2015 Groundwater Investigation Report
Boeing Auburn Facility
Auburn, Washington

June 16, 2016

Prepared for

The Boeing Company
Seattle, Washington

LANDAU ASSOCIATES

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LIST OF ABBREVIATIONS AND ACRONYMS

bgs ..... Below Ground Surface
Boeing ..... The Boeing Company
cis-1,2-DCE cis-1,2-Dichloroethene
Ecology ..... Washington State Department of Ecology
facility ..... Boeing Auburn Fabrication Division facility
ft ..... Feet/Foot
µg/L ..... Micrograms per Liter
Order ..... Agreed Order No. DE 01HWTRNR-3345
RI ..... Remedial Investigation
ROW ..... Right-of-Way
SIM ..... Selected Ion Monitoring
TCE ..... Trichloroethene
VOC ..... Volatile Organic Compound
VC ..... Vinyl Chloride
WAC ..... Washington Administrative Code

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1.0 INTRODUCTION

The Boeing Company (Boeing) is currently conducting corrective action at their Auburn Fabrication Division facility (facility) located at 700 15th Street Southwest in Auburn, Washington. Corrective action requirements are documented in an Agreed Order (Order; No. DE 01HWTRNR-3345) dated August 14, 2002 and the First Amended Agreed Order dated February 21, 2006, both with Washington State Department of Ecology (Ecology). The Order includes a requirement to conduct a remedial investigation (RI) of facility contamination impacts both within the facility (on Boeing property) and at downgradient properties (off Boeing property). This report documents the 2015 off Boeing property groundwater investigations in Auburn and Algona, Washington. The Boeing property[1] location and vicinity map are shown on Figure 1.

1.1 Background

Between 2004 and 2008, Boeing completed a series of RI activities on Boeing property that were summarized in the 2nd draft RI report (Landau Associates 2009a). This report was a comprehensive document that addressed all solid waste management units and areas of concern on Boeing property as required under the Order. Between 2009 and 2014, Boeing completed a series of investigation activities as part of the RI both on and off Boeing property. These activities are described in a series of supplemental RI reports (Landau Associates 2009b, 2010, 2012a,b; 2014a; 2015a).

An important objective of the RI activities is to characterize the nature and extent of two groundwater plumes: the Area 1 plume (Plume 1) and the western plume (Plume 2) that occur beneath the northern portion of the facility and extend off Boeing property to the north and northwest. These plumes contain relatively low level concentrations of the volatile organic compound (VOC) trichloroethene (TCE), and its breakdown products: cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). TCE and VC are the primary constituents of concern due to their relative toxicity and low cleanup levels.

The uppermost aquifer in the Auburn Valley consists of saturated portions of modern alluvium and recent alluvium deposited by the Green and White rivers. The Osceola Mudflow serves as a regional aquitard between the uppermost aquifer and deeper aquifers. Locally, beneath the Boeing property and off Boeing property to the north and northwest, the uppermost aquifer is approximately 80 to 100 feet (ft) thick. For the purpose of the RI, the uppermost aquifer has been subdivided into three groundwater zones based on depth beneath ground surface (bgs):

- A shallow zone, from approximately the ground surface to 30 ft bgs
  - The shallowest wells within this zone are screened at or near the water table; water table data is considered a subset of the shallow zone data

[1] The facility, as defined in the First Amended Agreed Order, consists of the Boeing property and the Prologis property directly north of the Boeing property.

- An intermediate zone, from approximately 40 to 60 ft bgs
- A deep zone, from approximately 80 to 100 ft bgs
  - The bottom of the deep zone is defined by the contact with the Osceola Mudflow, the depth of which may vary based on location.

Information about the extent of the two groundwater plumes was presented in the 2014 Algona Groundwater Investigation Report (2014 Report; Landau Associates 2015a). The 2014 Report also discussed the following data gaps and additional monitoring wells that were subsequently included in the 2015 work plan:

- A shallow zone well located along the southern portion of Milwaukee Avenue. The purpose of this well is to provide a long-term monitoring point for shallow zone detections of TCE, cis-1,2-DCE, and VC in samples collected at boring ASB0230.
- An intermediate zone well located west of AGW251. The purpose of this well is to monitor the western extent of VC in this area due to VC detections in intermediate zone samples collected from well AGW251.
- The City of Algona's request for three additional deep zone monitoring wells in residential Algona including a replacement deep zone well adjacent to AGW242; a deep zone well south of AGW242 on 7th Avenue, and a deep zone well on 9th avenue Near Chicago Avenue.
- Ecology's request for additional monitoring points between Milwaukee Avenue and the Interurban trail in the shallow, intermediate, and deep zones.

In addition to the wells and data gaps identified in the 2014 report; Ecology and Boeing identified the following additional work to be completed as part of the 2015 drilling program:

- Ecology and Boeing discussed the results from two water table wells (AGW225 and AGW226) with 15 ft screens. Based on the results from these wells, it appears there may be mixing of groundwater between the water table and deeper groundwater in the shallow zone. Boeing proposed (and Ecology approved) adding a water table well at each location. The water table wells were included in the 2015 work plan.
- In an email dated December 8, 2014, Ecology requested an additional shallow zone monitoring well in Auburn near West Main Street adjacent to the intermediate zone well AGW188 with the purpose of a long-term monitoring point north of the current extent of the shallow zone plume.
- During a conference call on February 26, 2015, Ecology requested an additional intermediate zone monitoring well be installed on 7th Avenue (adjacent to the previously requested deep zone monitoring well).

1.2 Investigation Scope and Objectives

The goal of the 2015 groundwater investigation work was to complete characterization of the nature and extent of groundwater contamination in Algona and Auburn. The objectives of the investigation focused on completing the characterization of the plume boundary in Algona and closing a remaining data gap in the shallow aquifer zone in Auburn near Lund Road and West Main Street. To meet the

goals and objectives, the 2015 groundwater investigation included installation of nine monitoring wells in Algona and one monitoring well in Auburn.

Two wells (AGW262 and AGW263) were installed to monitor groundwater quality at the water table in residential Algona with the purpose of evaluating the potential for vapor intrusion. Five wells (AGW260, AGW264, AGW265, AGW267, and AGW268) were installed to provide additional groundwater quality data in the intermediate and deep zones in residential Algona. One well (AGW261) was installed to provide long-term monitoring of the TCE plume in the shallow groundwater zone in the vicinity of boring ASB0230 at the south end of Milwaukee Avenue in commercial Algona. One multi-level well (AGW276) was installed in commercial Algona to evaluate groundwater quality in the intermediate and deep zones northwest of AGW145 and AGW146. One shallow zone monitoring well (AGW266) was installed to provide shallow zone groundwater quality data in Auburn north of the current extent of the shallow zone plume.

1.3 Report Organization

Well installation and groundwater sampling field investigations are presented in Section 2.0. Updates to the geology and hydrogeology conceptual models are presented in Section 3.0. Groundwater quality results for the initial samples from the wells are presented in Section 4.0.

2.0 FIELD INVESTIGATION ACTIVITES

The 2015 groundwater field investigation activities were conducted in accordance with the 2015 groundwater investigation work plan (Landau Associates 2015b). Field activities were completed in two mobilizations. The first mobilization included drilling, installation, and sampling of nine conventional wells. Eight wells were installed on City of Algona right-of-way (ROW), one well was installed on City of Auburn ROW. A ROW construction permit was obtained from the City of Algona on March 3, 2015. A construction permit was obtained from the City of Auburn on February 17, 2015 and a ROW use permit was obtained from the City of Auburn on February 19, 2015. The second mobilization included the drilling, installation, and sampling of one multi-level well. This well was installed on CIVF 1 property. A limited use access agreement was obtained from DCT Industrial (property manager) for the 840 Industry Drive NE property on August 13, 2015.

2.1 Well Installation

All conventional wells were installed in accordance with the Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 Washington Administrative Code [WAC]). The multi-level monitoring well was installed in accordance with the Minimum Standards for Construction and Maintenance of Wells (WAC 173-160) and the well variance (Ecology 2015) granted by Ecology that provides exception to specific sections of WAC 173-160. All wells were drilled and installed by using a rotosonic (sonic) drill rig operated by Cascade Drilling, Inc. of Woodinville, Washington. Well locations and elevations were surveyed by KPG, Inc. on April 17, 2015 and October 12, 2015. Survey information for the 2015 groundwater investigation wells AGW260 through AGW268 and AGW276 are presented in Table 1. New well locations are presented on Figure 2.

Well drilling and installation for the first mobilization took place between March 23 and March 30, 2015 and included wells AGW260 through AGW268. Wells AGW261, AGW264, AGW265, AGW266, and AGW267 have 10-ft-long well screens. Water table wells AGW262 and AGW263 and deep zone wells AGW260[2] and AGW268[3] have 5-ft-long well screens.

Well drilling and installation for AGW276 (second mobilization) took place between October 5 and 7, 2015. Well AGW276 has seven separate screen intervals in the shallow, intermediate, and deep zone; 10 ft (water table), 25 ft, 35 ft, 48 ft, 60 ft, 80 ft, and 100 ft bgs. Multi-level screens are approximately ½ ft long, except for the water table screen, which is approximately 5 ft long. Monitoring well screens and depths are presented in Table 1. Monitoring well logs are presented in Appendix A.

[2] AGW260 was installed as a replacement for the deep zone channel of multilevel well AGW242. Multi-level wells typically have short screen intervals; as such, a short screen was used for the replacement deep zone well.

[3] AGW268 was installed with a 5 ft screen instead of the planned 10 ft screen because the silt layer above the Osceola Mudflow was thicker than expected.

2.2 Groundwater Sampling

Initial groundwater samples[4] were collected from all new conventional monitoring wells at least 5 days after well development of each well. Initial groundwater sampling of the first mobilization took place on April 9, 2015. Initial groundwater samples were collected from the multi-level well (AGW276) on October 23, 2015. Groundwater sampling was conducted using a peristaltic pump and dedicated tubing, utilizing low-flow procedures. During purging, groundwater was monitored for field parameters (pH, conductivity, dissolved oxygen, temperature, oxidation-reduction potential, and turbidity).

All water samples were analyzed for VOCs using U.S. Environmental Protection Agency Methods 8260c and 8260c selected ion monitoring (SIM) by Eurofins Lancaster Laboratories, Inc. of Lancaster, Pennsylvania. SIM analysis was performed for VC in order to achieve reporting limits below site screening levels, and for tetrachloroethene at Ecology's request. All samples were analyzed on the standard 2-week turnaround time. Following the initial sampling, each well was incorporated into the site groundwater monitoring plan (Landau Associates 2014b). Groundwater sampling results are discussed in Section 4.0.

2.3 Groundwater Level Monitoring

Synoptic groundwater level monitoring was completed on June 15 and 16, 2015. Groundwater level data is discussed in Section 3.2.

[4] Initial groundwater samples are defined as samples collected shortly after well installation.

3.0 GEOLOGY AND HYDROGEOLOGY

Additional geologic and hydrogeologic data were collected as part of the 2015 drilling program. These data were evaluated and minor refinements were made to the geologic and hydrogeologic conceptual models as needed. Additional geologic data consists of soil texture information documented on boring logs and depth of the Osceola Mudflow deposit. Additional hydrogeologic data consists of groundwater levels collected at each new well.

3.1 Geology

Geologic conditions encountered during the 2015 drilling program were generally consistent with the existing conceptual model. Information from the new wells shows that the subsurface soil profile is consistent with previous investigations and generally consists of modern alluvium, overlain by 0 to 6 ft of fill and underlain by the Osceola Mudflow deposits. Based on explorations completed to date, the alluvium generally consists of dark gray, fine to medium sand with varying amounts of silt and occasional gravel and silt layers. The Osceola Mudflow aquitard deposit was identified at all four well borings that extended through the deep groundwater zone.

The Osceola Mudflow deposit was encountered between 78 and 84 ft bgs at the three deep wells in residential Algona and at 103 ft bgs at well AGW276 in commercial Algona. The Osceola Mudflow deposit observed in explorations completed to date generally consists of gray, well-graded sand with sub-angular gravel suspended in a matrix of silt and clay (diamicton). The Osceola Mudflow was encountered directly below a silt layer that was 1 ft thick at AGW264 and 6.5 ft thick at AGW268. At AGW260 and AGW276, a fine to medium sand layer separated the silt layer and the Osceola Mudflow.

3.2 Hydrogeology

Groundwater flow in the Auburn Valley is generally northward, parallel to the valley walls (Pacific Groundwater Group 1999). However, near the facility, there is a west to northwestern component to groundwater flow. The northwest component of flow becomes more pronounced in the area west of the Auburn facility due to groundwater discharging to surface water features west of the facility (such as the Chicago Avenue ditch, the Auburn 400 ponds, Mill Creek and adjacent wetland areas). Groundwater elevation contours for the shallow, intermediate, and deep groundwater zones are presented on Figures 3 through 5, respectively.

