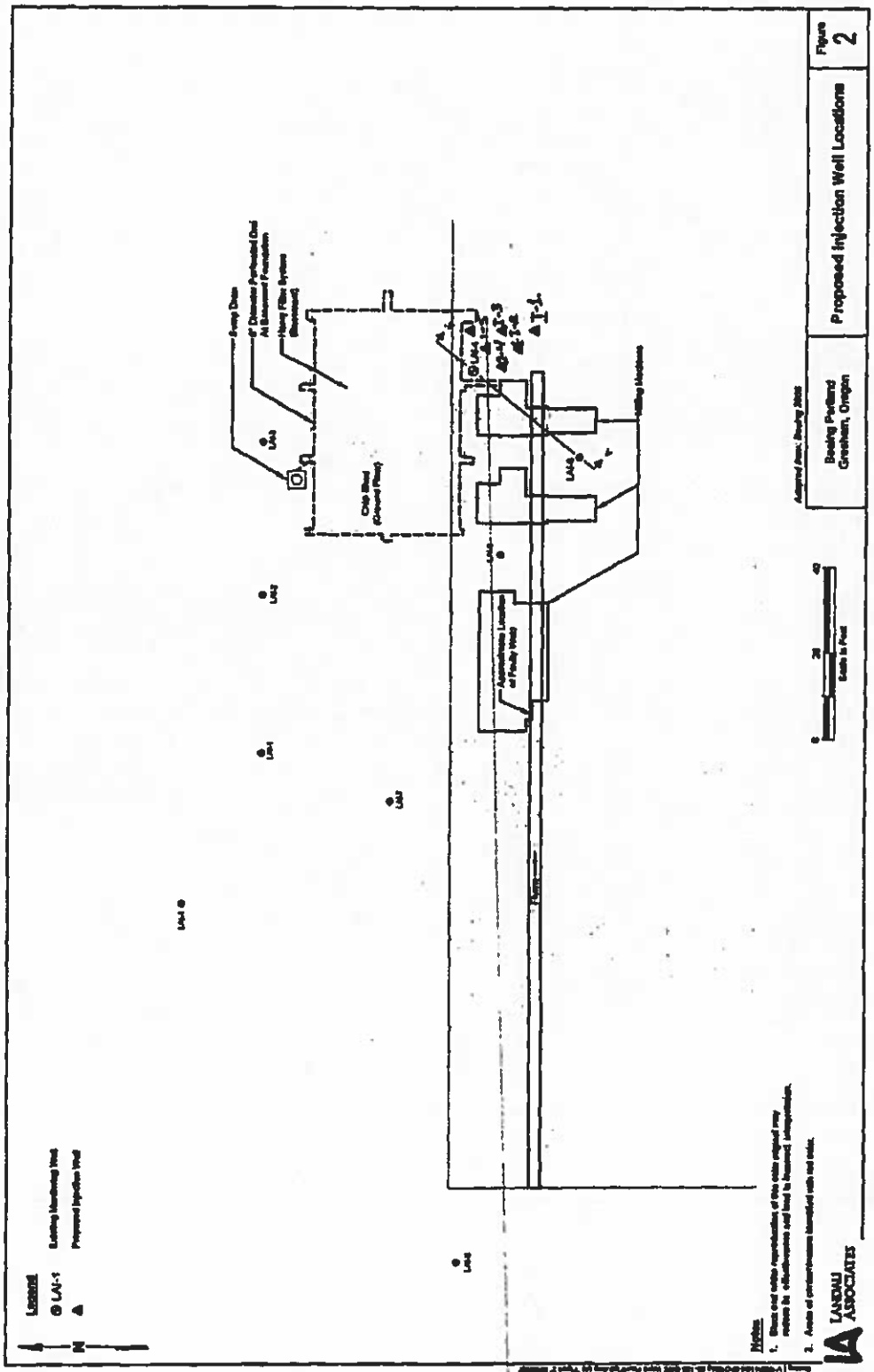
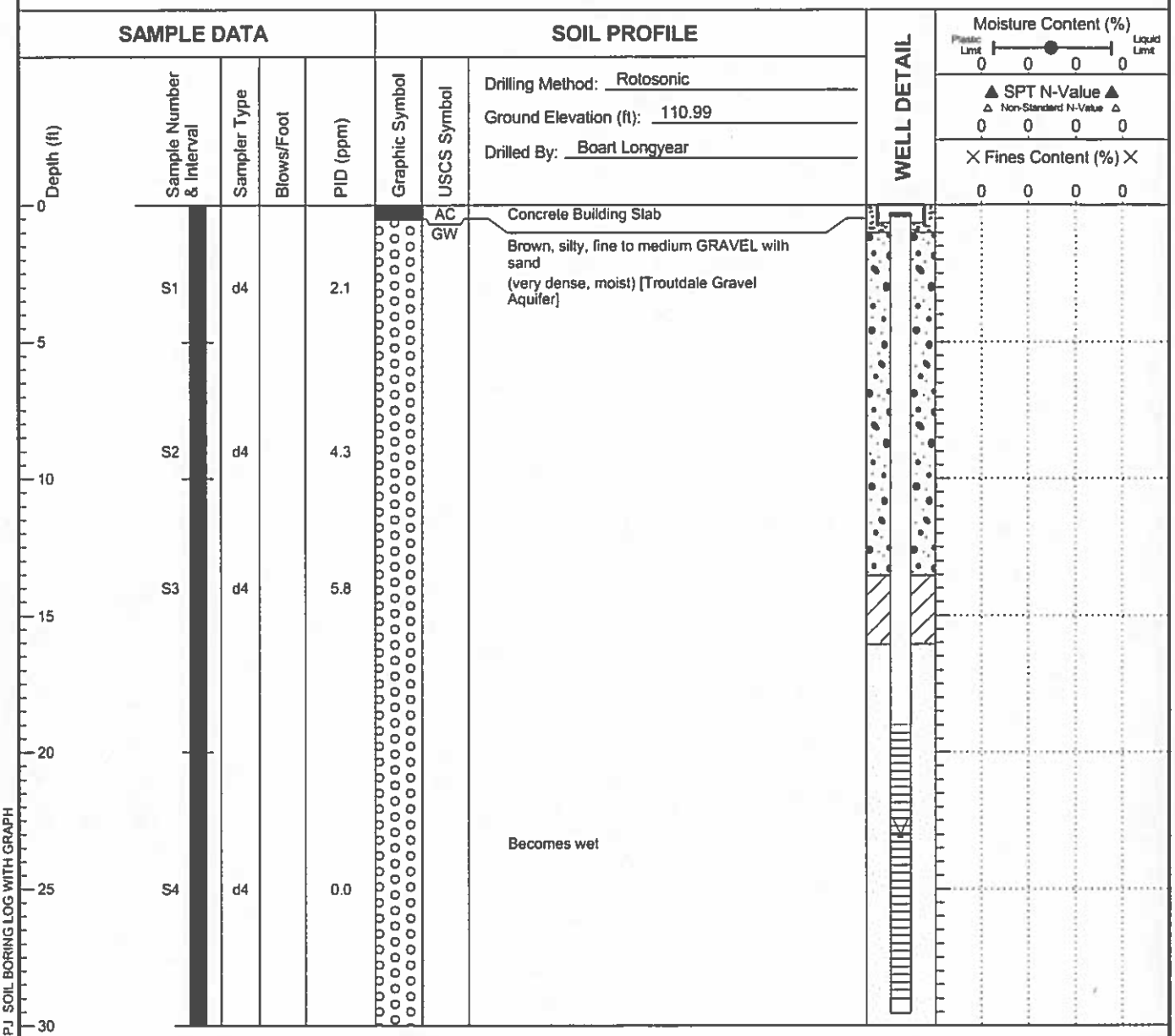


