TECHNICAL MEMORANDUM

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

TO: Carl Bach, The Boeing Company, and Allison Crowley, Seattle City Light

FROM: Colette Gaona and Kristy J. Hendrickson, P.E.

DATE: February 19, 2015

RE: ADDENDUM NO. 1
NORTH BOEING FIELD/GEORGETOWN STEAM PLANT SITE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
SAMPLING AND ANALYSIS PLAN AND QUALITY ASSURANCE PROJECT PLAN
SEATTLE, WASHINGTON

This technical memorandum presents Addendum No. 1 to the North Boeing Field/Georgetown Steam Plant Site (NBF/GTSP) Remedial Investigation/Feasibility Study (RI/FS) Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP, Leidos 2014). This addendum provides the revisions associated with the First Amendment to North Boeing Field/Georgetown Steam Plant Agreed Order No. DE 5685 (AO Amendment No. 1).

The SAP/QAPP describes the technical approach and procedures for the RI and identifies responsibilities for organizations and personnel involved in conducting the RI/FS. As a result of AO Amendment No. 1, some procedures and responsibilities have changed. The changes are summarized below, and a supplemental QAPP signature page is attached:

- Section 1.1. The Boeing Company (Boeing), the City of Seattle (City), and King County (County), the Potentially Liable Persons (PLPs) for the Site under the AO, will perform the RI/FS.
- Section 1.2. Landau Associates, Inc. (Landau) will conduct the RI/FS for the PLPs. References throughout the SAP/QAPP to Leidos performing specific actions should be changed to Landau. Leidos will now conduct oversight and review of the RI/FS on behalf of the Washington State Department of Ecology (Ecology).

  Add: Landau Associates – Edmonds, WA, Kris Hendrickson, RI/FS Project Manager
  Phone: (425) 778-0907, khendrickson@landauinc.com

  Landau Associates – Portland, OR, Colette Gaona, RI/FS Task Manager
  Phone: (503) 542-1083, cgaona@landauinc.com.
- Section 1.3. Responsibilities will be: Rosemary Trimmer, Matt Moroney, and Evelyn Ives – Field Managers; Rosemary Trimmer, Matt Moroney, and Evelyn Ives – Landau Health and Safety Managers.
- Section 1.4. Responsibilities will be: Colette Gaona – primary Laboratory Coordinator; Anne Halvorsen – Laboratory Quality Assurance/Quality Control Manager; Anne Halvorsen – Data Manager.

- Section 1.5. Subcontractors will be:
  - Analytical chemistry (all samples excluding soil vapor):
    Analytical Resources, Incorporated (ARI)
    Kelly Bottem
    4611 South 134th Place
    Tukwila, WA 98166
    Phone: (206) 695-6211
    kellyb@arilabs.com
  - Data validation, except for dioxin/furan analyses:
    Landau Associates
    Anne Halvorsen
    130 2nd Avenue South
    Edmonds, WA 98020
    Phone: (425) 778-0907
    ahalvorsen@landauinc.com
  - Confined space entry for storm drains (if needed):
    Landau Associates
    Dylan Frazer
    130 2nd Avenue South
    Edmonds, WA 98020
    Phone: (425) 778-0907
  - Utility location:
    APS
    Bill Philips
    43530 SE North Bend Way
    North Bend, WA 98045
    Phone: (425) 954-8436
  - Equipment supply:
    Landau Associates owns all sampling equipment anticipated to be required to complete the activities described in the SAP/QAPP. Rentals from equipment supply stores are not anticipated to be needed.

- Section 1.6. Revised schedule is included in AO Amendment No. 1.
- Section 2.3.1. Soil vapor points will be installed using Teflon tubing.
- Section 2.2.3. Groundwater purging and sampling will be conducted using polyethylene tubing. The polyethylene tubing and the silicon tubing used for sampling via peristaltic pump will remain in the well during the RI period.
- Section 2.8. Analytical data, except for dioxin/furan data, will be validated by Landau. Dioxin/furan data will be validated by EcoChem, Inc.
- Section 3.2.3. Analytical laboratory deliverables will include information necessary for data validation to be performed in accordance with Section 3.2.4. For analytical results for chemicals other than dioxins/furans, information for EPA Stage 2b data validation is required; for dioxin/furan results information for EPA Stage 4 data validation is required.
- Appendix C, Field Forms. Copies of field forms that will be used for the RI are attached.

In addition to the procedural changes outlined above, changes to RI field activities (groundwater monitoring, sample locations, and analytes) have been made since the issuance of the final SAP/QAPP (Leidos 2014). These changes to RI field activities are summarized below.

- Groundwater Monitoring
  - Existing wells with four rounds of sampling completed: Boeing completed RI monitoring at existing groundwater monitoring wells in 2014 (Landau Associates 2014). During sampling events to be performed at new RI groundwater monitoring wells, Ecology may request resampling for limited chemicals at groundwater monitoring wells where sampling has already been completed and where there were exceedances of the RI screening levels (RISLs).
  - Groundwater monitoring in the Building 3-333 Area: Groundwater compliance monitoring in the Building 3-333 Area has been completed and additional monitoring is not planned due to concentrations of polychlorinated biphenyls (PCBs) below the RISLs. All existing groundwater monitoring wells in the Building 3-333 area will be maintained to allow for possible sampling during the RI activities to better characterize the extent of Volatile Organic Compounds (VOCs) in groundwater in this area.
  - Groundwater monitoring in the Fenceline Area: Semiannual groundwater compliance monitoring at the Fenceline Area groundwater monitoring wells (NGW521, NGW522, and NGW523) will continue during the RI field investigation due to detected concentrations of total PCBs greater than the RISL at all three monitoring locations.
  - Groundwater monitoring at GTSP: Semiannual groundwater compliance monitoring at groundwater monitoring well GTSP-7 will continue during the RI field investigation and will be conducted by the City. Groundwater monitoring at GTSP-2 and GTSP-8 has been completed for the purposes of the RIFS and additional monitoring is not planned.

- Sample Locations and Analyses
  - Soil borings, vapor points, and monitoring wells: Due to potential access impediments, known utility locations, and planned construction activities during the RI field investigation, planned locations for a number of soil borings, vapor points, and monitoring wells have been adjusted slightly. In addition, laboratory analytical requirements for some samples have been revised. Notes on planned location adjustments and the final laboratory analytical requirements for each location are provided in Table 1.
  - Future sample relocations: Sample locations may be relocated by no more than 10 feet from the original planned location, based on current site conditions, if the relocated sample location meets the sampling objectives of the RI/FS Work Plan. If a sample location is required to be moved more than 10 feet from the planned location, Ecology approval of the new location will be obtained. Sample location changes and final sample locations will be documented in the RI report.
  - Substation V-94 soil sampling: Boeing has completed a soil cleanup at Substation V-94 under the Toxic Substances Control Act (TSCA; Landau Associates 2015). Based on the results of confirmation samples, Ecology approved the deletion of the four soil borings (CFA-SB12 through CFA-SB-15) that were located in the vicinity of Substation V-94. This change is reflected in Table 1.

- Building 3-350 soil sampling: Soil sample locations in the SAP/QAPP were based on available information on historical transformer locations. Based on further review of historical photographs and drawings of transformers formerly located near Building 3-350, soil sample locations at two possible transformer areas on the west and northeast sides of Building 3-350 (NFA-SB01, NFA-SB02, and NFA-SB05) are being relocated. The approximate locations of historical transformers, and the relocated soil borings are shown on Figure 1. This change is also reflected in Table 1.

Additional significant changes, as determined by Ecology, will be documented in separate addenda.

REFERENCES

Landau Associates. 2015. *Self-Implementing TSCA Cleanup, Substation V-94 Removal and Disposal, North Boeing Field, Seattle, Washington*. Prepared for The Boeing Company. January 28.

Landau Associates. 2014. Technical Memorandum to Carl Bach, the Boeing Company, re: *2014 Groundwater Monitoring Results, Remedial Investigation, North Boeing Field, Seattle, Washington*. August 18.