Groundwater elevation data was collected in June 2015 from all wells in the groundwater monitoring program. Groundwater elevation data was generally consistent with the previous interpretations of horizontal groundwater gradients. Additional intermediate and deep zone groundwater elevation data in residential Algona added additional control points for the elevation contours in this area, and was consistent with the northwest flow pattern.

4.0 GROUNDWATER QUALITY

Groundwater quality data from new wells, and ongoing groundwater monitoring, help refine the nature and extent of VOC groundwater contamination downgradient of the Boeing property in Algona and Auburn. Wells were installed to provide: 1) additional groundwater quality data at the water table in residential Algona, 2) additional intermediate and deep zone groundwater quality data in residential Algona, 3) additional groundwater quality data in all zones in commercial Algona, and 4) additional groundwater quality data in the shallow zone in Auburn. Groundwater analytical results for sampling of the newly installed monitoring wells are presented in Table 2. TCE, cis-1,2-DCE, and VC data from the newly installed monitoring wells are shown on Figure 2.

4.1 Extent of Volatile Organic Compounds at the Water Table in Residential Algona

Two conventional water table monitoring wells (AGW262 and AGW263) were installed to provide long-term monitoring of VOC concentrations at the water table for the purpose of evaluating potential for vapor intrusion in residential Algona. The constituents of concern for vapor intrusion are TCE and VC. These two wells were installed at locations where water table monitoring wells (AGW225 and AGW226) with 15 ft screens were previously installed. Samples from the wells with 15 ft screens appeared to be representative of a mixture of groundwater from the water table and deeper shallow zone groundwater. The new wells were installed with 5 ft screens in order to provide samples representative of the water table surface, allowing for a more accurate evaluation of vapor intrusion potential.

Concentrations of TCE, cis-1,2-DCE, and VC in groundwater samples from both AGW262 and AGW263 were lower than concentrations in previously collected groundwater samples from the adjacent wells with 15-ft screens. Concentrations of TCE and VC in the initial samples from the newly installed wells were below the screening levels for groundwater protective of indoor air.

4.2 Extent of Volatile Organic Compounds in the Intermediate and Deep Zones in Residential Algona

Two wells (AGW265 and AGW268) were installed to provide additional groundwater quality data in the intermediate zone. An additional purpose of well AGW265 is to delineate the westerly extent of the VC groundwater plume in the intermediate zone west of AGW251. Three conventional wells (AGW260, AGW264, and AGW267) were installed to provide additional groundwater quality data in the deep zone.

Intermediate zone well AGW268 is beyond the western extent of the intermediate zone TCE, cis-1,2-DCE, and VC plumes. As expected, this well had no detections of TCE, cis-1,2-DCE, or VC. Intermediate zone well AGW265 is west of well AGW251, which had detections of cis-1,2-DCE and VC in the intermediate zone. AGW265 did not have detections of TCE or cis-1,2-DCE; however, it did have a low-

level detection of VC (0.059 micrograms per liter [µg/L]). This well will be used to continue to monitor the western extent of the VC plume near AGW251.

The deep zone wells (AGW260, AGW264, and AGW267) are beyond the western extent of the deep zone TCE, cis-1,2-DCE, and VC plumes. As expected, these three wells had no detections of TCE, cis-1,2-DCE, or VC.

4.3 Extent of Volatile Organic Compounds in Commercial Algona

Two wells (AGW261 and AGW276) were installed to monitor the extent of VOCs in commercial Algona. AGW261 was installed in the shallow zone. AGW276 was installed as a multi-channel well to monitor all groundwater zones.

One conventional well (AGW261) was installed to provide long-term monitoring of the TCE plume in the shallow groundwater zone near boring ASB0230 in commercial Algona. TCE, cis-1,2-DCE, and VC were detected in the samples from AGW261 at concentrations of 2.6 µg/L, 1.1 µg/L, and 0.10 µg/L, respectively. This well will be used to continue to monitor the concentrations of TCE, cis-1,2-DCE, and VC in this location.

One multi-level well (AGW276) was installed to measure concentrations downgradient of AGW145 and AGW146, which have the highest concentrations of TCE in the intermediate and deep zone, respectively. The well location also provides additional data between direct-push borehole samples along Milwaukee Avenue North and the Interurban Trail. TCE was detected in only two channels at AGW276, channel 2 at 25 ft and channel 6 at 80 ft, at concentrations of 0.4 µg/L and 1.9 µg/L respectively. Cis-1,2-DCE was detected in six out of seven channels with maximum concentrations of 2.1 µg/L in the shallow zone, 6.7 µg/L in the intermediate zone, and 1.1 µg/L in the deep zone. VC was detected in six out of seven channels with maximum concentrations of 3.2 µg/L in the shallow zone, 0.96 µg/L in the intermediate zone, and 0.092 µg/L in the deep zone. Importantly, TCE and VC were not detected in the water table sample indicating a low risk for vapor intrusion in adjacent structures. Concentrations of TCE, cis-1,2-DCE, and VC in the intermediate and deep zone channels of AGW276 were all less than at upgradient wells AGW145 and AGW146.

4.4 Extent of Volatile Organic Compounds in the Shallow Zone in Auburn

One well (AGW266) was installed to provide additional shallow zone groundwater quality data in Auburn. This well is located north of the current extent of the TCE and VC shallow zone plumes in Auburn. The groundwater sample collected from this well had no detections of TCE or VC; however, sample did have a low-level detection of cis-1,2-DCE (0.4 µg/L). This well will be used to continue to monitor the northern boundary of the shallow zone plumes.

5.0 SUMMARY

The 2015 groundwater investigation focused on filling remaining data gaps and addressing concerns of the City of Algona and Ecology in order to complete the RI monitoring well network. A summary of observations and conclusions based on data from the newly installed wells is provided below:

- Newly installed conventional water table wells (AGW262 and AGW263) provide samples that are more representative of the concentrations of VOCs at the water table. These new wells, combined with previously installed water table wells in northern residential Algona, provide adequate spatial coverage for long-term monitoring of vapor intrusion potential in residential Algona.
- The western extent of the VOC groundwater plumes in the intermediate and deep zone in residential Algona has been adequately defined. There are no detections of constituents of concern at wells AGW260(D), AGW264(D), AGW267(D), and AGW268(I). However, Ecology has requested one additional year of monitoring at these wells to verify that chemicals are not migrating deeper into the aquifer. It is recommended that sampling at these four wells be continued for one additional year (through June 2017) and then be discontinued if there are no detections of constituents of concern.
- Wells AGW261 and AGW276 provide appropriate locations for long-term monitoring of the groundwater plumes in commercial Algona. TCE, cis-1,2-DCE, and VC were detected at low concentrations in AGW261 (shallow zone). VOCs were detected in all zones at AGW276; however, TCE and VC were not detected at the water table, indicating a low risk for vapor intrusion at nearby buildings.
- Well AGW266 adequately bounds the northern extent of the TCE and VC plumes in Auburn. Cis-1,2-DCE was detected at a low concentration at this location, but TCE and VC were not detected. Well AGW266 provides an appropriate location for long-term monitoring the northern extent of the shallow zone in Auburn.

The newly installed wells are considered adequate to complete the RI monitoring well network. No additional wells are proposed at this time.

6.0 USE OF THIS REPORT

This work plan has been prepared for the exclusive use of The Boeing Company and applicable regulatory agencies for specific application to the Auburn Fabrication Division facility remedial investigation. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of the scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions at this project. We make no other warranty, either express or implied.

This document has been prepared under the supervision and direction of the following key staff.

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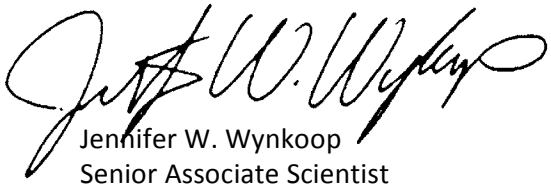
Project Hydrogeologist



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Data Source: Esri 2012

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Boeing Auburn Auburn, Washington	**Vicinity Map**	Figure 1

AGW268 (I)	
TCE	<0.2
cis-1,2-DCE	<0.2
VC	<0.02

AGW260 (D)	
TCE	<0.2
cis-1,2-DCE	<0.2
VC	<0.02

AGW267 (D)	
TCE	<0.2
cis-1,2-DCE	<0.2
VC	<0.02

AGW265 (I)	
TCE	<0.2
cis-1,2-DCE	<0.2
VC	**0.059**

AGW262 (WT)	
TCE	<0.2
cis-1,2-DCE	<0.2
VC	**0.20**

AGW263 (WT)	
TCE	**0.4**
cis-1,2-DCE	**4.2**
VC	**0.080**

AGW264 (D)	
TCE	<0.2
cis-1,2-DCE	<0.2
VC	<0.02

AGW261 (S)	
TCE	**2.6**
cis-1,2-DCE	**1.1**
VC	**0.10**

AGW276 (M)	1 (WT)	2 (S)	3 (S)	4 (I)	5 (I)	6 (D)	7 (D)
TCE	<0.2	**0.4**	<0.2	<0.2	<0.2	**1.9**	<0.2
cis-1,2-DCE	**0.8**	**1.9**	**2.1**	**0.6**	**6.7**	**1.1**	<0.2
VC	**0.037**	**1.4**	**3.2**	**0.094**	**0.96**	**0.092**	**0.024**

AGW266 (S)	
TCE	<0.2
cis-1,2-DCE	**0.4**
VC	<0.02

Notes

1. New monitoring well results presented from intial well sampling on April 9, 2015.
2. Results reported in ug/L.
   TCE = Trichloroethene; VC = Vinyl Chloride
   cis-1,2-DCE = cis-1,2-Dichloroethene.
3. <0.2 = Compound not detected at indicated reporting limit.
4. Well designations beginning with APP are installed and owned by WSDOT.
5. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

Legend

- Offsite Water Table Well
- Shallow Monitoring Well (2 to 30 ft BGS)
- (I) Intermediate Monitoring Well (40 to 60 ft BGS)
- (D) Deep Monitoring Well (80 to 100 ft BGS)
- (M) Multi-Level Well
- Wetland Areas
- Water Bodies
- Waterways

N

0 500 1,000

Scale in Feet

Base map source: Geometrix 2003; Aerial Photo Source: ESRI World Imagery; Parcel Data Source: King County GIS 2012

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Boeing Auburn
Auburn, Washington

Groundwater Results for New Monitoring Wells

Figure 2

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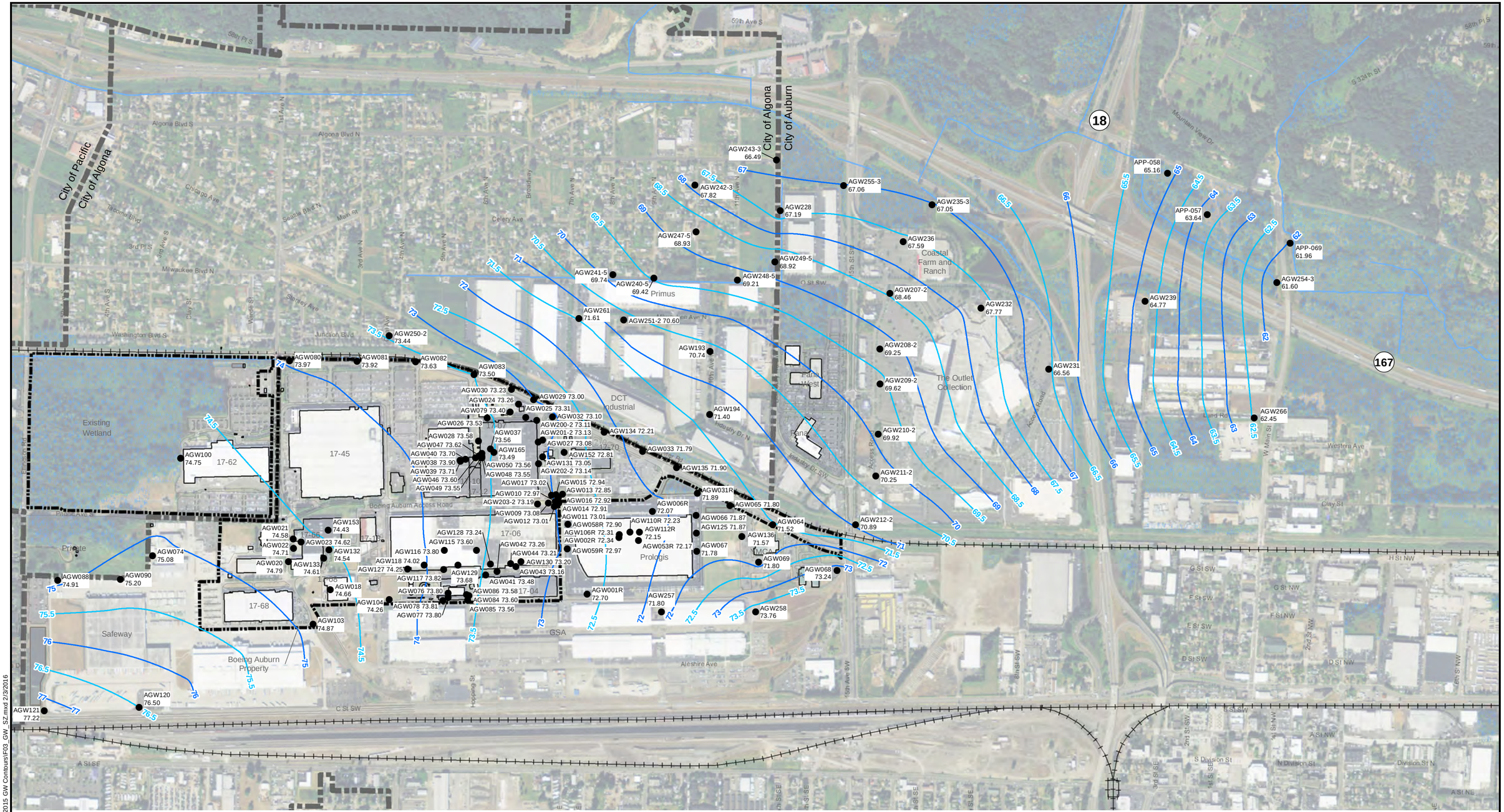