Figure 2
Proposed Injection Well Locations
Boeing Portland Gresham, Oregon
LANDAU ASSOCIATES

IW-3



Boring Completed 12/27/07
Total Depth of Boring = 30.0 ft.

Injection Well Completed 12/27/07
Elevation at Top of Protective Casing = 110.83 ft.
Total Depth of Injection Well = 30.0 ft.

Notes.
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

25116.147 5/5/10 N:\PROJECTS\025116_INJECTION.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

Boeing Portland Injection Well Installation Portland, OR	Log of Boring IW-3	Figure A-

MULT 92267

01-11-2008

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 89469

START CARD # 197756

(1) LAND OWNER

Owner Well I.D. I-3

First Name _____ Last Name _____

Company THE BOEING CO.

Address 19000 NE SANDY BLVD

City GRESHAM State OR Zip 97030

(2) TYPE OF WORK

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

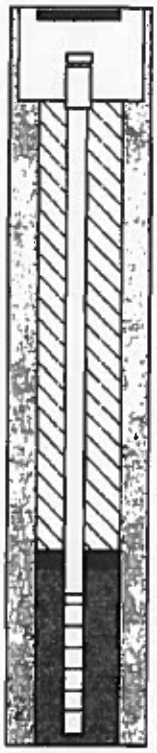
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other SONIC

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 30 ft. Special Standard ☐



MONUMENT/VAULT Below Ground
From 0 To 1

BORE HOLE
Diameter 6 From 0 To 30

CASING
Dia. 2 From 0 To 20
Gauge SCH 40 Wld ☐ Thrd ☒
Material ○ Steel ◉ Plastic

LINER
Dia. _____ From _____ To _____
Gauge _____ Wld ☐ Thrd ☐
Material ○ Steel ○ Plastic

SEAL
From 1 To 18
Material Bentonite Chips
Amount 5.00 S Grout weight _____

SCREEN
Casing/Liner _____ Material PVC
Diameter 2 From 20 To 30
Slot Size .010

FILTER
From 18 To 30 Material SAND Size of pack 10/20

(5) WELL TESTS

○ Pump ○ Bailer ○ Air ○ Flowing Artesian

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

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SW 1/4 of the NE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ___ ° ___ ' ___ " or _____ DMS or DD
Long ___ ° ___ ' ___ " or _____ DMS or DD

◉ Street address of well ○ Nearest address

19000 NE SANDY BLVD

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	12-27-2007		22

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
SILTY GRAVELS WITH BOULDERS	0	30

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

(unbonded) Monitor Well Constructor Certification

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

License Number 10581 Date 01-11-2008

Electronically Submitted

Signed BRIAN OWENS (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10408 Date 01-11-2008

Electronically Submitted

Signed PETER S LARSEN (E-filed)

Contact Info (optional)