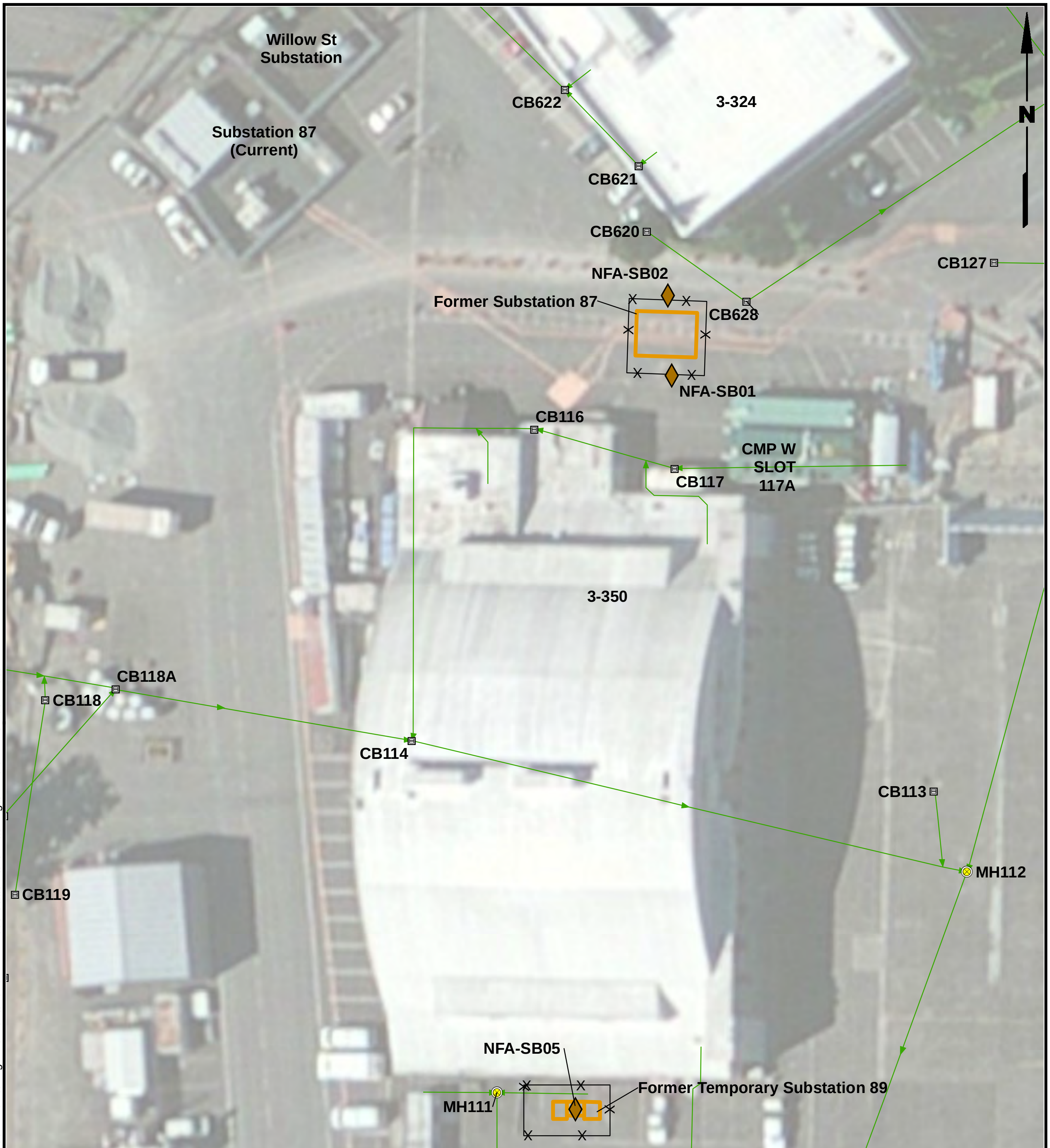
Leidos (formerly SAIC). 2014. *North Boeing Field/Georgetown Steam Plant Site, Remedial Investigation/Feasibility Study, Final Sampling and Analysis Plan and Quality Assurance Project Plan*. Prepared for Toxics Cleanup Program, Northwest Regional Office, Washington State Department of Ecology, Bellevue, Washington. April.

Leidos. 2013. *North Boeing Field/Georgetown Steam Plant Site, Remedial Investigation/Feasibility Study, Remedial Investigation/Feasibility Study Work Plan, Final*. Prepared for the Washington State Department of Ecology, Toxics Cleanup Program, Bellevue, Washington. November 11.

CMG/KJH/tam

Attachments:

Table 1: Sample and Analyses Summary Table
Figure 1: Building 3-350 and RI Monitoring Locations
Supplemental QAPP Signature Page
Field Forms



Legend

- Proposed RI Soil Boring Location
- Former Fence
- Former Substation
- Catch Basin
- Inlet
- Manhole
- North Lateral Drain Line

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 50 100

Scale in Feet

Data Source: Esri World Imagery.

G:\Projects\025\082\915\RIF01Building3-350RIMonitoring.mxd 1/29/2015 NAD 1983 StatePlane Washington North FIPS 4601 Feet

LANDAU ASSOCIATES

North Boeing Field Seattle, Washington	**Building3-350 and RI Monitoring Locations**	Figure 1

TABLE 1
NBF/GTSP REMEDIAL INVESTIGATION
SAMPLE SUMMARY AND COORDINATION NOTES
Revised with Ecology/Leidos Notes, 01/16/2015

Area of Concern	Proposed Sample ID	Figure Number	Sample Media	Final SAP/QAPP Addendum No. 1 Analyses	SAP/QAPP Addendum No. 1 Notes and Proposed Changes
GTSP					
North Yard and East Yard Areas	GTSP-SB01	5	Soil	PCBs, Dioxins/Furans	
	GTSP-SB02	5	Soil	PCBs, Metals, SVOCs, VOCs, Dioxins/Furans	
NBF - PEL Area					
Bldg 3-323 Area	PEL-SB01	6	Soil	PCBs, Metals, PAHs	
	PEL-SB02	6	Soil	PCBs, Metals, PAHs	
	PEL-SB03	6	Soil	PCBs, Metals, PAHs	
	PEL-SB04	6	Soil	PCBs, Metals, PAHs	Boring location may need to be adjusted based on numerous underground utilities in this area. Goal is to characterize soil in area northwest of Building 3-323
	PEL-SB05	6	Soil	PCBs, Metals, PAHs	Boring location may need to be adjusted based on numerous underground utilities in this area. Goal is to characterize soil in area north of Building 3-323 , in area west of LAI-SB74 and SB-17
	PEL-SB06	6	Soil	PCBs, Metals, PAHs	A limited-access drill rig may be required to locate the sample under the canopy on the northeast corner of Building 3-323. Goal is to get the sample location as close to Building 3-323 as possible
	VP01	6	Soil/Vapor	VOCs (Vapor and Soil)	
	VP02	6	Soil/Vapor	VOCs (Vapor and Soil)	
Bldg 3-302 and 3-322 Area	PEL-SB07	6	Soil	PCBs, Metals	
	PEL-SB08	6	Soil	PCBs, Metals	
Bldg 3-329, 3-333, 3-335 Area	NGW601	8	Soil/Groundwater	PCBs, VOCs (Soil), VOCs (GW)	
	NGW602	8	Soil/Groundwater	PCBs, VOCs (Soil), VOCs (GW)	
	NGW603	8	Soil/Groundwater	PCBs, TPH, VOCs (Soil and GW)	
	PEL-SB09	8	Soil	PCBs, TPH, VOCs	
	PEL-SB10	7	Soil	PCBs, TPH (see note 7)	
	PEL-SB11	7	Soil	PCBs, TPH (see note 7)	
	PEL-SB12	7	Soil	PCBs, TPH, VOCs	
	PEL-SB13	7	Soil	PCBs, TPH, VOCs	
	PEL-SB14	7	Soil	PCBs, TPH, VOCs	
	VP03	7	Soil/Vapor	VOCs, TPH (Soil), VOCs (Vapor)	
	VP04	8	Soil/Vapor	VOCs, TPH (Soil), VOCs (Vapor)	
	VP05	8	Soil/Vapor	VOCs, TPH (see note 7) (Soil), VOCs (Vapor)	
Bldg 3-324 Area	PEL-SB15	8	Soil	PCBs, TPH, PAHs, BTEX	
	PEL-SB16	8	Soil	PCBs, TPH, PAHs, BTEX	
	PEL-SB17	8	Soil	PCBs, TPH, PAHs, BTEX	
	PEL-SB18	8	Soil	PCBs, TPH, PAHs, BTEX	
	VP06	8	Soil/Vapor	TPH, VOCs (Soil); VOCs (Vapor)	
	NGW604	8	Soil/Groundwater	PCBs, Metals, TPH, PAHs, BTEX	
Bldg 3-315 and 3-326 Area	PEL-SB19	7	Soil	PCBs, PAHs	
	PEL-SB20	7	Soil	PCBs, PAHs	Planned location for boring was moved 5 to 10 feet west/southwest to avoid utilities and 3-315 building footprint; goal is to determine presence/absence of contamination resulting from potential PCB-containing transformers at Building 3-315
	PEL-SB21	7	Soil	PCBs, PAHs	Planned location for boring was moved 5 to 10 feet west/southwest to avoid utilities and 3-315 building footprint; goal is to determine presence/absence of contamination resulting from potential PCB-containing transformers at Building 3-315. Boring will be advanced as close to the building as possible.
Bldg 3-353	PEL-SB22	7	Soil	PCBs, TPH, PAHs, BTEX	
	VP07	9	Soil/Vapor	TPH, VOCs (Soil); VOCs (Vapor)	
	NGW605	7	Soil/Groundwater	PCBs, Metals, TPH, SVOCs, BTEX (Soil and GW)	
Green Hornet Area	PEL-SB23	9	Soil	TPH, SVOCs, PCBs, VOCs	
	PEL-SB24	9	Soil	TPH (see note 7), SVOCs, PCBs, VOCs	
	PEL-SB25	9	Soil	TPH (see note 7), SVOCs, PCBs, VOCs	
	PEL-SB26	9	Soil	TPH, SVOCs, PCBs, VOCs	
	PEL-SB27	9	Soil	TPH, SVOCs, PCBs, VOCs	
	PEL-SB28	9	Soil	TPH, SVOCs, PCBs, VOCs	
	PEL-SB29	9	Soil	TPH, SVOCs, PCBs, VOCs	
	NGW606	9	Soil/Groundwater	TPH, SVOCs, PCBs, VOCs (Soil), TPH, SVOCs, BTEX (GW)	