Legend

- AGW121 79.13 — Monitoring Well Designation, Groundwater Elevation (ft, MSL)
- 72 / 72.5 — Groundwater Elevation Contours
- Boeing Property
- Waterway
- Wetland Area
- City Limits

Notes

1. All water level data in ft, MSL. Vertical datum is NGVD29. Data collected in June 2015.
2. Multilevel wells have multiple channels. Channel designations are included in the well ID (ex: AGW208-2). Groundwater elevations listed are for the channel closest to 30 ft below ground surface.
3. Wells with APP designation are owned by WSDOT.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

N

0 1,000 2,000

Scale in Feet

Base map source: Geometrix 2003; Aerial Photo Source: Esri World Imagery; Parcel Data Source: King County GIS 2013

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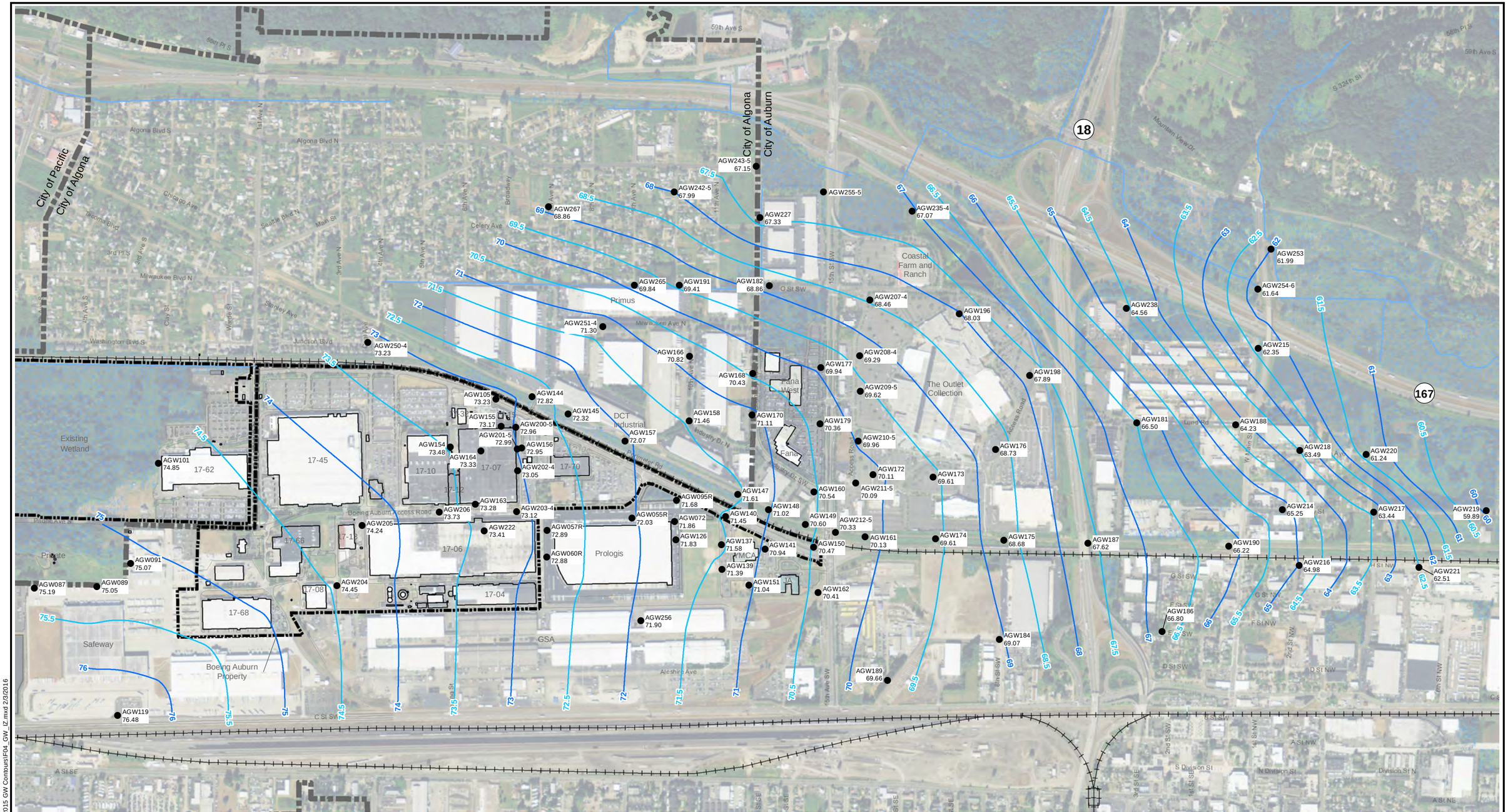
Boeing Auburn
Auburn, Washington

Shallow Zone (20-30 ft) Groundwater Elevation Contours June 2015

Figure 3



Legend

- AGW119 78.48 — Monitoring Well Designation, Groundwater Elevation (ft, MSL)
- 72 / 72.5 — Groundwater Elevation Contours
- Boeing Property
- Waterway
- Wetland Area
- City Limits

Notes

1. All water level data in ft, MSL. Vertical datum is NGVD29. Data collected in June 2015.
2. Multilevel wells have multiple channels. Channel designations are included in the well ID (ex: AGW208-2).
3. Wells without a posted water level had anomalous data.
4. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

N

0 1,000 2,000

Scale in Feet

Base map source: Geometrix 2003; Aerial Photo Source: Esri World Imagery; Parcel Data Source: King County GIS 2013

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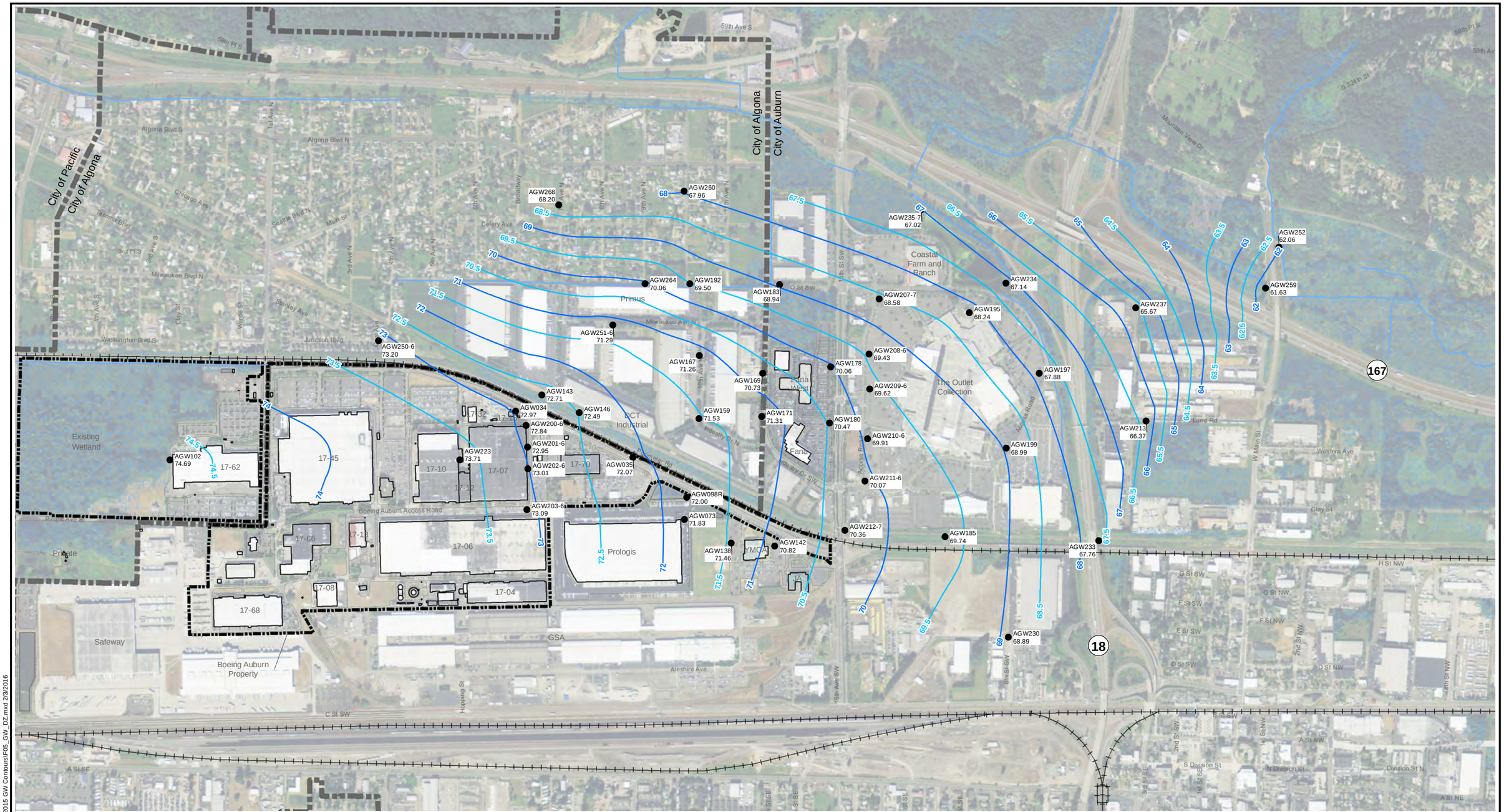
Boeing Auburn Auburn, Washington	**Intermediate Zone (40-60 ft) Groundwater Elevation Contours June 2015**	Figure 4



Legend

- AGW102 76.06 — Monitoring Well Designation, Groundwater Elevation (ft, MSL)
- 72 / 72.5 — Groundwater Elevation Contours
- Boeing Property
- Waterway
- City Limits

Notes

1. All water level data in ft, MSL. Vertical datum is NGVD29. Data collected in June 2015.
2. Multilevel wells have multiple channels. Channel designations are included in the well ID (ex: AGW208-2).
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

N

0 1,000 2,000

Scale in Feet

Base map source: Geometrix 2003; Aerial Photo Source: Esri World Imagery; Parcel Data Source: King County GIS 2013

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Boeing Auburn Auburn, Washington	**Deep Zone (80-100 ft) Groundwater Elevation Contours June 2015**	Figure 5

G:\Projects\025\164\120\110\2Q 2015 GW Contours\F05_GW_DZ.mxd 2/3/2016

Table 1
Drilling and Well Installation Matrix
Boeing Auburn

Well ID	Well Type	Coordinates		Well Rim Elevation	Top of Casing Elevation (ft)	Date of Installation	Groundwater Zone	Well Permanent Screen Depth ft bgs (bottom)	Screen Length (ft)	Notes
		Northing	Easting							
AGW260	Conventional	109460.2	1287868.2	70.07	69.47	3/23/2015	D	84	5	Replacement well for malfunctioning deep zone channel at AGW242
AGW261	Conventional	108233.0	1289275.1	76.49	76.04	3/24/2015	S	29	10	
AGW262	Conventional	109917.7	1288486.0	70.42	69.93	3/24/2015	S (WT)	7.5	5	
AGW263	Conventional	109527.9	1288849.2	72.49	72.1	3/24/2015	S (WT)	7.5	5	
AGW264	Conventional	109047.3	1288848.3	72.44	71.89	3/25/2015	D	78	10	
AGW265	Conventional	109041.1	1288848.2	72.51	71.97	3/26/2015	I	59	10	
AGW266	Conventional	115377.9	1290323.1	65.07	64.69	3/26/2015	S	29	10	
AGW267	Conventional	108132.6	1288020.5	72.67	72.17	3/27/2015	I	59	10	
AGW268	Conventional	108133.0	1288015.1	72.77	72.22	3/30/2015	D	71	5	
AGW276	Multi-level	108771.0	1289999.5	79.11		10/7/2015				
AGW276-1					78.74		S(WT)	15	5	
AGW276-2					78.74		S	25	0.5	
AGW276-3					78.74		S	35	0.5	
AGW276-4					78.73		I	48	0.5	
AGW276-5					78.73		I	60	0.5	
AGW276-6					78.74		D	80	0.5	
AGW276-7					78.74		D	100	0.5	

Abbreviations/Acronyms

bgs = below ground surface
ft = feet

Groundwater Zone

D = deep
I = intermediate
S = shallow
WT = water table

Well Type

Conventional = Well with a single screen located in either the shallow, intermediate, or deep zone.