ORIGINAL - WATER RESOURCES DEPARTMENT

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

Form Version: 0.32

Map of well

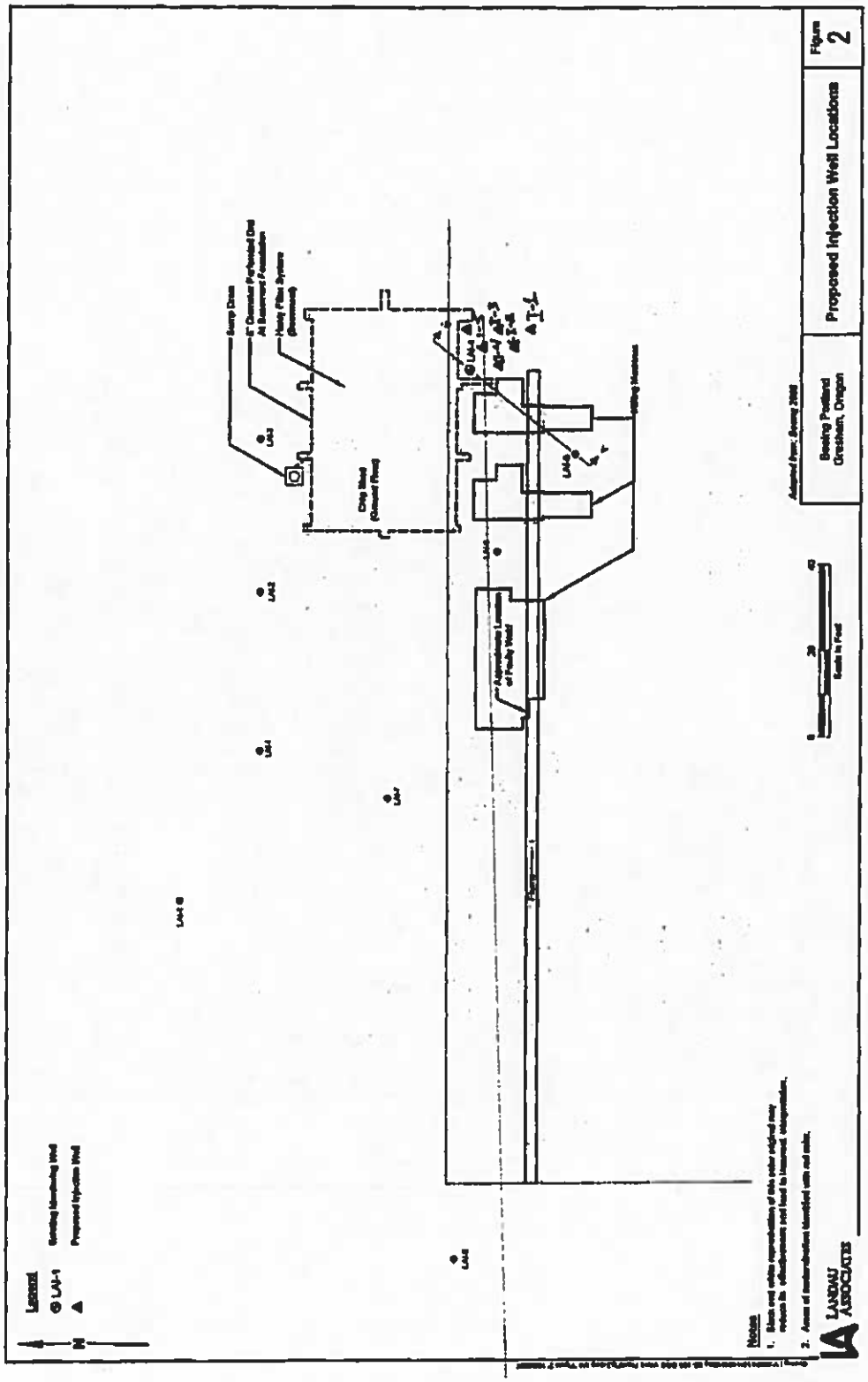
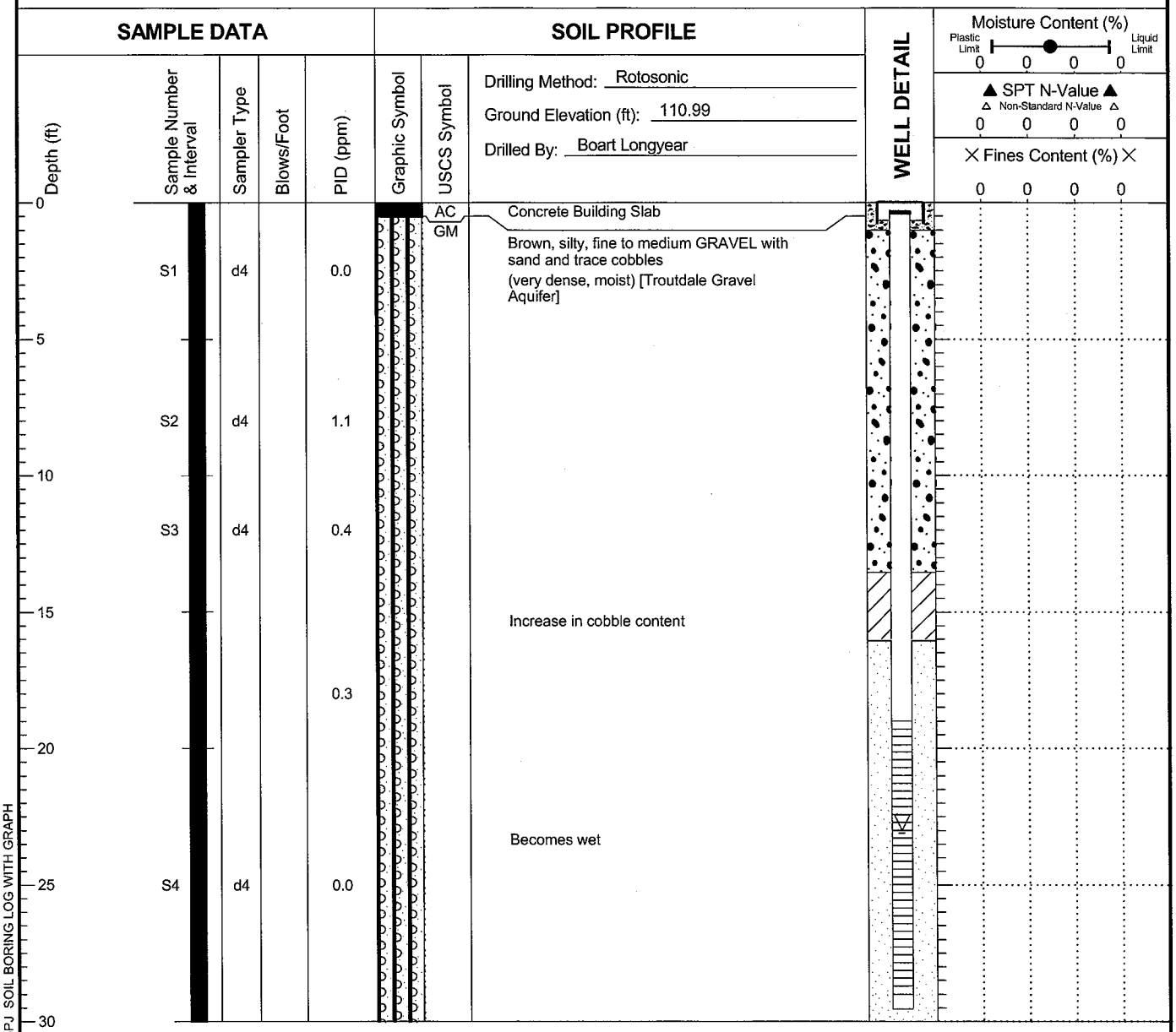