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Revised with Ecology/Leidos Notes, 01/16/2015

Area of Concern	Proposed Sample ID	Figure Number	Sample Media	Final SAP/QAPP Addendum No. 1 Analyses	SAP/QAPP Addendum No. 1 Notes and Proposed Changes
NBF - North Flightline					
Fmr Bldg 3-360 and 3-361 Area	NGW607	11	Soil/Groundwater	VOCs (Soil and GW)	
Bldg 3-380 Storm Drain Area	NFA-SB01	11	Soil	PCBs, Metals	Boring relocated to the north side of Building 3-350 based on former location of Substation No. 87. See Figure 1 of SAP/QAPP Addendum No. 1. The AOC boundaries will be redrawn in the RI to include this boring within an area of concern.
	NFA-SB02	11	Soil	PCBs, Metals	Boring relocated to the north side of Building 3-350 based on former location of Substation No. 87. See Figure 1 of SAP/QAPP Addendum No. 1. The AOC boundaries will be redrawn in the RI to include this boring within an area of concern.
	NFA-SB03	12	Soil	PCBs, TPH, SVOCs, VOCs	
	NFA-SB04	12	Soil	PCBs, TPH, SVOCs, VOCs	
Bldg 3-380 Area	NGW608	13	Soil/Groundwater	PCBs, Metals, SVOCs (Soil and GW)	
	NGW609	13	Soil/Groundwater	PCBs, Metals, SVOCs (Soil and GW)	
Bldg 3-390 Area	NGW610	14	Soil/Groundwater	PCBs, Metals, TPH, SVOCs, VOCs (see note 8) (Soil and GW)	
Concourse A Area	NFA-SB05	14	Soil	PCBs, Metals, TPH, SVOCs, VOCs (see note 8)	Boring relocated to the south side of Building 3-350 based on historical temporary location of Substation No. 89. See Figure 1 of SAP/QAPP Addendum No. 1. The AOC boundaries will be redrawn in the RI to include this boring within an area of concern.
	NFA-SB06	14	Soil	PCBs, Metals, TPH, SVOCs, VOCs (see note 8)	Planned location for boring was moved approximately 10 feet to the north (approximately 12 feet from the edge of the blast fence) to clear the utility corridor in this area.
	NFA-SB07	15	Soil	PCBs, Metals, TPH, SVOCs, VOCs (see note 8)	
	NFA-SB08	15	Soil	PCBs, Metals, TPH (see note 7), SVOCs, VOCs (see note 8)	
	NFA-SB09	15	Soil	PCBs, Metals, TPH, SVOCs, VOCs (see note 8)	
	NGW611	14	Soil/Groundwater	PCBs, Metals, TPH, SVOCs, VOCs (see note 8) (Soil and GW)	
	NGW612	15	Soil/Groundwater	PCBs, Metals, TPH, SVOCs, VOCs (see note 8) (Soil and GW)	
NBF - Central Flightline					
Bldg 3-801 Area	CFA-SB01	18	Soil	TPH (see note 7), VOCs	
	CFA-SB02	18	Soil	TPH (see note 7), VOCs	
	VP08	18	Soil/Vapor	VOCs (Soil and Vapor)	
	NGW613	19	Soil/Groundwater	Metals, VOCs, SVOCs (Soil) Metals, VOCs (GW)	
Bldg 3-800 Area	VP09	18	Soil/Vapor	VOCs (Soil and Vapor)	
	NGW614	18	Soil/Groundwater	Metals, VOCs (Soil and GW)	
Main Fuel Farm Area	CFA-SB03	20	Soil	TPH (see note 7), PAHs, BTEX	
	CFA-SB04	20	Soil	TPH (see note 7), PAHs, BTEX	
	CFA-SB05	20	Soil	TPH, PAHs, BTEX	
	NGW615	20	Soil/Groundwater	TPH, PAHs, BTEX	
	NGW616	20	Soil/Groundwater	TPH, PAHs, BTEX	Planned groundwater monitoring well location was moved approximately 10 to 20 feet southeast to avoid conflicts with traffic and construction activities.
	NGW617	20	Soil/Groundwater	TPH, PAHs, BTEX	Planned groundwater monitoring well location was moved approximately 10 feet southwest into pedestrian traffic lane, to clear distance from nearby electrical utilities.
	VP10	20	Soil/Vapor	TPH, VOCs (Soil), VOCs (Vapor)	Vapor point will be installed when Building 3-818 construction is completed. Date to be determined.
Concourse B Area	NGW618	17	Soil/Groundwater	PCBs, Metals (Soil), PCBs, Metals, SVOCs, VOCs (GW)	
	NGW619	17	Soil/Groundwater	PCBs, Metals, SVOCs, VOCs (Soil and GW)	
	CFA-SB06	17	Soil	PCBs, Metals	
Central Flightline Transformer Area	CFA-SB07	19	Soil	PCBs, Metals	
	CFA-SB08	19	Soil	PCBs, Metals	
	CFA-SB09	19	Soil	PCBs, Metals	
	CFA-SB10	19	Soil	PCBs, Metals	
	CFA-SB11	19	Soil	PCBs, Metals	
	CFA-SB12	19	Soil	PCBs, Metals	In area of Substation V-94 TSCA cleanup, completed in November 2014. Sampling location removed.
	CFA-SB13	19	Soil	PCBs, Metals	In area of Substation V-94 TSCA cleanup, completed in November 2014. Sampling location removed.
	CFA-SB14	19	Soil	PCBs, Metals	In area of Substation V-94 TSCA cleanup, completed in November 2014. Sampling location removed.
	CFA-SB15	19	Soil	PCBs, Metals	In area of Substation V-94 TSCA cleanup, completed in November 2014. Sampling location removed.