Notes

Coordinate System and Zone: Washington State Plane, North Zone Coordinates
Horizontal Datum: North American Datum of 1983 (91), North Zone, U.S. Feet.
Vertical Datum: National Geodetic Vertical Datum of 1929, U.S. Feet.
To convert elevations shown hereon to North American Vertical Datum of 1988 elevations please add 3.49 feet.

Table 2
Groundwater Analytical Results for Newly Installed Wells
Boeing Auburn

Sample ID:	AGW260	AGW261	AGW262	Dup of AGW262 AGW900	AGW263	AGW264	AGW265	AGW266	AGW267	AGW268	AGW276-1-15	AGW276-2-25	AGW276-3-35	AGW276-4-48	AGW276-5-60	AGW276-6-80	AGW276-7-100	Dup of AGW276-7-100 AGW900
Zone:	Deep	Shallow	Water Table	Water Table	Water Table	Deep	Int.	Shallow	Deep	Int.	Water Table	Shallow	Shallow	Int.	Int.	Deep	Deep	Deep
SDG:	1552310	1552310	1552310	1552310	1552310	1552310	1552310	1552310	1552310	1552310	8104029	8104028	8104026	8104025	8104027	8104024	8104022	8104023
Lab ID:	7842328	7842322	7842324	7842323	7842325	7842326	7842327	7842321	7842329	7842330	1603637	1603637	1603637	1603637	1603637	1603637	1603637	1603637
Sample Date:	4/9/2015	4/9/2015	4/9/2015	4/9/2015	4/9/2015	4/9/2015	4/9/2015	4/9/2015	4/9/2015	4/9/2015	10/23/2015	10/23/2015	10/23/2015	10/23/2015	10/23/2015	10/23/2015	10/23/2015	10/23/2015
VOLATILES (µg/L)																		
Method SW8260C																		
Acetone	5.0 U	5.0 U	5.0 U	5.0 U	**76**	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	**12**	5.0 U	5.0 UJ	**5.8** J	5.0 U	5.0 UJ	5.0 UJ	5.0 U
Benzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
2-Butanone	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 U	5.0 UJ	5.0 UJ	5.0 U
Carbon Disulfide	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Carbon Tetrachloride	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Chloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Chloroform	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	**0.3** J	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Chloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
1,2-Dichloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
1,1-Dichloroethene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
cis-1,2-Dichloroethene	0.2 U	**1.1**	0.2 U	0.2 U	**4.2**	0.2 U	0.2 U	**0.4**	0.2 U	0.2 U	**0.8**	**1.9**	**2.1** J	**0.6** J	**6.7**	**1.1** J	0.2 UJ	0.2 U
trans-1,2-Dichloroethene	0.2 U	**0.3**	0.2 U	0.2 U	**0.2**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.2**	0.2 UJ	0.2 UJ	**0.5**	0.2 UJ	0.2 UJ	0.2 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
cis-1,3-Dichloropropene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
trans-1,3-Dichloropropene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
2-Hexanone	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 U	5.0 UJ	5.0 UJ	5.0 U
4-Methyl-2-Pentanone (MIBK)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 UJ	5.0 UJ	5.0 U	5.0 UJ	5.0 UJ	5.0 U
Methylene Chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Styrene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
1,1,2,2-Tetrachloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Tetrachloroethene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Toluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
1,1,2-Trichloroethane	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UJ	0.2 UJ	0.2 U	0.2 UJ	0.2 UJ	0.2 U
Trichloroethene	0.2 U	**2.6**	0.2 U	0.2 U	**0.4**	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**0.4**	0.2 UJ	0.2 UJ	0.2 U	**1.9** J	0.2 UJ	0.2 U
Trichlorofluoromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Vinyl Acetate	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
Vinyl Chloride	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	**1.2**	**2.6** J	0.2 UJ	**0.8**	0.2 UJ	0.2 UJ	0.2 U
m,p-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
o-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U
VOLATILES (µg/L)																		
Method 8260C SIM																		
Tetrachloroethene	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U
Vinyl Chloride	0.020 U	**0.10**	**0.20**	**0.21**	**0.080**	0.020 U	**0.059**	0.020 U	0.020 U	0.020 U	**0.037**	**1.4**	**3.2**	**0.094**	**0.96** J	**0.092**	**0.024**	**0.026**

Abbreviations/Acronyms

Bold = Detected compound.
J = Indicates the analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
U = Indicates the compound was not detected at the reported concentration.
UJ = The analyte was not detected in the sample; the reported sample reporting limit is an estimate.

APPENDIX A

Monitoring Well Logs: AGW260 through AGW268 and AGW276

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:

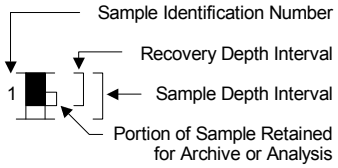
Primary Constituent:	> 50%	"GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:	> 30% and ≤ 50%	"very gravelly," "very sandy," "very silty," etc.
	> 15% and ≤ 30%	"gravelly," "sandy," "silty," etc.
Additional Constituents:	> 5% and ≤ 15%	"with gravel," "with sand," "with silt," etc.
	≤ 5%	"trace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

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	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Rotosonic
5	Air Rotary (Rock)
6	Wash Rotary (Rock)
7	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
VST	Vane Shear Test
GT	Other Geotechnical Testing
CA	Chemical Analysis

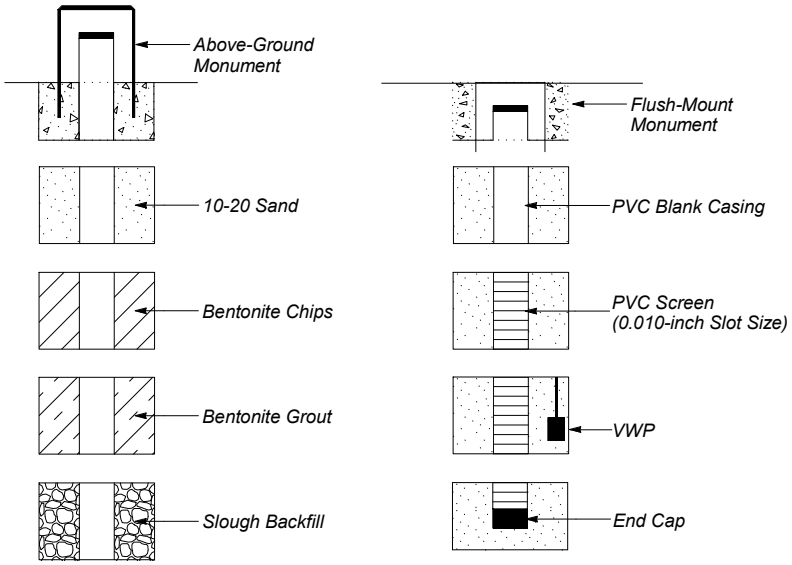
Groundwater

▽ Approximate water elevation at time of drilling (ATD).

▼ Approximate water elevation at other time(s). When multiple water levels are obtained other than ATD, only a representative range is shown. See text for additional information.

Note: Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Well Log Graphics



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Boeing Auburn
Auburn, Washington

Soil Classification System and Key

Figure A-1 (2 of 2)

AGW260

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Depth (ft) | Elevation | Sample Number & Interval | Sampler Type | Blows/Foot | PID (ppm) | Graphic Symbol | USCS Symbol

Drilling Method: Rotosonic

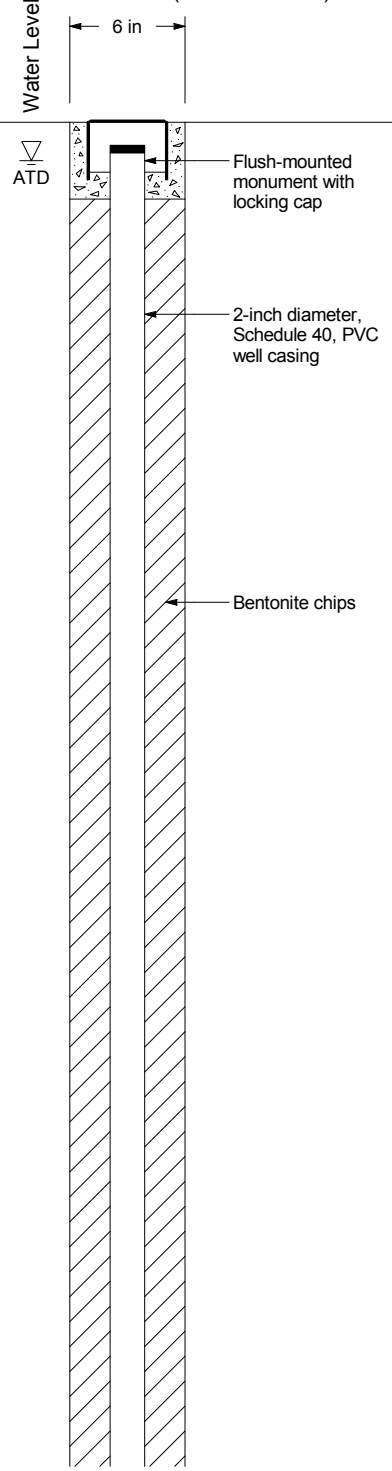
Ground Elevation (ft): 70.07

Drilled By: Cascade Drilling Inc.

Not sampled 0 to 70 ft BGS- See AGW242 for lithology

Water Level

Monitoring Well Detail
(DOE#: BIM491)



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.
4. **DOE Unique Well Number: BIM491**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW260

Figure
A-2
(1 of 3)

AGW260

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Drilling Method: Rotosonic

Ground Elevation (ft): 70.07

Drilled By: Cascade Drilling Inc.

Monitoring Well Detail
(DOE#: BIM491)

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Water Level
35	35							
40	30							
45	25							
50	20							
55	15							
60	10							
65	5							
70								

Not sampled 0 to 70 ft BGS- See AGW242 for lithology

2-inch diameter, Schedule 40, PVC well casing

Bentonite chips

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.
4. **DOE Unique Well Number: BIM491**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW260

Figure
A-2
(2 of 3)

AGW260

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

Drilling Method: Rotosonic

Ground Elevation (ft): 70.07

Drilled By: Cascade Drilling Inc.

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Soil Description
70	0	S-1	d4				ML	Gray SILT with sand (dense, wet) **(ALLUVIUM)**
		S-2	d4				WD	WOOD with grayish-brown silt (log)
							ML	Gray SILT with organics (wood) (very stiff, wet)
75	-5	S-3	d4				SP-SM	Gray silty, fine SAND (medium dense, wet)
		S-4	d4				SP	Dark gray, fine SAND (medium dense, wet)
		S-5	d4					
80	-10							
85							SM	Gray, very silty, fine to medium SAND with angular to subangular gravel and clay (medium dense, wet) **(OSCEOLA MUD FLOW)**

Boring Completed 03/23/15
Total Depth of Boring = 85.0 ft.

Monitoring Well Detail
(DOE#: BIM491)

Water Level

- 10/20 Colorado sand pack
- 2-inch diameter, Schedule 40, PVC screen (0.010-inch slot size)
- Threaded end cap
- Bentonite chips

Monitoring Well Completed 03/23/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 69.47 ft.
Total Depth of Monitoring Well = 83.5 ft.