Figure 2
Proposed Injection Well Locations
Boeing Portland Gresham, Oregon
Legend
Existing Monitoring Well
Proposed Injection Well
Notes
LANDAU ASSOCIATES

IW-4



Boring Completed 12/27/07
Total Depth of Boring = 30.0 ft.

Injection Well Completed 12/27/07
Elevation at Top of Protective Casing = 110.70 ft.
Total Depth of Injection Well = 30.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

25116.147 5/5/10 N:\PROJECTS\025116_INJECTION.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

Boeing Portland Injection Well Installation Portland, OR	Log of Boring IW-4	Figure A-

MULT 92268

01-11-2008

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

WELL LABEL # L 89470

START CARD # 197757

(1) LAND OWNER

Owner Well I.D. I-4

First Name _____ Last Name _____

Company THE BOEING CO.

Address 19000 NE SANDY BLVD

City GRESHAM State OR Zip 97030

(2) TYPE OF WORK

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

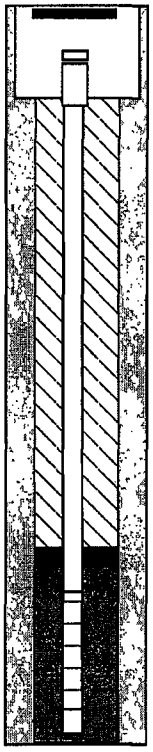
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other SONIC

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 30 ft. Special Standard ☐



MONUMENT/VAULT Below Ground
From 0 To 1

BORE HOLE
Diameter 6 From 0 To 30

CASING
Dia. 2 From ☐ 0 To 20
Gauge SCH 40 Wld Thrd
Material ◯ Steel ◉ Plastic ☐ ☒

LINER
Dia. _____ From ☐ _____ To _____
Gauge _____ Wld Thrd
Material ◯ Steel ◯ Plastic ☐ ☐

SEAL
From 1 To 18
Material Bentonite Chips
Amount 5.00 S Grout weight _____

SCREEN
Casing/Liner _____ Material PVC
Diameter 2 From 20 To 30
Slot Size .010

FILTER
From 18 To 30 Material SAND Size of pack 10/20

(5) WELL TESTS

◯ Pump ◯ Bailer ◯ Air ◯ Flowing Artesian

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

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SW 1/4 of the NE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ° ' " or _____ DMS or DD
Long ° ' " or _____ DMS or DD
◉ Street address of well ◯ Nearest address