TABLE 1
NBF/GTSP REMEDIAL INVESTIGATION
SAMPLE SUMMARY AND COORDINATION NOTES
Revised with Ecology/Leidos Notes, 01/16/2015

Area of Concern	Proposed Sample ID	Figure Number	Sample Media	Final SAP/QAPP Addendum No. 1 Analyses	SAP/QAPP Addendum No. 1 Notes and Proposed Changes
NBF - South Flightline					
Bldg 3-380, 3-831, and 3-832 Area	NGW620	21	Soil/Groundwater	PCBs, TPH	
Site-Wide Groundwater Investigation					
	NGW621	12	Soil/Groundwater	PCBs, Metals, TPH, SVOCs (GW), Soil TBD	
	NGW622	17	Soil/Groundwater	PCBs, Metals, TPH, SVOCs (GW), Soil TBD	Planned groundwater monitoring well location was moved approximatley 20 to 30 feet south outside of the runway ramp between NBF and KCIA, behind the blast fence.
	NGW623	19	Soil/Groundwater	PCBs, Metals, TPH, SVOCs (GW), Soil TBD	
	NGW624	19	Soil/Groundwater	PCBs, Metals, TPH, SVOCs (GW), Soil TBD	
	NGW625	21	Soil/Groundwater	PCBs, Metals, TPH, SVOCs (GW), Soil TBD	

TSCA = Toxic Substances Control Act
SVOC = semivolatile organic compound
PAH = polycyclic aromatic hydrocarbon
TPH = total petroleum hydrocarbon
PCB = polychlorinated biphenyl
VOC = volatile organic compound
BTEX = benzene, toluene, ethylbenzene, xylenes
GW = groundwater
TBD = to be determined

Notes:
1. Soil boring depths for locations without wells or vapor points are generally expected to continue to at least the depth of the water table or to the base of contamination as identified in the field or previous investigations, whichever is deeper.
2. Borings for monitoring wells are expected to reach an approximate depth of 10 feet below the water table (for well completion) or until field or previous indications of contamination are no longer present, whichever is deeper.
3. Borings for soil vapor points will be completed to approximately 5 to 6 feet below ground surface.
4. The anticipated minimum number of analytical soil samples submitted per boring is two; an overall average number of 2.5 samples per boring is assumed.
5. For soil vapor points, only one soil sample, collected at the base of the hand auger boring near the probe screen depth, is anticipated for analysis.
6. Depth of monitoring wells will be determined by the groundwater table. Well screens will generally be set so that the water table intersects the well screen.
7. VPH/EPH fractions (Method B suite) will be analyzed on one or more samples in areas with petroleum contamination, to be determined in the field.
The following borings have been tentatively identified for these analyses: NGW603, PEL-SB10, PEL-SB11, VP05, PEL-SB24, PEL-SB25, NFA-SB08, CFA-SB01, CFA-SB02, CFA-SB03, and CFA-SB04.
8. VOCs in soil will only be analyzed if field indications suggest their presence.

QUALITY ASSURANCE PROJECT PLAN
SUPPLEMENTAL SIGNATURE PAGE

Site: North Boeing Field / Georgetown Steam Plant

Document Name: North Boeing Field / Georgetown Steam Plant Site Remedial Investigation/ Feasibility Study, Sampling and Analysis Plan and Quality Assurance Project Plan.

Document Date: April 16, 2014

Supplemental Signature Page Date: January 13, 2015

Signature below indicates review and approval of the Quality Assurance Project Plan and agreement that the anticipated sampling and analytical methods are sufficient to meet the quality objectives of the NBF-GTSP Remedial Investigation.

The Boeing Company

1/12/15

Carl Bach Date
EH&S Remediation Project Manager
Phone: (206) 898-0438
carl.m.bach@boeing.com

Seattle City Light

1/12/15

Allison Crowley Date
Environmental Affairs and Real Estate Division
Environmental Remediation Advisor
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King County

1/12/15

Peter Dumaliang Date
Airport Environmental Scientist
Airport Engineering
King County International Airport/Boeing Field
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Landau Associates, Inc.

1/13/15

Kristy J. Hendrickson Date
RI/FS Project Manager
Phone: (425) 778-0907
khendrickson@landauinc.com

Landau Associates, Inc.
(data validation except dioxin/furan data)

1/13/15

Anne S. Halvorsen Date
Data Manager
Phone: (425) 778-0907
ahalvorsen@landauinc.com

Forms

LANDAU ASSOCIATES

FIELD EQUIPMENT CALIBRATION SHEET

Client: ______________________ **Project:** ______________________

Comments: ____

Date / Time / Initials	Instrument (Make and Model)	Serial or ID Number	Calibration Gas or Substance	Concentration or Value	Instrument Reading	Comments	OK?

LANDAU ASSOCIATES

One-Call Utility Locate Record

Project Name ________________________ Project No. ________________________

Client ________________________ Date/Time ________________________

One-Call (1-800-424-5555) Landau Rep. ________________________

UTILITY LOCATE REQUEST INFORMATION

Request # (Provided by Utility Locate Service) ________________________

Caller ID: (Edmonds #15763) (Portland #24570) (Spokane #30033) (Tacoma #30319)	County
City, Town, or Area Name:	Inside/Outside City Limits
Street Address:	
Property Owner:	
Township/Range/Section/Qtr Section:	
Type of work:	
Overhead utilities:	
Extent of work:	
Start Date:	Start Time:
Name of Caller: (And second contact if caller is not available)	

Title:	Phone #: (Cell #)	Return Call Requested:
Contractor (Landau Associates)		
Contractor Address:		

Utilities To Be Notified

(1) Have all necessary information complete before calling for request.
(2) Important to record request number. Original request can not be recovered otherwise, if questions or problems arise.
(3) Important to record names of underground utility owners who were notified.

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Field Soil Classification Notes

Toughness	
Description	**Criteria**
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak, soft.
Medium	Medium pressure is required to roll the thread to near the plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

Dilatancy	
Description	**Criteria**
None	No visible change in the specimen during shaking.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

Dry Strength	
Description	**Criteria**
None	The dry specimen crumbles into powder with mere pressure of handling.
Low	The dry specimen crumbles into powder with some finger pressure.
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure.
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very high	The dry specimen cannot be broken between the thumb and a hard surface.

Plasticity	
Description	**Criteria**
Non-plastic	A 1/8" thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Field Index Tests

Plasticity	Toughness of Plastic Thread	Dilatancy Reaction	Dry Strength	Sample Description
nonplastic/low	low	rapid	none/low	SILT
low	low/medium	rapid/slow	low/medium	SILT with clay
low/medium	medium	slow	medium	clayey SILT
medium	medium/high	slow/none	medium/high	silty CLAY
high	high	none	high	CLAY with silt
high	high	none	very high	CLAY
nonplastic/low	low/medium	slow	low/medium	organic SILT (a)
medium/high	medium/high	none	to very high	organic CLAY (a)

(a) Organic SILT or CLAY identification should be based on the presence of organic material in addition to the index test results. Organic SILT or CLAY may be lighter in weight than an inorganic SILT or CLAY.

Miscellaneous Data (Approximations)

1 cf = 7.5 gal	1 cfs = 448.8 gpm
1 gal = 0.134 cf	psi = 0.434 x height of H2O column(ft)
1 cy = 202 gal	1 psi = 2.31 ft of water
1 gal of water = 8.34 lb	1 cf/hr = .1247 x gpm
1 cf of fresh water = 62.4 lb	1 sack of sand = 1 cf (100 lb)
1 gal = 231 ci	1 sack of cement = 1 cf (96 lb)

Angularity	
Description	**Criteria**
Angular	Particles have sharp edges and relatively plane sides with unpolished surfaces.
Subangular	Particles are similar to angular description but have rounded edges.
Subrounded	Particles have nearly plane sides but have well rounded corners and edges.
Rounded	Particles have smoothly curved sides and no edges.

Criteria for Describing Cementation	
Term	**Field Identification**
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

Graphic Log Symbols	
Symbol	**Description**
———	A change in geologic units that was seen in a sample, or noted by cuttings or drilling behavior.
- - - -	A gradational change in the same geologic unit that was noted during the exploration.

HCL Reaction	
Description	**Criteria**
None	No visible reaction.
Weak	Some reaction, with bubbles forming slowly.
Strong	Violent reaction, with bubbles forming immediately.