90
95
100
105

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.
4. **DOE Unique Well Number: BIM491**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

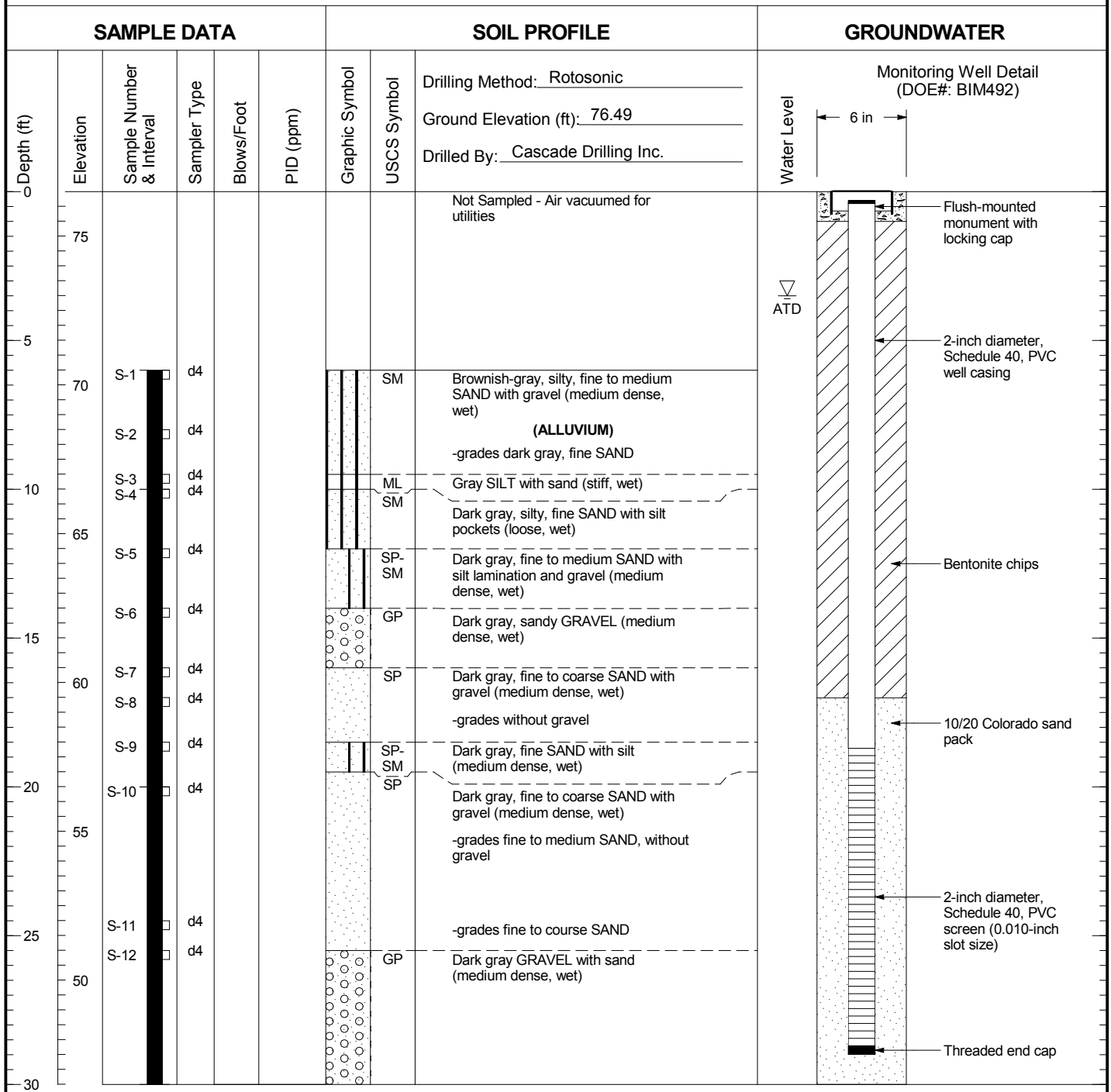
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW260

Figure
A-2
(3 of 3)

AGW261



Boring Completed 03/24/15
Total Depth of Boring = 30.0 ft.

Monitoring Well Completed 03/24/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 76.04 ft.
Total Depth of Monitoring Well = 29.0 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.
4. **DOE Unique Well Number: BIM492**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW261

Figure
A-3

AGW262

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

Drilling Method: Rotosonic

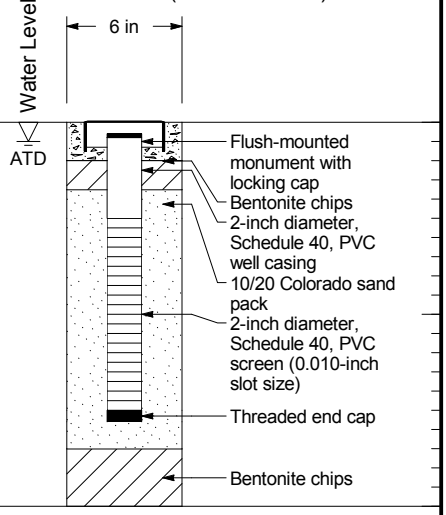
Ground Elevation (ft): 70.42

Drilled By: Cascade Drilling Inc.

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Description
0	70							Not sampled - Air vacuumed for utilities
		S-1	d4				SM	Brownish-gray, silty, fine SAND with organics (peat-like material) (medium dense, wet)
		S-2	d4				SP	**(ALLUVIUM)**
5	65	S-3	d4				SM	Dark gray, fine SAND (medium dense, wet)
								Dark gray, very silty, fine SAND (medium dense, wet)
10								

Boring Completed 03/24/15
Total Depth of Boring = 10.0 ft.

Monitoring Well Detail
(DOE#: BIM493)



Monitoring Well Completed 03/24/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 69.93 ft.
Total Depth of Monitoring Well = 7.5 ft.

15
20
25
30
35

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.
4. **DOE Unique Well Number: BIM493**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

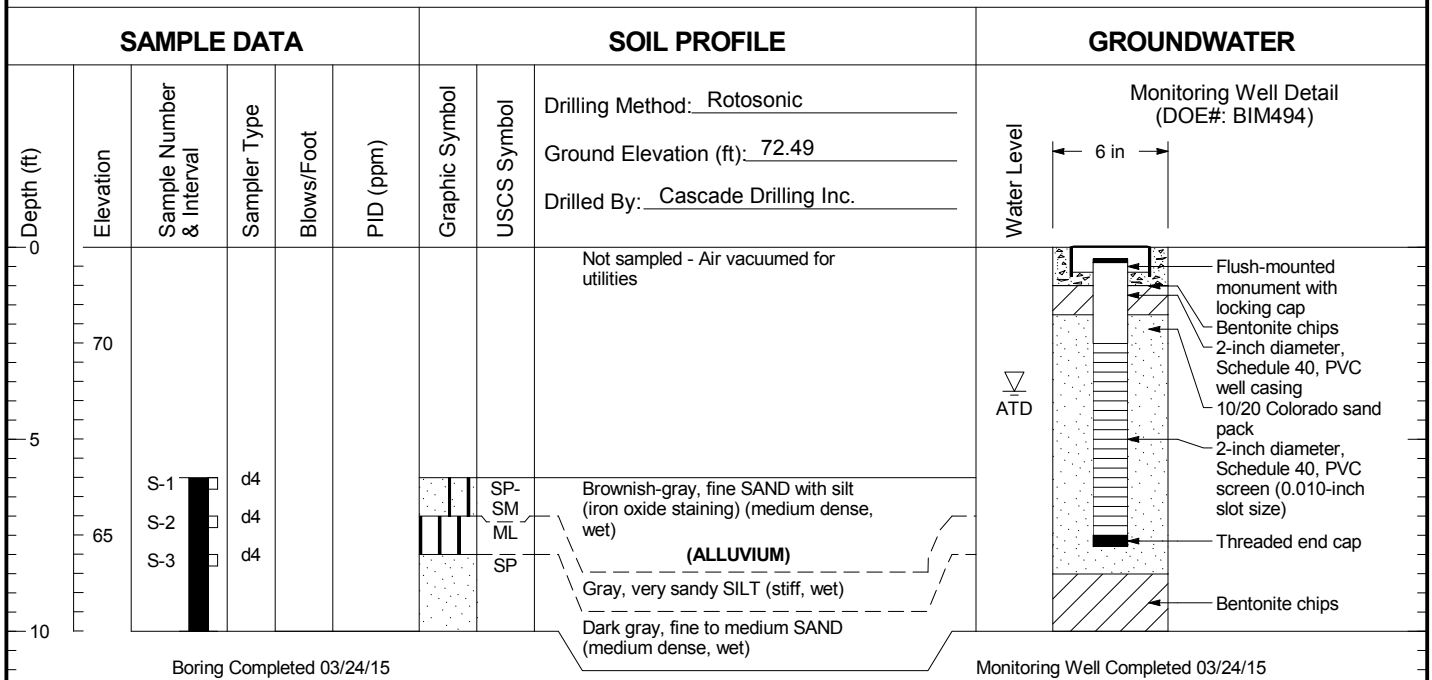
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW262

Figure
A-4

AGW263



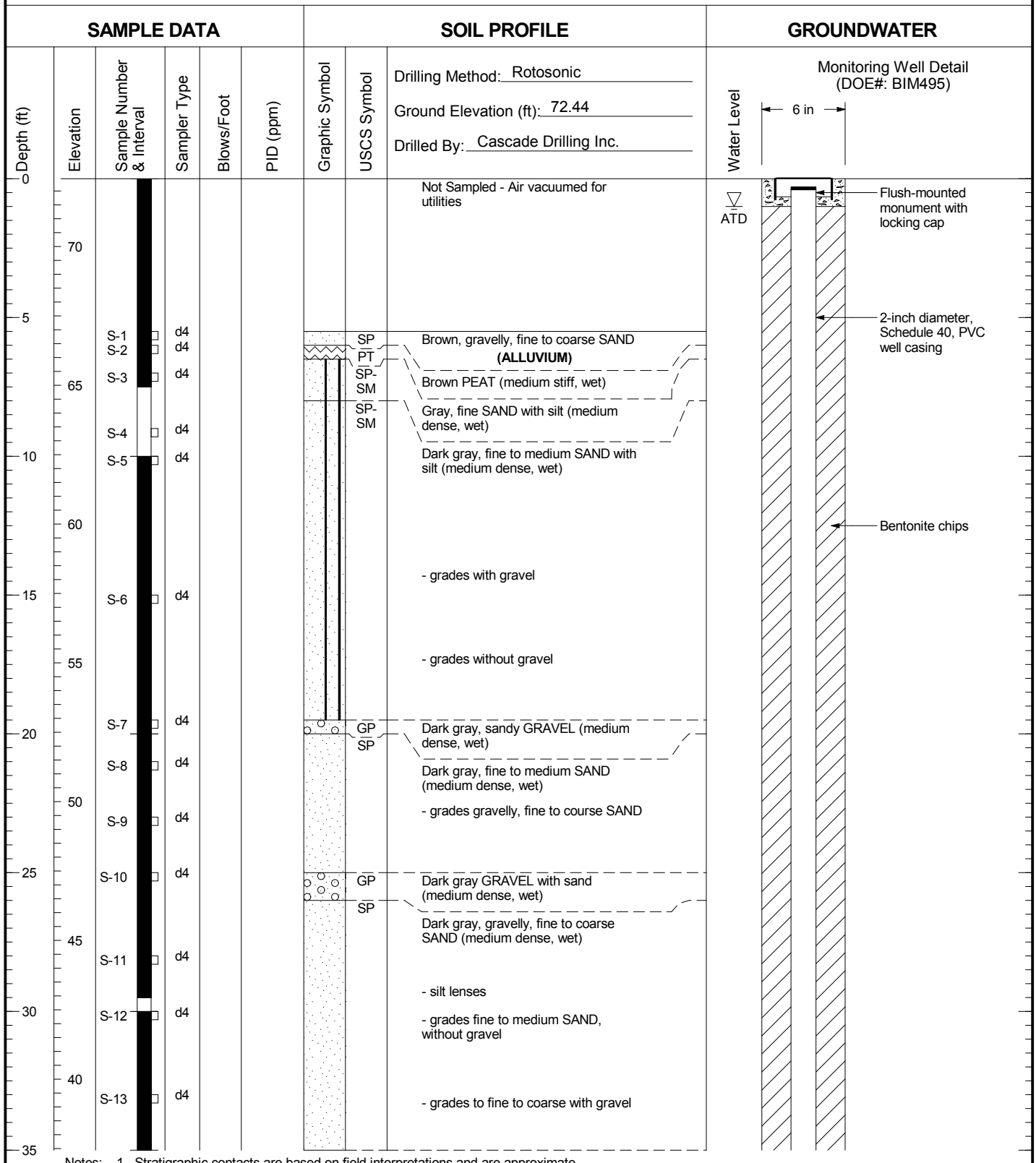
Boring Completed 03/24/15
Total Depth of Boring = 10.0 ft.