19000 NE SANDY BLVD

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	12-27-2007		22

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
SILTY GRAVELS WITH BOULDERS	0	30

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

(unbonded) Monitor Well Constructor Certification

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

License Number 10581 Date 01-11-2008
Electronically Submitted
Signed BRIAN OWENS (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10408 Date 01-11-2008
Electronically Submitted
Signed PETER S LARSEN (E-filed)
Contact Info (optional) _____

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

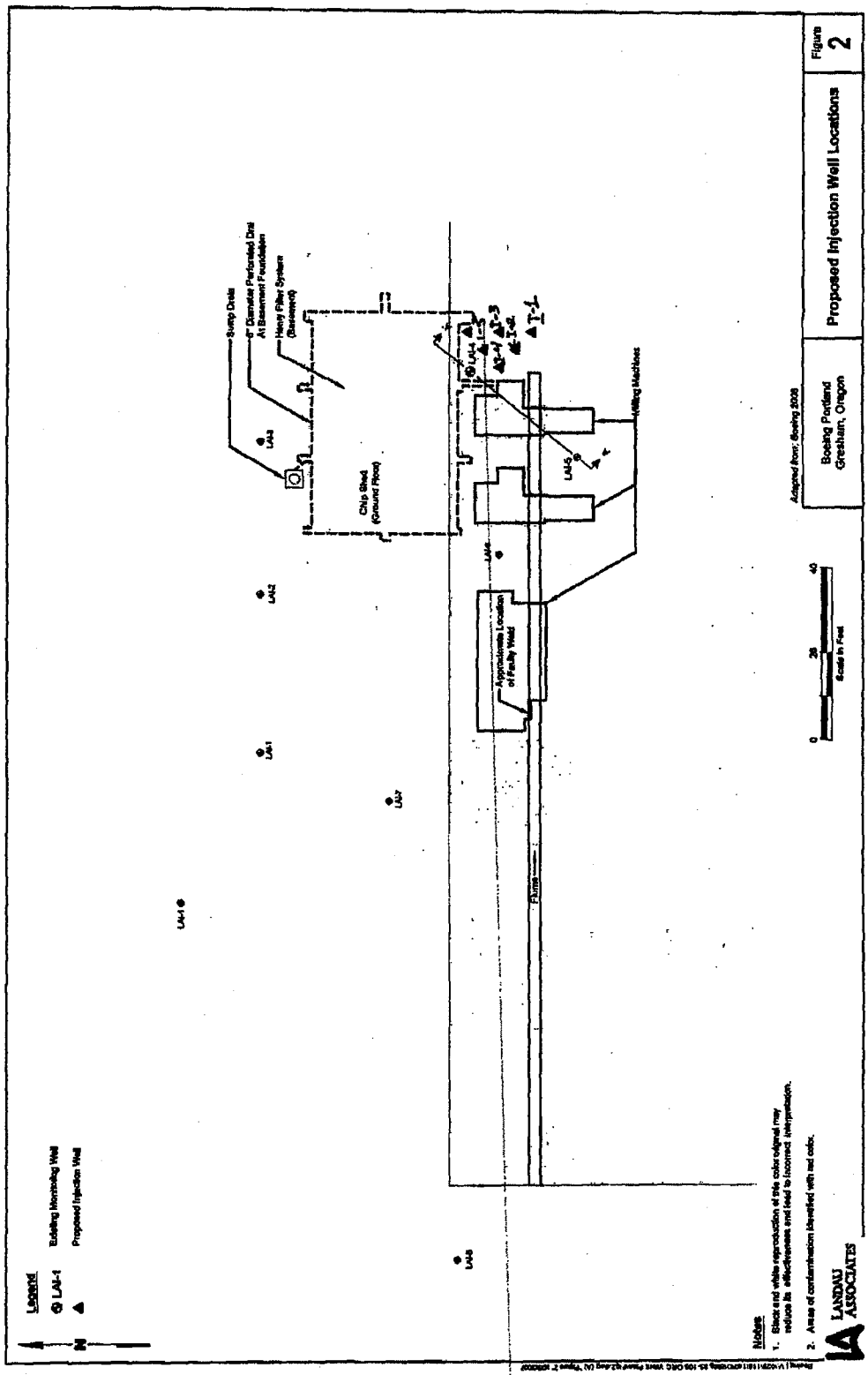
Form Version: 0.32

MONITORING WELL REPORT -
Map with location identified must be attached and shall include an approximate scale and north arrow