Volume of Schedule 40 PVC Pipe

Dia. (in.)	OD (in.)	ID (in.)	Volume (gal/linear ft)	Weight of Water (lbs/linear ft)
1.25	1.66	1. 38	0.08	0.64
2	2.375	2.067	0.17	1.45
3	3.5	3.068	0.38	3.2
4	4.5	4.026	0.66	5.51
6	6.625	6.065	1.5	12.5
8	8.625	7.981	2.6	21.65
12	12.75	11.938	5.81	48.44

Volume of Open Borehole and Annulus Between Casing and Hole

Hole Dia. (in.)	Volume per lineal ft of Hole		Nom. Casing Dia. (in.)	Volume per lineal ft of Annulus		lb Sand per linear ft of Annulus	lb 0.5 in. pellets per lineal ft of Annulus
	Gal	Cu.		Gal	Cu.		
7.25	2.14	0.29	1.25	2.03	0.27	27	21
7.25	2.14	0.29	2	1.91	0.26	26	20
7.75	2.45	0.33	2	2.22	0.3	30	23
8.25	2.78	0.37	2	2.55	0.34	34	26
10.25	4.29	0.57	2	4.06	0.54	54	41
8.25	2.78	0.37	3	2.28	0.3	30	23
10.25	4.29	0.57	3	3.79	0.51	51	38
12.25	6.13	0.82	3	5.62	0.75	75	57
8.25	2.78	0.37	4	1.95	0.26	26	20
10.25	4.29	0.57	4	3.46	0.46	46	35
12.25	6.13	0.82	4	5.3	0.71	71	54
12.25	6.13	0.82	6	4.33	0.58	58	44

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ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

Field Soil Classification Notes

Sample Description:

USCS Symbol	Color, secondary soil type, PRIMARY SOIL TYPE with modifiers, minor components, other features/descriptors/information (density/consistency/moisture)(geologic unit)
Examples:	1. Grayish brown, gravelly, fine to medium SAND with silt and trace cobbles and scattered roots (dense, moist)(weathered till) 2. Mottled black and green, silty SAND and clayey SILT; hydrocarbon sheen, faint hydrocarbon odor (loose and soft, moist)(fill)

Soil Classification System

Major Divisions			USCS Letter Symbol	Typical Descriptions
Coarse-Grained Soil (More than 50% of material is larger than No. 200 sieve size)	GRAVEL and GRAVELLY SOIL (50% or more 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 (50% or more 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.
Primary Constituent:			>50%	"GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents:			≤50% and >30%	"very gravelly," "very sandy," "very silty," etc.
Additional Constituents:			≤30% and >15%	"sandy," "gravelly," etc.
Additional Constituents:			≤15% and >5%	"with gravel," "with sand," "with silt," etc.
Additional Constituents:			≤5%	"with trace gravel," "with trace sand," "with trace silt," etc., or not noted.

Other Materials / Typical Descriptions

Other Materials		Typical Descriptions
Pavement	**AC or PC**	Asphalt concrete pavement or Portland Cement pavement.
Rock	**RK**	Rock (See rock classification).
Wood/Organics	**WD**	Wood, lumber, wood chips, roots.
Debris	**DB**	Construction debris, garbage.
Primary Constituent:	>50%	"Rock," "Wood," "Debris."
substantial	≤50% and >30%	fine SAND with substantial debris.
abundant	≤30% and >15%	fine SAND with abundant debris.
with	≤15% and >5	fine SAND with debris.
trace	≤5%	fine SAND with trace debris.

Note: USCS letter symbols correspond to the symbols used by the Unified Soil Classification System and ASTM classification methods. Dual letter symbols (e.g., SP-SM) for a sand or gravel indicate a soil with an estimated 5-15% fines. Multiple letter symbols (e.g., ML/CL) indicate borderline or multiple soil classifications.

Grain Size Definitions

Term	Grain Size (Inches or Sieve #)	Term	Grain Size (Inches or Sieve #).
Boulders	> 12 inches	**Silt**	Soil passing a No. 200 sieve, very slightly or nonplastic, low to none dry strength.
Cobbles	12-3 inches		
Gravel		**Clay**	Soil passing a No. 200 sieve, can exhibit plasticity within a range of water contents, high dry strength.
Coarse	3 inches-3/4 inches		
Fine	3/4 inch-#4		
Sand		**Organic Soil**	Sufficient organic content to influence soil properties.
Coarse	#4-#10		
Medium	#10-#40	**Peat**	Composed of primarily organic matter in stages of decomposition, usually organic odor, dark brown to black color, spongy consistency, texture fibrous to amorphous.
Fine	#40-#200		

Moisture Designations

Term	Field Identification
Dry	Apparent absence of moisture. Dusty. Dry to the touch.
Damp	Between dry and moist. Some moisture is present, but usually insufficient to develop apparent cohesion (bulk) in sand and below the plastic limit in clay. Below optimum moisture content.
Moist	Grains appear darkened, but no visible water. Sand will exhibit apparent cohesion (bulk) and silt/clay will clump. Near optimum moisture content.
Wet	Visible water on larger grain surfaces. Sand and cohesionless silt exhibit dilatancy. Cohesive silt/clay can be readily remolded. Soil leaves wetness on the hand when squeezed. Over optimum moisture content.

Caving Modifiers		Seepage Modifiers		Sheen	
None		None		NS-	None
Minor-	Isolated	Slow-	< 1 gpm	SS-	Slight
Moderate-	Frequent	Moderate-	1-3 gpm	MS-	Moderate
Severe-	General	Rapid-	> 3 gpm	HS-	Heavy

Consistency and Relative Density Properties

SILT and CLAY	Sampler Type	Sampler ID (inches)	Hammer Wt.	Hammer Drop	Consistency: Very Soft	Soft	Med Stiff	Stiff	Very Stiff	Hard
Penetration Resistance (blows/ft)	SPT	1.50	140	30	0-2	4-2	4-8	8-15	15-30	>30
	D&M	2.42	300	30	0-2	4-2	4-8	8-16	16-31	>31
	D&M	2.42	140	30	0-3	3-6	6-12	12-25	25-65	>65
	WSDOT	2.00	140	30	0-3	3-5	5-10	10-19	19-38	>38
	MOD. CAL.	2.375	140	30	0-4	4-7	7-15	15-29	29-53	>53
Shear Strength (psf)			-	-	0-250	250-500	500-1000	1000-2000	2000-4000	>4000
Unit weight (pcf) saturated							110-130	120-140	120-140	>130

SAND	Sampler Type	Sampler ID (inches)	Hammer Wt.	Hammer Drop	Relative Density: Very Loose	Loose	Med Dense	Dense	Very Dense
Penetration Resistance (blows/ft)	SPT	1.50	140	30	0-4	4-10	10-30	30-50	>50
	D&M	2.42	300	30	0-6	6-15	15-42	42-73	>73
	D&M	2.42	140	30	0-11	11-26	26-74	74-120	>120
	WSDOT	2.00	140	30	0-5	5-12	12-38	38-63	>63
	MOD. CAL.	2.375	140	30	0-7	7-19	19-53	53-92	>92
Unit Weight (pcf)									
Moist					-100	95-125	110-130	110-140	+130
Submerged					-60	55-65	60-70	65-85	+75

SILT and CLAY (Strength Estimates)

Consistency	Torvane, (tsf) Shear Strength	Pocket Pen. (tsf), Unconfined Strength	Field Approximation of Hand Penetration
Very Soft	<0.13	<0.25	Easy several inches by fist.
Soft	0.13-0.25	0.25-0.5	Easy several inches by thumb.
Medium Stiff	0.25-0.5	0.5-1	Moderate several inches by thumb.
Stiff	0.5-1	1-2	Readily indented by thumb.
Very Stiff	1-2	2-4	Readily indented by thumbnail.
Hard	>2	>4	Difficulty by thumbnail.

Note: *Pocket Penetrometer and unconfined compression tests yield qu. Torvane yields Su; Su=qu/2.*

Sand (Strength Estimates)

Relative Density	Field Approximation
Very Loose	Easily penetrated many inches (>12) with 1/2" rebar pushed by hand.
Loose	Easily penetrated several inches with 1/2" rebar pushed by hand.
Medium Dense	Easily to moderately penetrated with 1/2" rebar driven by 5 lb hammer.
Dense	Penetrated 1 ft with difficulty using 1/2" rebar driven by 5 lb hammer.
Very Dense	Penetrated only a few inches with 1/2" rebar driven by 5 lb hammer.

Criteria for Describing Structure

Structure: Term	Criteria	Bedding: Term	Criteria
Stratified	Alternating layers	**Parting**	0-1/16"
Laminated	Alternating layers > 1/4"	**Seam**	1/16"-1/2"
Fissured	Shears/separations along planes of weakness	**Layer**	>1/2" to 12"
Slickensided	Polished, glossy, striated fractured planes	**Stratum**	>12"
Blocky	Easily breaks into small angular lumps	**Pocket**	Irregular,< 1 foot
Lensed	Small pockets of different soils	**Varved**	Alternating seams or laminations
Homogeneous	Same color and appearance throughout	**Scattered**	≤1 per foot
Sheared	Disturbed texture, mix of strengths	**Frequent**	≥1 per foot

Note: Thickness of layers should be noted on logs.