Monitoring Well Completed 03/24/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 72.10 ft.
Total Depth of Monitoring Well = 7.5 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.
4. **DOE Unique Well Number: BIM494**

LANDAU ASSOCIATES	Boeing Auburn Auburn, Washington	Log of Monitoring Well AGW263	Figure A-5

AGW264



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.
4. **DOE Unique Well Number: BIM495**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

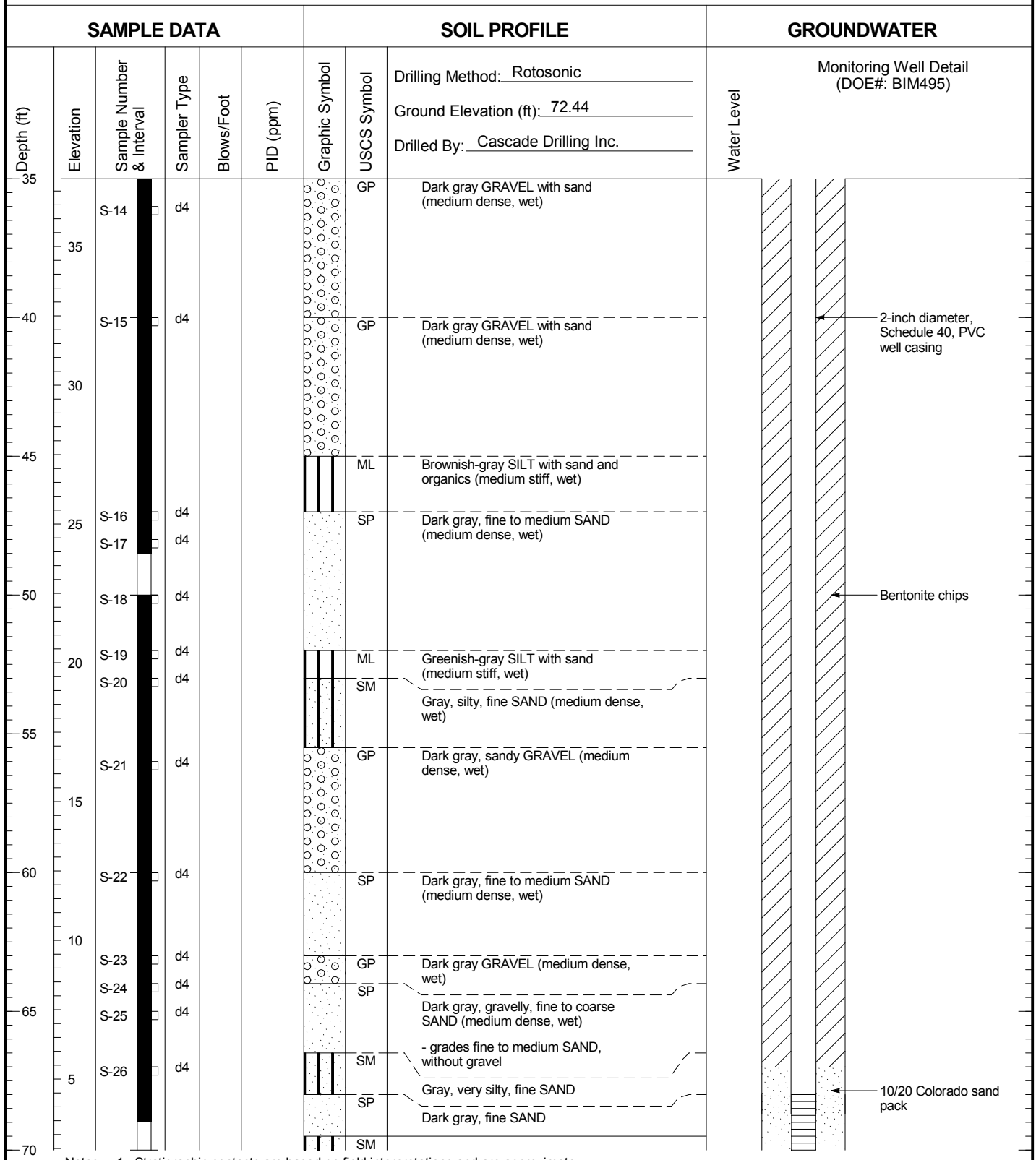
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW264

Figure
A-6
(1 of 3)

AGW264



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.
4. **DOE Unique Well Number: BIM495**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW264

Figure
A-6
(2 of 3)

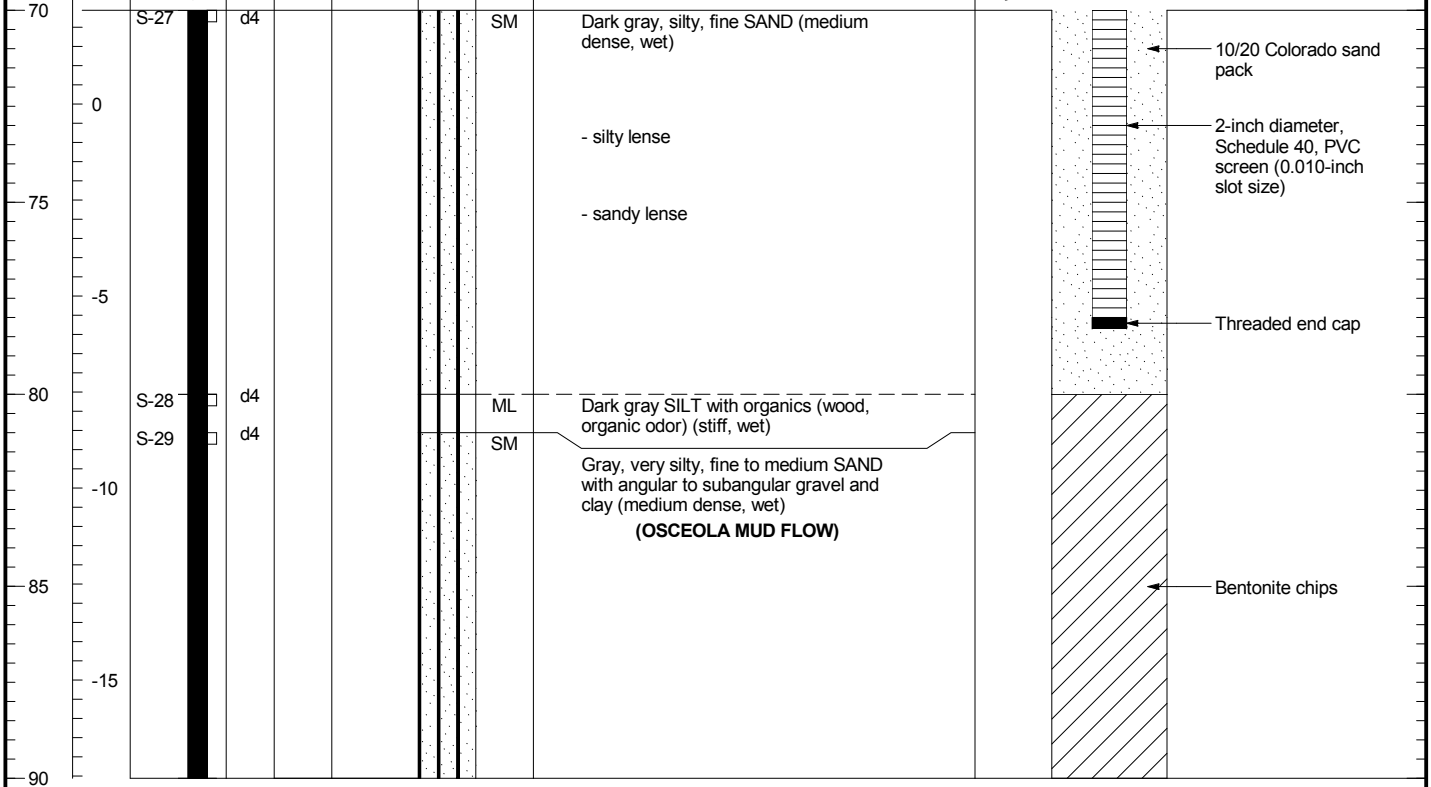
AGW264

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Drilling Method: Rotosonic

Ground Elevation (ft): 72.44

Drilled By: Cascade Drilling Inc.



Boring Completed 03/25/15
Total Depth of Boring = 90.0 ft.

Monitoring Well Completed 03/25/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 71.89 ft.
Total Depth of Monitoring Well = 78.0 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.
4. **DOE Unique Well Number: BIM495**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW264

Figure
A-6
(3 of 3)

AGW265

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Depth (ft) | Elevation | Sample Number & Interval | Sampler Type | Blows/Foot | PID (ppm) | Graphic Symbol | USCS Symbol

Drilling Method: Rotosonic

Ground Elevation (ft): 72.51

Drilled By: Cascade Drilling Inc.

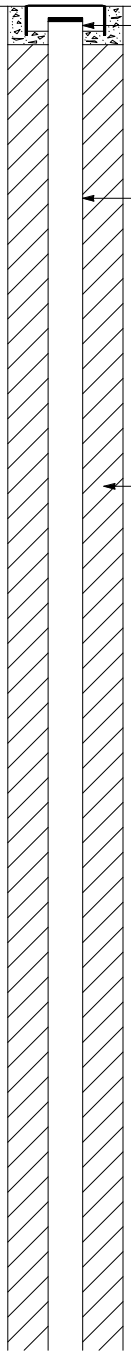
Not sampled- See AGW264 for lithology

Water Level

ATD

Monitoring Well Detail
(DOE#: BIM496)

6 in



Depth (ft): 0, 5, 10, 15, 20, 25, 30, 35

Elevation: 70, 65, 60, 55, 50, 45, 40

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.
4. **DOE Unique Well Number: BIM496**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW265

Figure
A-7
(1 of 2)

AGW265

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Depth (ft) | Elevation | Sample Number & Interval | Sampler Type | Blows/Foot | PID (ppm) | Graphic Symbol | USCS Symbol

Drilling Method: Rotosonic

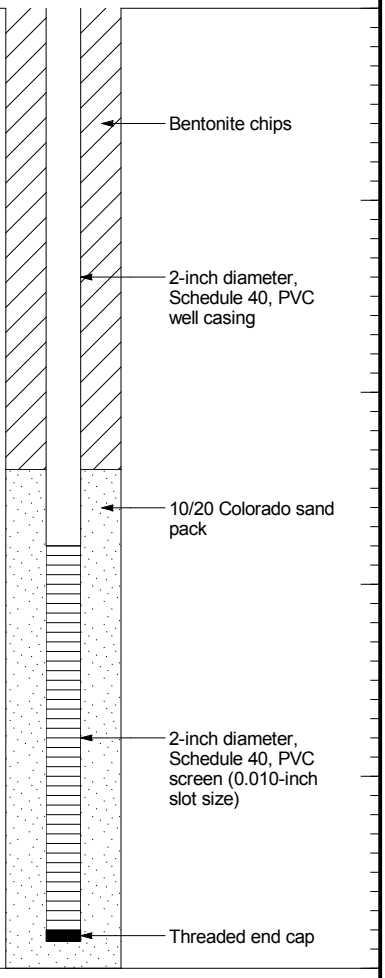
Ground Elevation (ft): 72.51

Drilled By: Cascade Drilling Inc.

Water Level

Monitoring Well Detail
(DOE#: BIM496)

Not sampled- See AGW264 for lithology



Boring Completed 03/26/15
Total Depth of Boring = 60.0 ft.

Monitoring Well Completed 03/26/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 71.97 ft.
Total Depth of Monitoring Well = 59.0 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.
4. **DOE Unique Well Number: BIM496**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

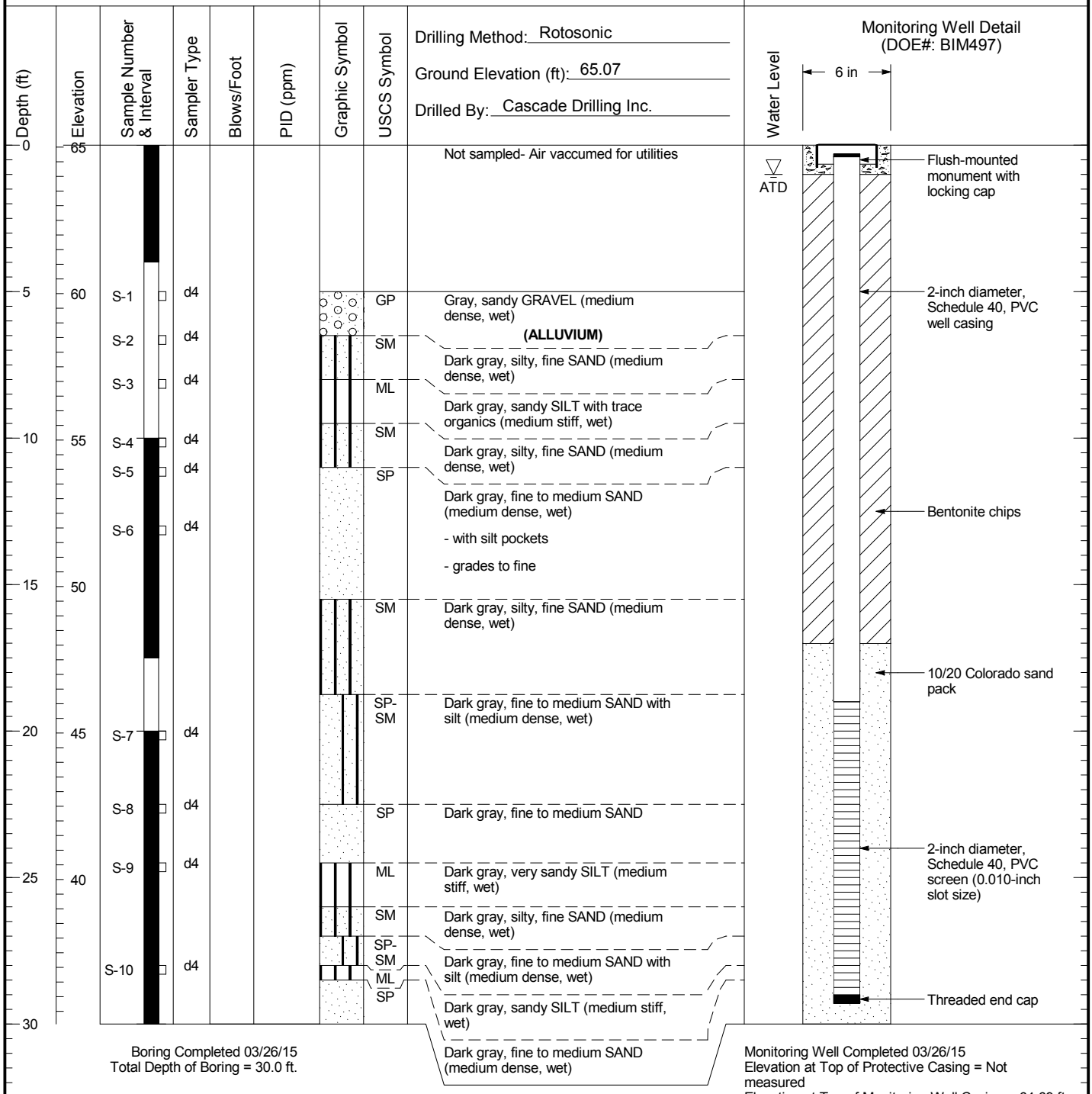
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW265