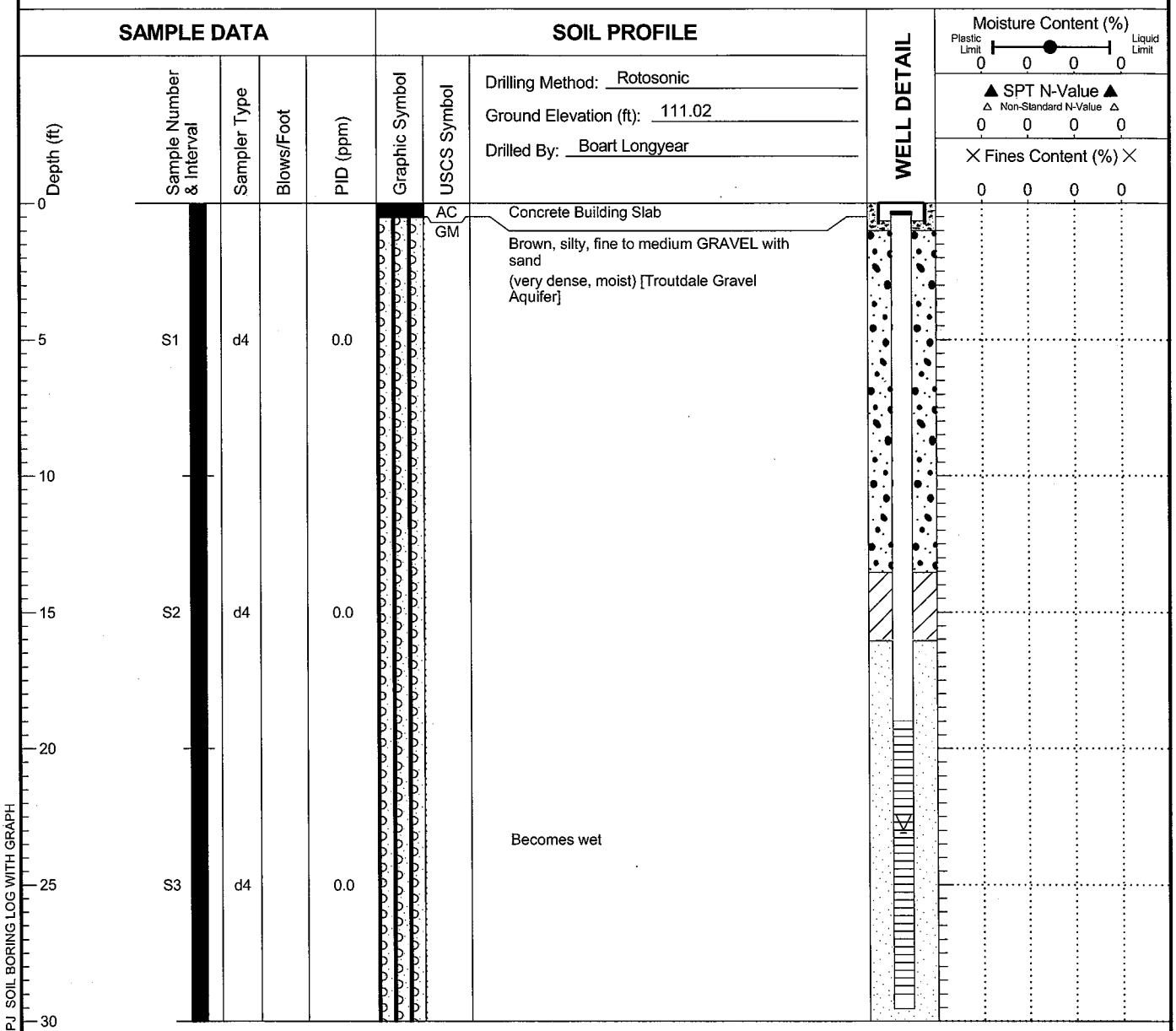
MULT 92268
01-11-2008

WELL I.D. # L 89470
START CARD # 197757

Map of well



IW-5



Boring Completed 12/28/07
Total Depth of Boring = 30.0 ft.