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Exploration No. ____________________
Date __________ Hour ______________

Log of Exploration

Project Name ______________________ Project No. ______________________

Client/owner ______________________ Exploration Operator ______________

Exploration Method ____

____

Logged by ______________________ Exploration Completed ______________

Ground Surface Conditions ______________________________________

Weather Conditions ____

Location Sketch (show dimensions to mapped features)

North Arrow

(East) (North)

Coordinates: "x" __________ "y" __________ Method __________

Elevations ______________________ Datum ________________

Sampler and Hammer Information

a = 3.25-in. O.D. – D&M
b = 2.0-in. O.D. – SPT
c = Shelby Tube
d = Grab Sample
g = 2.5-in. O.D.– WSDOT
h = 3.0-in. O.D. – M.Calif.
i = ________________

1 = 300-lb./30-in. Drop
2 = 140-lb./30-in. Drop
3 = Pushed
4 = Vibrocore
5 = ______________

Water Level Information

Date		
Time		
Depth to Water		
Hole Depth		
Casing Depth		

Sample Depth (top) (ft.)	Sample Length (ft.)	Recovery Length (ft.)	Retained Depth (top) (ft.)	Retained Length (ft.)	Sample Number	Sampler/Hammer Codes	Blow Counts	Other Test Data) ____	USCS Symbol / Unit Contact	Depth Scale (ft)	Sample Description Color, secondary soil type, PRIMARY SOIL TYPE with modifiers and minor components (density/consistency, moisture)(geologic unit)	Comments on Heave, Water Conditions, & Drilling Action
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		
										1		
										2		
										3		
										4		
										5		
										6		
										7		
										8		
										9		
										0		

Total Depth ____________ Finish Date ________________ Hour ____________ Continued

As-Built
Well Completion Form

Exploration No.: ____________

Well No. (If different than Expl. No.): ____________

Client/Owner: ____________ Project No.: ____________

Project Name: ____________

Drilling Co.: ____________

LAI Rep(s): ____________

Installation Start Date: ____________ Hour: ____________

Installation Finish Date: ____________ Hour: ____________

Well Type: ☐ Single ☐ Nested ☐ Clustered

BORING AND WELL DIMENSIONS AND INSTALLATION DETAILS

DOE Unique Well No.: ____________

Number of Pipes in Boring: ____________

Boring Diameter at Top of Hole: ____________

Does Diameter of Hole Change? ____________

Boring Diameter at First Step Down: ____________

Depth of First Step Down: ____________

Boring Diameter at Second Step Down: ____________

Depth of Second Step Down: ____________

Well Completion Date: ____________

Elevation of Well Cover: ____________

Elevation of Top of Well Pipe: ____________

Depth to Water: ____________

Date: ____________ Time: ____________

MATERIALS USED

____________ Sacks of ____________ Sand

____________ Sacks of ____________ Concrete/Cement

____________ Sacks of ____________ Grout Mix Used

____________ Sacks of Bentonite Chips

____________ Feet of ________-inch PVC Blank Casing

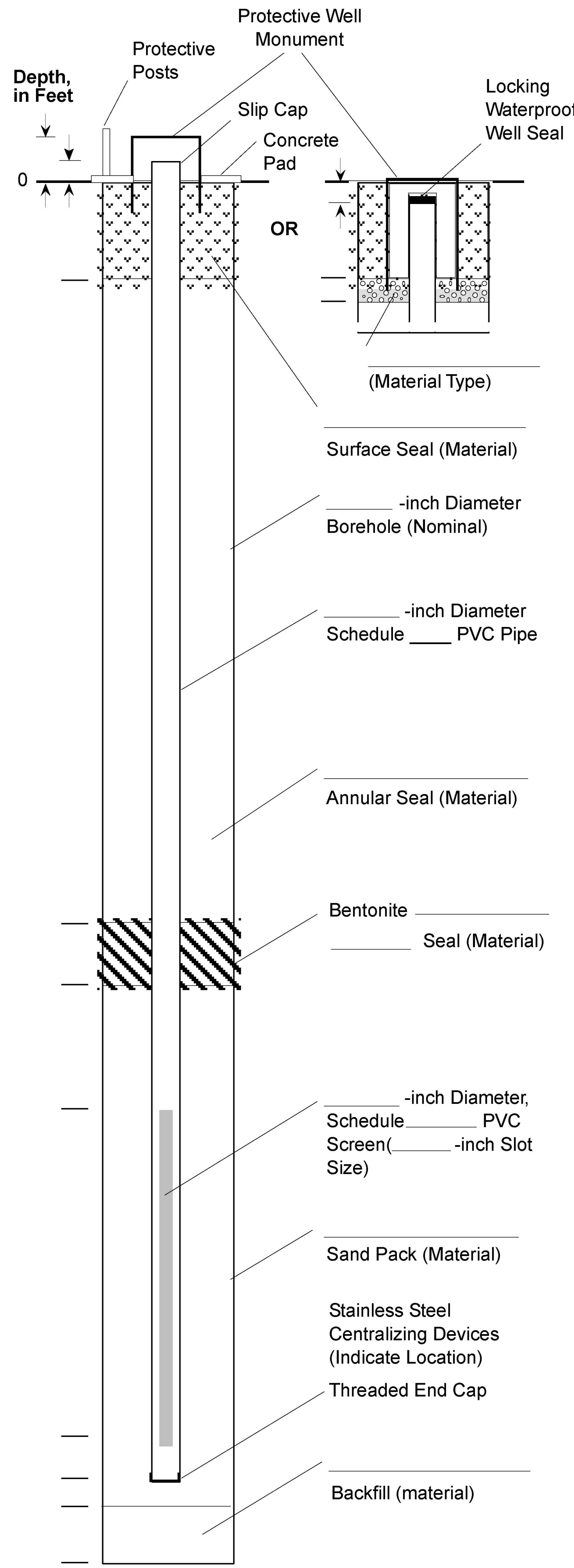
____________ Feet of ________-inch PVC Slotted Screen

____________ Threaded End Cap

____________ Waterproof Well Seal/Slip Cap

____________ Flush Mount/Aboveground Protective Monument

____________ Protective Posts



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LANDAU ASSOCIATES

Well Development Record

Project Name: ______________________ Project No. ______________________
Location: ______________________ Date: ______________________
Client: ______________________ Landau Representative: ______________________

Well Number: ______________________ Time: ______________________

Depth to Water: ______________________
Well Depth: ______________________
Casing Diameter: ______________________
Casing Volume: ______________________

Volume of Schedule 40 PVC Pipe

Diameter (inch)	O.D. (inch)	I.D. (inch)	Volume (gal/ln ft)	Wt. Water (lbs/ln ft)
1.25	1.660	1.380	0.08	0.64
2	2.375	2.067	0.17	1.45
4	4.500	4.026	0.66	5.51
6			1.47	12.24

Est. Purge Volume: ______________________

Method of Development: ______________________ Surge Block: Yes ______ No ______

Begin Development: Time: Final Volume Purged: ______________________
Finish Development: Time: Water Disposal: ☐ 55-gal drum ☐ Storage Tank ☐ Ground ☐ Other __________

Initial Water Quality: (Turbidity, Color, Odor, Other) ______________________ Initial Yield: _______
pH: _______ Temp: _______ Conductivity: _______ Turbidity: ___
Notes: ______________________

Water Quality Notes: ______________________

Gallons	pH	Temperature	Conductivity	Turbidity	Comments

Final Water Quality: (Turbidity, Color, Odor, Other) ______________________
Final Yield: ______________________
pH: _______ Temperature: _______ Conductivity: _______ Turbidity: _______

Depth to Water After Development: ______________ Well Depth After Development: ______________

Groundwater Elevation Record

Project Name ______________________ Project No. ______________________

Location ______________________ Date ______________________

______________________ Landau Rep. ______________________

Client ______________________ Weather ______________________

Water Level Indicator No. __________ **Sensitivity Setting** __________

Well I.D.	Time	Groundsurface Elevation (ft)	Depth to Water (ft)	Groundwater Elevation	Comments/Observations

* From top of well casing.
** Record relative positions of ground surface, well casing, and protective casing (monument cover) if elevation of well casing is unknown. Record Datum if known.