Figure
A-7
(2 of 2)

AGW266



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.
4. **DOE Unique Well Number: BIM497**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

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Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW266

Figure
A-8

AGW267

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Depth (ft) | Elevation | Sample Number & Interval | Sampler Type | Blows/Foot | PID (ppm) | Graphic Symbol | USCS Symbol

Drilling Method: Rotosonic

Ground Elevation (ft): 72.67

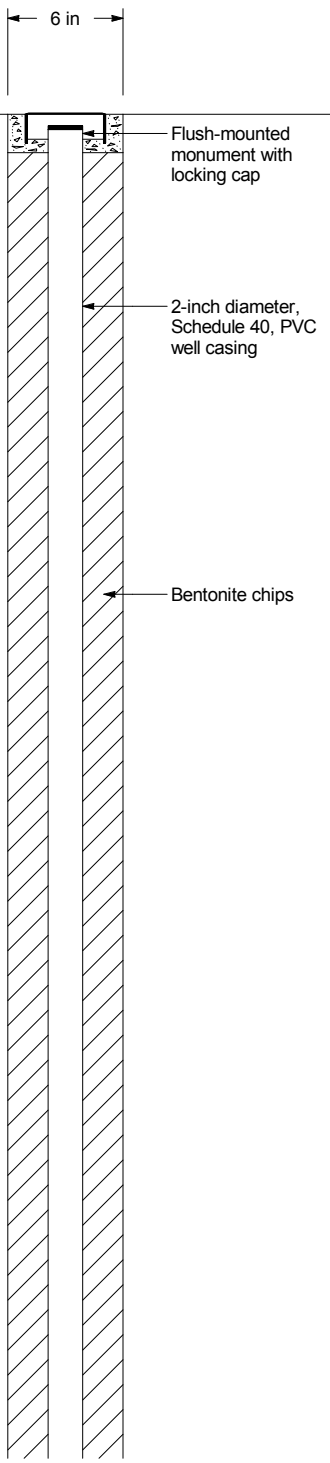
Drilled By: Cascade Drilling Inc.

Not sampled 0 to 40 ft BGS. See AGW268 for lithology.

Water Level

ATD

Monitoring Well Detail
(DOE#: BIM499)



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.
4. **DOE Unique Well Number: BIM499**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

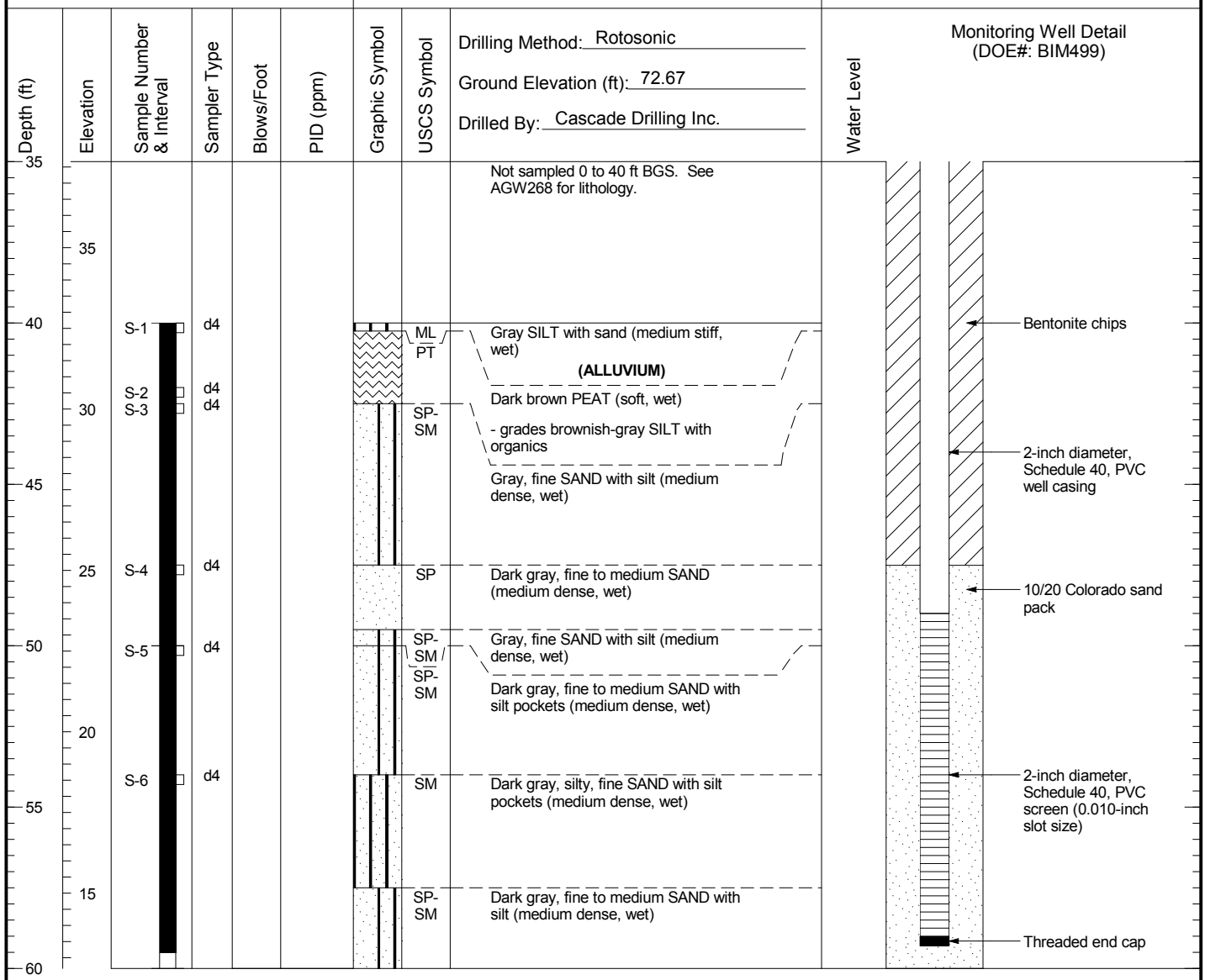
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW267

Figure
A-9
(1 of 2)

AGW267



Boring Completed 03/27/15
Total Depth of Boring = 60.0 ft.

Monitoring Well Completed 03/27/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 72.17 ft.
Total Depth of Monitoring Well = 59.0 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.
4. **DOE Unique Well Number: BIM499**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW267

Figure
A-9
(2 of 2)

AGW268

SAMPLE DATA					SOIL PROFILE			GROUNDWATER
Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Drilling Method: Rotosonic Ground Elevation (ft): 72.77 Drilled By: Cascade Drilling Inc.	Water Level
0								Not sampled - Air vacuumed for utilities	ATD
	70								
5		S-1	d4				SP-SM	Gray, fine SAND (medium dense, wet) **(ALLUVIUM)**	
	65	S-2	d4				SM	Gray, very silty, fine SAND (medium dense, wet)	
10		S-3	d4					- grades very silty	
	60	S-4	d4				SP	Dark gray, fine to medium SAND (medium dense, wet)	
15		S-5	d4				SP-SM	Gray, fine SAND with silt (medium dense, wet)	
	55						SM	Gray, silty, fine SAND (medium dense, wet)	
20		S-6	d4				ML	Gray, sandy SILT (medium stiff, wet)	
		S-7	d4				SP	Dark gray, fine to coarse SAND (medium dense, wet)	
	50								
25		S-8	d4					- grades with silt	
		S-9	d4				ML	Brownish-gray, sandy SILT with interspersed organics (medium stiff, wet)	
	45								
30		S-10	d4				SM	Gray, silty, fine SAND (loose, wet)	
		S-11	d4				SP-SM	Dark gray, fine SAND with silt and interspersed organics (wood) (medium dense, wet)	
	40								
35									

Monitoring Well Detail (DOE#: BIM500)

6 in

- Flush-mounted monument with locking cap
- 2-inch diameter, Schedule 40, PVC well casing
- Bentonite chips

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.
4. **DOE Unique Well Number: BIM500**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW268

Figure
A-10
(1 of 3)

AGW268

Drilling Method: Rotosonic

Ground Elevation (ft): 72.77

Drilled By: Cascade Drilling Inc.

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Soil Profile	Water Level	Monitoring Well Detail (DOE#: BIM500)
35										
		S-12	d4				SP	Dark gray, fine SAND (medium dense, wet)		
	35									
							ML	Brownish-gray SILT with organics (peat) (medium stiff, wet)		
40		S-13	d4							Bentonite chips
		S-14	d4				SM	Gray, silty, fine SAND (medium dense, wet)		
45										
	30									
	25									
50		S-15	d4					- grades dark gray, fine to medium SAND		2-inch diameter, Schedule 40, PVC well casing
		S-16	d4				SP	Dark gray, fine to medium SAND (medium dense, wet)		
	20	S-17	d4				ML	Gray SILT with sand and gravel (medium stiff, wet)		
		S-18	d4					- grades without sand and gravel - grades sandy		
55										
	15						SP	Gray, fine SAND with silt (medium dense, wet)		
60		S-19	d4					- grades dark gray, fine to medium SAND		
		S-20	d4				ML	Gray SILT (medium stiff, wet)		
	10									
65		S-21	d4				SM	Dark gray, silty, fine SAND (medium dense, wet)		10/20 Colorado sand pack
		S-22	d4				ML	Greenish-gray SILT (medium stiff, wet)		2-inch diameter, Schedule 40, PVC screen (0.010-inch slot size)
	5						SM	Gray, silty, fine SAND (medium dense, wet)		
70										

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.
4. **DOE Unique Well Number: BIM500**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW268

Figure
A-10
(2 of 3)

AGW268

SAMPLE DATA / SOIL PROFILE / GROUNDWATER

Drilling Method: Rotosonic

Ground Elevation (ft): 72.77

Drilled By: Cascade Drilling Inc.

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Soil Description
70		S-23	d4				SP	Dark gray, fine SAND (medium dense, wet)
		S-24	d4				ML	Gray SILT with organics (medium stiff, wet)
75	0							
	-5	S-25	d4				SM	Gray, very silty, fine to medium SAND with angular to subangular gravel and clay (medium dense, wet)
80								**(OSCEOLA MUD FLOW)**
85								
90								
95								
100								
105								

Boring Completed 03/30/15
Total Depth of Boring = 80.0 ft.