Injection Well Completed 12/28/07
Elevation at Top of Protective Casing = 110.47 ft.
Total Depth of Injection Well = 30.0 ft.

Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key" figure for explanation of graphics and symbols.

25116.147 5/5/10 N:\PROJECTS\025116_INJECTION.GPJ SOIL BORING LOG WITH GRAPH

LANDAU ASSOCIATES

Boeing Portland Injection Well Installation Portland, OR	Log of Boring IW-5	Figure A-

MULT 92269

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-0395)

01-11-2008

WELL LABEL # L 89471

START CARD # 197758

(1) LAND OWNER

Owner Well I.D. I-5

First Name _____ Last Name _____

Company THE BOEING CO.

Address 19000 NE SANDY BLVD

City GRESHAM State OR Zip 97030

(2) TYPE OF WORK

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

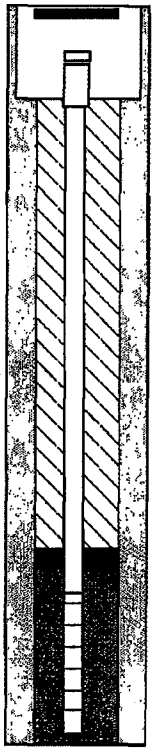
(3) DRILL METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Hollow Stem Auger ☐ Cable Mud ☐ Reverse Rotary ☒ Other SONIC

(4) CONSTRUCTION

Piezometer Well ☐

Depth of Completed Well 30 ft. Special Standard ☐



MONUMENT/VAULT Below Ground
From 0 To 1

BORE HOLE
Diameter 6 From 0 To 30

CASING
Dia. 2 From ☐ 0 To 20
Gauge SCH 40 Wld Thrd
Material ◯ Steel ◉ Plastic ☐ ☒

LINER
Dia. _____ From ☐ _____ To _____
Gauge _____ Wld Thrd
Material ◯ Steel ◯ Plastic ☐ ☐

SEAL
From 1 To 18
Material Bentonite Chips
Amount 5.00 S Grout weight _____

SCREEN
Casing/Liner _____ Material PVC
Diameter 2 From 20 To 30
Slot Size .010

FILTER
From 18 To 30 Material SAND Size of pack 10/20

(5) WELL TESTS

◯ Pump ◯ Bailer ◯ Air ◯ Flowing Artesian

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

Temperature 53 °F Lab analysis ☐ Yes By _____

Supervising Geologist/Engineer _____

Water quality concerns? ☐ Yes (describe below)

From	To	Description	Amount	Units

(6) LOCATION OF WELL (legal description)

County Multnomah Twp 1.00 N N/S Range 3.00 E E/W WM
Sec 29 SW 1/4 of the NE 1/4 Tax Lot 500
Tax Map Number _____ Lot _____
Lat ° ' " or _____ DMS or DD
Long ° ' " or _____ DMS or DD
◉ Street address of well ◯ Nearest address

19000 NE SANDY BLVD

(7) STATIC WATER LEVEL

	Date	SWL(psi)	+ SWL(ft)
Existing Well / Predeepening			
Completed Well	12-27-2007		22

Flowing Artesian? ☐ Dry Hole? ☐

WATER BEARING ZONES Depth water was first found _____

SWL Date	From	To	Est Flow	SWL(psi)	+ SWL(ft)

(8) WELL LOG

Ground Elevation _____

Material	From	To
SILTY GRAVELS WITH BOULDERS	0	30

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

(unbonded) Monitor Well Constructor Certification

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

License Number 10581 Date 01-11-2008

Electronically Submitted

Signed BRIAN OWENS (E-filed)

(bonded) Monitor Well Constructor Certification

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

License Number 10408 Date 01-11-2008

Electronically Submitted

Signed PETER S LARSEN (E-filed)

Contact Info (optional) _____

ORIGINAL - WATER RESOURCES DEPARTMENT

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

MONITORING WELL REPORT -
Map with location identified must be attached and shall include an approximate scale and north arrow

MULT 92269
01-11-2008

WELL I.D. # L 89471
START CARD # 197758

Map of well