LANDAU ASSOCIATES

Groundwater Low-Flow Sample Collection Form

Project Name: ____________ Project Number: ____________
Event: ____________ Date/Time: ____________
Sample Number: ____________ Weather: ____________
Landau Representative: ____________

WATER LEVEL/WELL/PURGE DATA

Well Condition: Secure (YES or NO) Damaged (YES or NO) Describe: ____________

DTW Before Purging (ft) ______ Time: ______ Flow through cell vol. ______ GW Meter No.(s) ______

Begin Purge: Date/Time: ______ End Purge: Date/Time: ______ Gallons Purged: ______

Purge water disposed to: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Other ______

Time	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Internal Purge Volume (gal)	Comments/ Observations
Purge Goals: Stablization of Parameters for three consecutive readings within the following limits	+/- 3%	+/- 3%	+/- 10%	+/- 0.1 units	+/- 10 mV	+/- 10%	< 0.3 ft	>/= 1 flow through cell	

SAMPLE COLLECTION DATA

Sample Collected With: ☐ Bailer ☐ Pump/Pump Type ______

Made of: ☐ Stainless Steel ☐ PVC ☐ Teflon ☐ Polyethylene ☐ Other ☐ Dedicated

Decon Procedure: ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Dedicated

(By Numerical Order) ☐ Other ______

Sample Description (color, turbidity, odor, sheen, etc.): ______

Replicate	Temp (°F/°C)	Cond. (uS/cm)	D.O. (mg/L)	pH	ORP (mV)	Turbidity (NTU)	DTW (ft)	Ferrous iron (Fe II)	Comments/ Observations
1									
2									
3									
4									
Average:									

QUANTITY	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
	(8260) (8010) (8020) (NWTPH-G) (NWTPH-Gx) (BTEX) WA ☐ OR ☐
	(8270) (PAH) (NWTPH-D) (NWTPH-Dx) (TPH-HCID) (8081) (8141) (Oil & Grease) WA ☐ OR ☐
	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO3/CO3) (Cl) (SO4) (NO3) (NO2) (F)
	(COD) (TOC) (Total PO4) (Total Kiedahl Nitrogen) (NH3) (NO3/NO2)
	(Total Cyanide) (WAD Cyanide) (Free Cyanide)
	(Total Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	(Dissolved Metals) (As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silic
	VOC (Boeing short list)
	Methane Ethane Ethene Acetylene
	others

Duplicate Sample No(s): ______
Comments: ______
Signature: ______ Date: ______

LANDAU ASSOCIATES

Sub Slab Vapor / Soil Gas Sample Collection Form

Project Name: ______________________ Project Number: ______________________

Client: ______________________ Sample Number: ______________________

Landau Rep: ______________________ Date/Time Collected: ______________________

Location Information: ______________________

SAMPLE TYPE

☐ Sub Slab Vapor ☐ Soil Gas ☐ Other: ______________________

WEATHER DATA

Rainfall < 1" in 24 hrs.? (YES or **NO**) Irrigation not w/in 5 hrs.? (YES or **NO**) Standing water near sampling location? (YES or **NO**)

Air Temperature __________ °F or °C Wind Direction __________ Wind Speed __________ mph Humidity __________ %

Barometric Pressure __________ in HG or mBar Is sampling occurring after frontal system during stable pressure? (**YES** or NO)

SOIL GAS AND SUB SLAB INFORMATION AND AND PURGE DATA

Nature of Location: PERMENANT or TEMPORARY (circle one) ☐ Post-Run Tubing (PRT) ☐ Soil Gas Monitoring Well ☐ Other: ___________

Installation Method : ☐ Direct Push Drill Rig ☐ Hollow Stem Auger ☐ Rotosonic ☐ Other: ________________

☐ Hand Driven ☐ Rotohammer ☐ Vapor Pin Manufacturer:________________

If Permanent, Is Well Secure? (YES or NO or NA) Damaged (YES or NO) YES-Describe: ______________________

Materials: ☐ PVC Pipe ☐ Stainless Steel ☐ Teflon ☐ Nylon or Polyethylene Tubing ☐ Other: ____________

Well/Hole Diameter: _______ inches Total Depth of Well: _______ ft Depth to Groundwater: _______ ft

Vacuum/Pressure of source (in. H_2O): ____________________ Time: ______________

Purge Volume Calculation: ______________________

Purge: Begin Time ____________ End Time ____________ Casing Volume (ft^3): ___________

Flow Rate (liter or ml/min): ________________ Volume Purged (ft^3): _____________

VOLUME EXAMPLES

Diameter (in)	OD (in)	ID (in)	Vol (ft^3/ln ft)
0.25 (tubing)	0.250	0.170	0.00016
1 (sch. 40)	1.315	1.029	0.006
1.25 (sch. 40)	1.660	1.380	0.010
2 (sch. 40)	2.375	2.067	0.020

Vol. Purged (ft^3)	Temp. (°F/°C)	PID (ppm)	Other	Comments/Observations

LEAK TEST OPTIONS

☐ Shut-in Test Starting Vacuum: _________ in H2O *(target 100 inches H2O)* Test Duration: _________ minutes *(target > 1 min)*

Ending Vacuum: ___________ in H2O *(target no noticable vacuum decrease)* Result: PASS FAIL (circle one)

☐ Helium Shroud Design: ______________________ Helium Source Concentration:__________

Shroud Tracer Concentration Fluctuation: _________ % *(target ± 10%)* Tracer Equilibration Time: ___________*(target min. 5 min)*

Sample Air Tracer Concentration: ________ % of Shroud Conc. *(target <5%)*

☐ Water Bath (vapor pins only)

SAMPLE COLLECTION DATA

Sample Container: ☐ Summa Canister, Size (liters) ___________ Canister #:________________ ☐ Tedlar Bag, Size (liters): ____________

☐ Passive / Diffusive Manufacturer:________________________ ☐ Other: ________________

Sample Type: ☐ Grab ☐ Integrated (composite sample over time)

Sample Collection/Purge Pump (if used): ______________________

Summa Canister, Pre-Sampling and Post-Sampling: Initial Vacuum: __________ in Hg Vacuum After Sample Collection: ___________ in Hg

LABORATORY ANALYSES: ______________________

Duplicate Sample Number(s) and Comments: ______________________

Signature: ______________________ Date: ______________

LANDAU ASSOCIATES

SAMPLE COLLECTION FORM
STORM DRAIN SOLIDS, SURFACE DEBRIS, AND ANTHROPOGENIC MEDIA

Client: ______________________ **Project:** ______________________

Sampled By: ______________________

Sample ID	Sample Date	Sample Time	Nearest Building Number	Sample Media	Sample Description (Location Notes)

LANDAU ASSOCIATES

EQUIPMENT RINSE SAMPLE COLLECTION FORM

Project: ______________________ Date/Time: ______________________

Sample ID: ______________________ Weather: ______________________

Analysis: ____

EQUIPMENT RINSE DATA

Equipment Rinsed: ______________________

Environmental sample for which equipment was used: ______________________

Method of decontaminating: ______________________

SAMPLE CONTAINER DATA

Type	Preservative	Volume	No. Required	No. Filled

SAMPLE METHOD: ______________________

Photograph taken? ☐

Sample entered on COC? ☐

SAMPLE PRESERVATION METHOD: ______________________ Iced: ________

Comments: ____

Signature: ______________________ DateTime: ______________________

LANDAU ASSOCIATES

Boeing- North Boeing Field
Service Providers Confined Space Notification

Service Provider:	
Date:	
Boeing Onsite Activity Representative:	
Boeing EHS Representative:	
Project Number and Title:	

This workplace contains permit-required confined spaces. This communication provides notice to you that the job described below may involve entry into a "Permit Required Confined Space"(PRCS) as described in Chapter 296-809 WAC. In accordance with the WAC standard, entry into a PRCS requires a confined space entry permit program.
As a condition of our contract or purchase order, The Boeing Company requires that all independent contractors comply with applicable WAC regulations.