Monitoring Well Detail
(DOE#: BIM500)

Water Level

Threaded end cap

Bentonite chips

Monitoring Well Completed 03/30/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 72.22 ft.
Total Depth of Monitoring Well = 70.0 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.
4. **DOE Unique Well Number: BIM500**

025164. 6/29/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

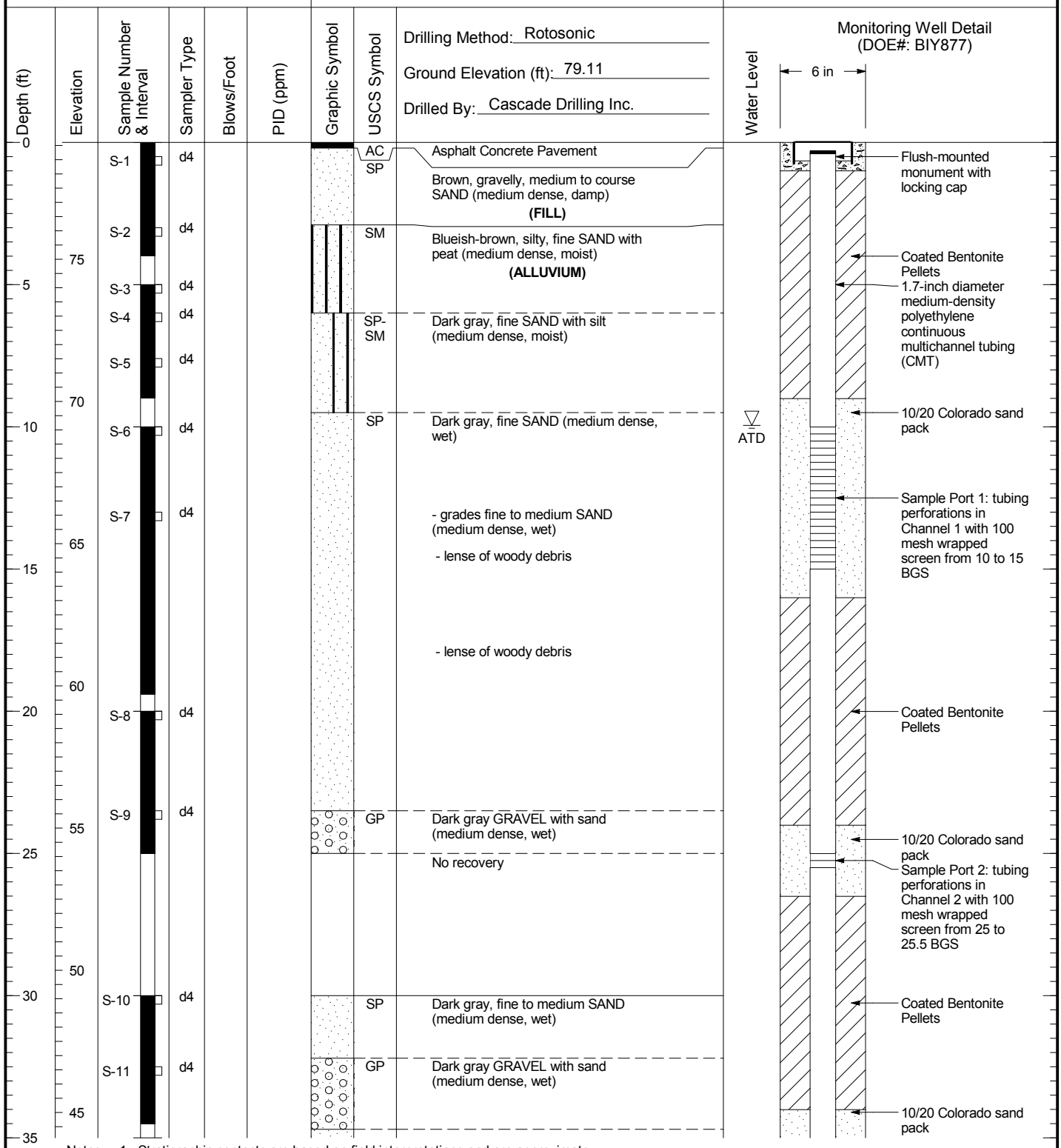
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW268

Figure
A-10
(3 of 3)

AGW276



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.
4. **DOE Unique Well Number: BIY877**

025164. 11/10/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

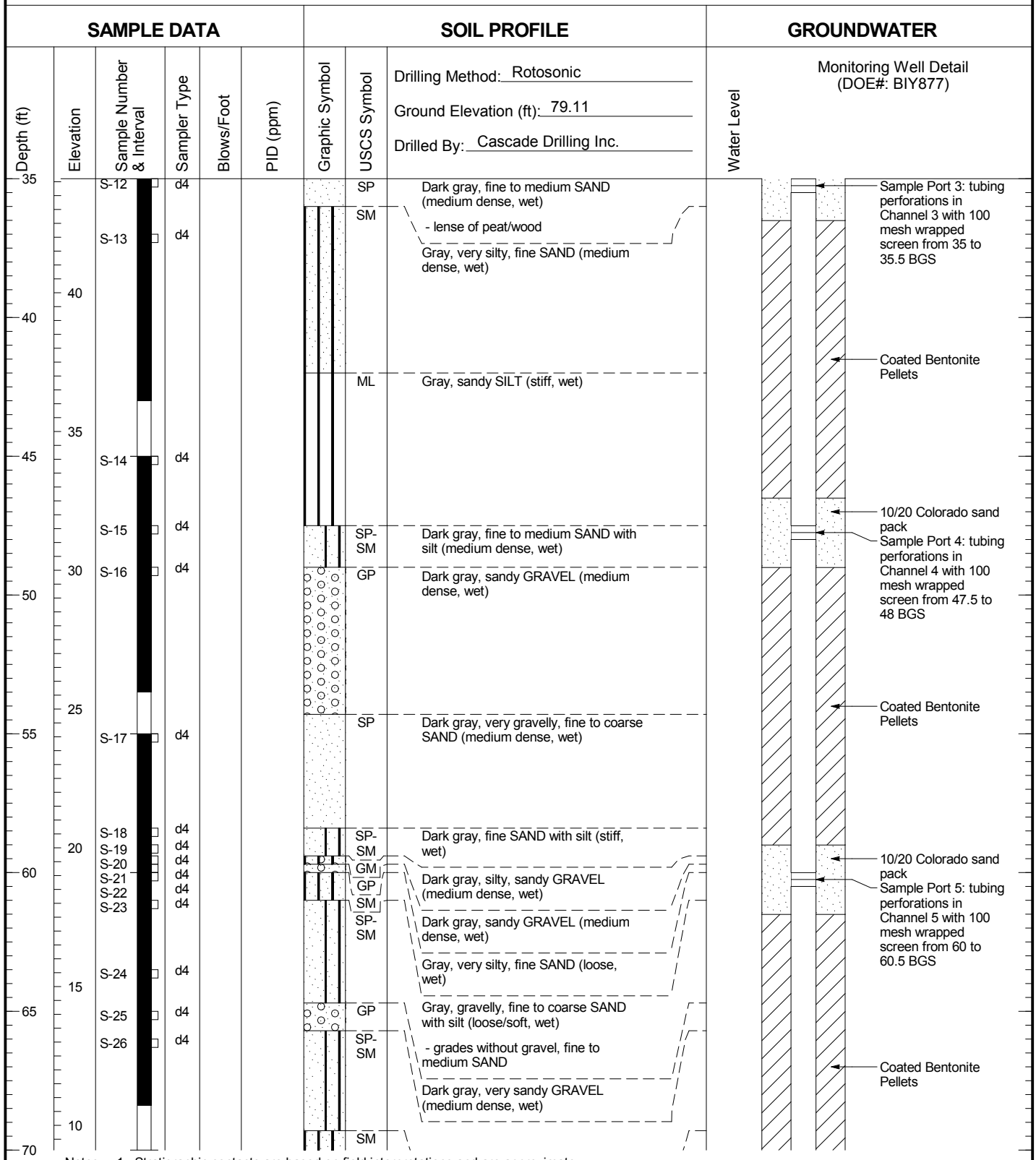
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW276

Figure
A-11
(1 of 4)

AGW276



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.
4. **DOE Unique Well Number: BIY877**

025164. 11/10/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

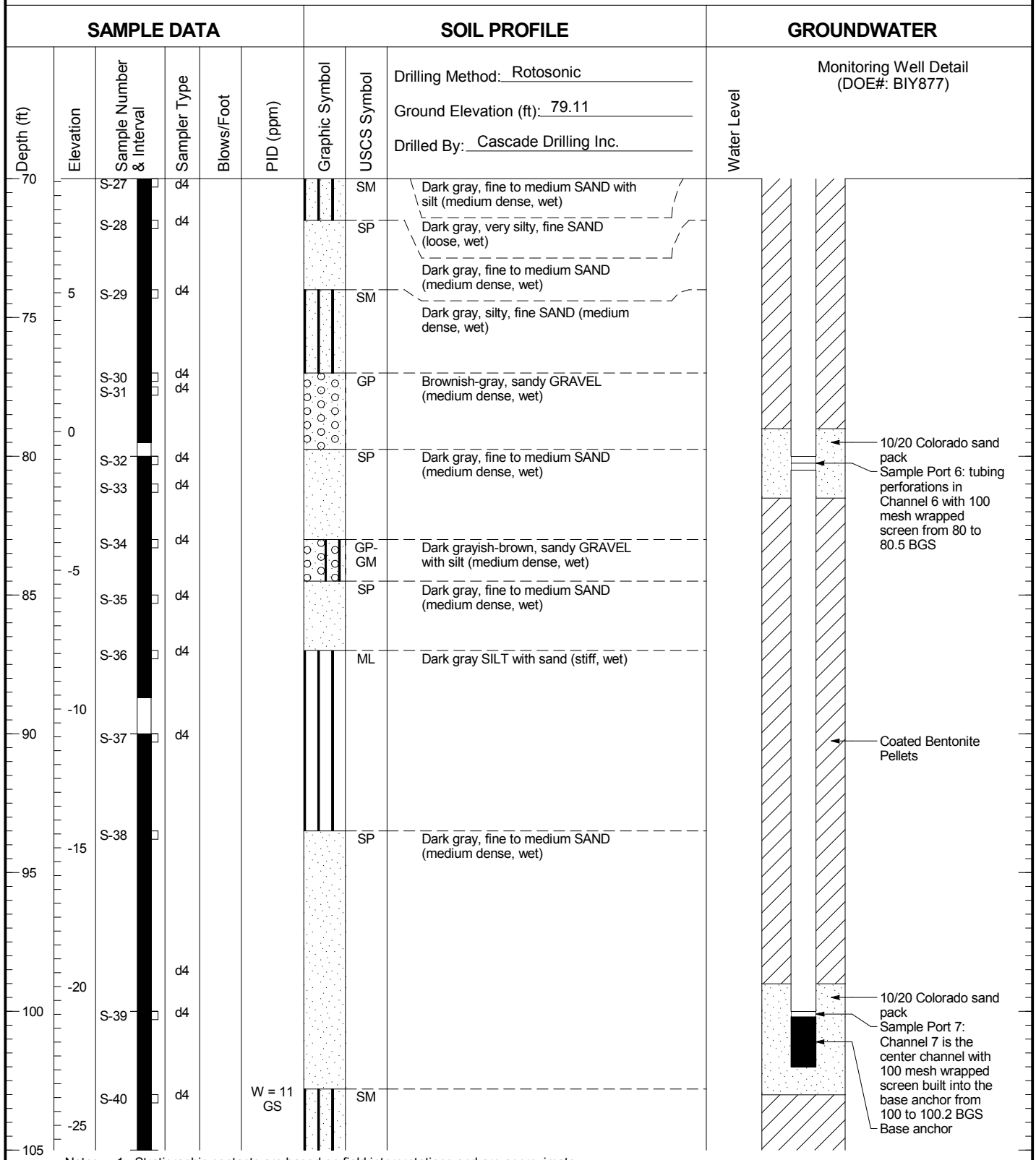
LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW276

Figure
A-11
(2 of 4)

AGW276



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.
4. **DOE Unique Well Number: BIY877**

025164. 11/10/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW276

Figure
A-11
(3 of 4)

AGW276

SAMPLE DATA | **SOIL PROFILE** | **GROUNDWATER**

Drilling Method: Rotosonic

Ground Elevation (ft): 79.11

Drilled By: Cascade Drilling Inc.

Monitoring Well Detail
(DOE#: BIY877)

Depth (ft)	Elevation	Sample Number & Interval	Sampler Type	Blows/Foot	PID (ppm)	Graphic Symbol	USCS Symbol	Water Level
105							SM	
	-30							
110								

Gray, very silty, fine to medium SAND with angular to subangular gravel and clay (medium dense, wet)
(OSCEOLA MUD FLOW)

Coated Bentonite Pellets

Boring Completed 10/06/15
Total Depth of Boring = 110.0 ft.

Monitoring Well Completed 10/07/15
Elevation at Top of Protective Casing = Not measured
Elevation at Top of Monitoring Well Casing = 78.74 ft.
Total Depth of Monitoring Well = 100.0 ft.

115
120
125
130
135
140

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.
4. **DOE Unique Well Number: BIY877**

025164. 11/10/15 N:\PROJECTS\025164 - MASTER FILE.GPJ WELL LOG W/ ELEVATION

LANDAU ASSOCIATES

Boeing Auburn
Auburn, Washington

Log of Monitoring Well AGW276

Figure
A-11
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