Description of Confined Space:	
Building Location:	
Column or Location:	
Estimated Entry Date:	

The Boeing Company has identified the following potential hazards, which may, or may not, be present at the time of entry into the space. *This notice does not relieve you of your duty to independently evaluate hazards presented by work in or around this confined space(s) and to implement the precautions and hazard controls necessary for safe entry into the space(s).*

Prior to entry, please call Boeing Fire Department at **206 655-8800** *to verify that the in-plant rescue team will be available for the duration of the entry or entries and call them when the entries have finished*.

*Report any confined space **emergency** immediately by calling 206 655-2222 from any cell phone.*

Review list; NA if not applicable; circle or bold applicable items for this entry

Potential Atmospheric Hazards	N/A	Yes	No	**Potential Physical Hazards**	N/A	Yes	No
Oxygen deficiency				Mechanical Systems or Equipment Hazards			
Flammable/LEL (solvent/fuels/methane/coatings/etc):				Electrical Shock (high and low voltage)			
Carbon Monoxide				Engulfment/drowning			
Hydrogen Sulfide				Steam or high pressure systems			
Other Toxic (bold/circle below or specify)				Tripping and slipping hazards			
Solvents MEK/MPK/MBK/tolune/other				Falls over 4 feet			
Acids: Alodine/Nitric/other				Entrapment between inwardly converging walls			
Fuel: jet/gasoline/diesel/other				Chemical contact hazards			
Hydraulic Mist: skydrol/regular/other				Other (biological hazard/traffic/etc. specify below):			
Paint: vapors/residue/other				Foot traffic			
Chromates/Chromium				Pinch points: hatch and floor.			
Other:(specify):				Other (specify):.			

Hazard Control - Precautions and Procedures	N/A	Yes	No	Personal Protective Equipment:	N/A	Yes	No
Secure Area: (barricades / cones / railing /tape/ other:				Head			
Lighting: (explosion-proof / explosion-proof flashlights / other:)				Foot Protection			
Fire protection: (fire extinguisher / other:)				Hearing Protection			
Additional ventilation: (process / mechanical blower / continuous / other:)				Protective Clothing: (Tyvek™ / Kleen Guard™/ Fuel Cell™ / cloth coveralls/ Tychem QC™ / PVC Rain Suit / other:)			
NON-Energized work: Hazardous energy sources: lockout, tagout, tryout. (electrical / mechanical / pneumatic / hydraulic / per MES placard / other:)				Hand Protection: (leather / thin latex / med. latex / Chemipro™ / nitrile / PVC / Silver Shield™ / other:			
Ground fault protection:				Respiratory Protection: (½ face / full face/ airline) H2S: >10ppm do not enter. CO: >25ppm do not enter; Recommended: PID 0-50ppm half-face respirator (OV, P100l; 50-500 full face cartridge (OV, P 100); 500-1000 airline; >1000 do not enter.			
Other: (disconnect piping / blanking / inerting / purging				Eye / Face Protection: (safety glasses / goggles / face shield / other)			
Hot Work Permit Required (grinding, torch work, welding, etc.)?				Falls / Rescue Protection: (D-ring harness / lanyard / tripod / lifeline / other:			
Other:							

The Boeing Company has implemented the following precautions/procedures for Boeing personnel who will be working in, or near, the confined space described above. Service Providers are responsible to implement similar precautions as necessary.

	Standby attendant
	Training for entrants. entry supervisors, and attendants
	Written entry permit authorized by Entry Supervisor
	Continuous atmospheric sampling/monitoring for oxygen levels, flammable vapors or toxic conditions with periodic recording of data
	Ventilation whenever unsafe atmospheric conditions exist or have the potential to exist
	Appropriate personal protective equipment
	Provisions/equipment for emergency retrieval or rescue.

I have received and understood the preceding notification.

________________________________ ________________________________ ____________

Service Provider Designed Representative (print) Signature Date

Attach PRIOR to work being performed:

	Copy of Service Provider Permit Required Confined Space Program
	Copy of Service Provider Permit Required Confined Space Permit
	If PRCS is reclassified by Service Provider to Non Permit Required Confined Space : Attach procedure and documentation for reclassification for review by EHS Representative

Debriefing must be done within 3 manufacturing days of completion of confined space entry or entries:

		Copy of Closed Permit
		Review of program followed during confined space entry
Yes	No	Hazards confronted or created? If so specify here or attach summary:

Debriefed:

_______________________________________ _______________________________________ _______________

Service Provider Designed Representative (print) Signature Date

___________________________________ ____ _____________

Boeing Representative (print) Signature Date

Copy to EHS Representative Copy to Project File

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

Confined Space Entry Permit

Facility:	North Boeing Field, RI/FS				
Date and time:	________				
Permit Valid From:	________	To:	________		
Specific Entry Location:	________				
Purpose of Entry:	________				
(specify any additional)	________				
Entry Supervisor:	________	Date:	________	Time:	________
Entry Attendant:	________	Date:	________	Time:	________
(entrant may change, use personnel list on following page)					
Facility/Proj Manager(s):	________	Date:	________	Time:	________

Emergency Contact Information: (In case of emergency, call in the order listed)

Boeing Emergency Dispatch	206-655-2222
911	911
Jennifer Parsons (Boeing)	206-715-7981
or Fred Wallace (Boeing)	206-930-0461
Jerry Ninteman (Landau Assoc.)	206-850-4503

Potential Chemicals of Concern: (see HASP for more details)

PCBs in storm drain system solids
PAHs in storm drain system solids
Bis [2-ethylhexyl] phthalate in storm drain system solids
Mercury in storm drain system solids
Lead in storm drain system solids
Arsenic in storm drain system solids
Hydrogen Sulfide
Coal tar pitch volatiles (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene)

Potential Physical Hazards: (see HASP for more details)

Equipment Hazards
Slips, Trips, and Falls
Atmospheric Conditions in work area

REVIEW THE PLAN, CHECK FOR THE FOLLOWING:	YES	NO
Entry Plan Attached and Reviewed	☐	☐
Area Secured (barricades, cones, other)	☐	☐
Ventilation Equip. in Place, Operating and Grounded	☐	☐
(minimum of 2 air influent and effluent locations)		
Communication Equipment Tested (Voice and Visual)	☐	☐
Body Harness Checked	☐	☐
Rescue Equipment In Place	☐	☐
Required PPE Equipment in Place & Available (Half Face Respirators, PIDs, Hardhat, Steel Toe Boots, Hearing Protection, Gloves, Eye Protection [around drilling or concrete equip.])	☐	☐
Fire Protection Equipment Available	☐	☐
Standby Personnel Available	☐	☐
Pre-Entry Atmospheric Conditions Within Acceptable Levels	☐	☐
All Personnel Understand PID Action Levels	☐	☐
Entry Conditions Acceptable	☐	☐

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

Confined Space Entry Permit

Atmospheric Hazards to be Monitored, and Acceptable Levels:

Oxygen	L.E.L	PID*	H2S	Other	Other	Other
>19.5%	<10%	<15ppm	10 ppm			
<23.5%						

* For PID Readings:			Then:
< 15 ppm			No Action Required
> 15 ppm	but	< 75 ppm	Evacuate Work Area or Establish Exclusion Zone Around Work Area and Upgrade to Level C Half Face Respirator with Organic Vapor/HEPA
>75 ppm			Evacuate Work Area

Types and Quantities of Monitoring Equipment:

MultiRAE Plus multi-gas meter w/ 10.6 ev PID lamp and O2, H2S, & LEL

Monitoring Instrument Calibration Data Log:

	Oxygen (%)	L.E.L (%)	H2S (ppm)	PID (ppm)
Calibration levels				
MultiRAE Plus multi-gas meter readings				

Monitoring Schedule:

Prior to entry, monitors & equipment will be run & watched continuously with readings documented every 5 minutes for 2 consecutive readings. During CSE work, document results every 30 minutes. Double check that PID alarm levels have been set at lowest setting (15 ppm - action Level for half face respirators)

Gas Testing Logsheet

Location	Time	Oxygen	L.E.L.	H2S	PID	Other

Entry/Attendant Personnel: All entrants & attendants listed below have completed confined space entry

Name	Entrant / Attendant	Entry Time	Exit Time	Entry Time	Exit Time	Entry Time	Exit Time	Entry Time	Exit Time	Entry Time	Exit Time

Entry Supervisor Signature (sign at end of each shift and save permit in project file for 1 year)

date