Report
Storm Drain Structure and Surface Cleanup
North Boeing Field
Seattle, Washington

June 18, 2010

Prepared for

The Boeing Company
Seattle, WA

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1.0 INTRODUCTION

This report documents storm drain structure, surface, and soil cleanup activities performed in locations impacted by polychlorinated biphenyls (PCBs) at North Boeing Field (NBF) in Seattle, Washington. NBF is located east of East Marginal Way South adjacent to the King County Airport and the City of Seattle Georgetown Steam Plant (GTSP) (Figure 1). The cleaning and removal of soil and asphalt was conducted by The Boeing Company (Boeing). Activities described in this report began on March 10, 2010 and were completed in April 2010, with the exception of the flange removal activities, which took place in May 2010. The objective of the cleaning and removal was to remove accessible material with concentrations of PCBs greater than 0.5 milligrams per kilogram (mg/kg) in locations identified during field sampling events in June, July, and August 2009. While there are no known occurrences of historic PCB spills on the NBF property and potential PCB sources have not been identified as originating from the NBF property, PCBs have historically been detected at the site. Sampling activities and investigation results that provided the basis for determining areas and material for cleaning and removal are discussed in the *Storm Drain System Source Investigation Report, North Boeing Field, Seattle, Washington* (Landau Associates 2009). All activities described in this report were performed in accordance with the *Storm Drain Structure and Surface Cleanup Work Plan, North Boeing Field, Seattle, Washington* (work plan, Landau Associates 2010a), which was approved by the US Environmental Protection Agency (EPA) and the Washington Department of Ecology (Ecology). Total PCB concentrations for soil, asphalt, and surface material near the 3-322 building that provided the basis for cleanup activities are summarized on Figure 2.

Cleanup and disposal of material with total PCB concentrations that were greater than or equal to 50 mg/kg during sampling events was conducted in accordance with the Toxic Substances Control Act (TSCA) under the requirements of the risk-based cleanup procedures for the cleanup and disposal of PCB remediation waste [40 C.F.R. § 761.61(c)]. Procedures for cleaning and removal activities, field documentation, confirmation sample collection and designation, chemical analysis, equipment decontamination, waste disposal, and reporting for this material are described in Section 2.

In addition, soil and surface locations identified during sampling events as having concentrations greater than 0.5 mg/kg, but less than 50 mg/kg, were cleaned or excavated. Because the source of PCB contamination is unknown, cleanup and disposal of this material was conducted in compliance with Model Toxics Control Act (MTCA) requirements and as an Interim Action in accordance with the NBF/GTSP Agreed Order. Procedures for cleaning and removal activities, field documentation, confirmation sample collection, chemical analysis, equipment decontamination, and waste disposal for this material are described in Section 3.

Locations of samples that were collected as part of this investigation and cleanup are shown on Figure 3. Sample locations are defined by four categories: TSCA material confirmation sample locations, soil characterization sample locations (includes characterization sample locations from source investigation activities), confirmation samples from soil that was later excavated, and confirmation samples from soil that remains *in situ*. Sample results for these four categories are presented in Tables 1, 2, 3, and 4, respectively, and sample results are discussed further in Sections 2 and 3. Laboratory analytical reports are provided in Appendix A.

2.0 MATERIAL WITH PCBS GREATER THAN OR EQUAL TO 50 MG/KG

Storm drain structures, asphalt, and soil identified for cleaning with total PCBs greater than or equal to 50 mg/kg were sampled in June, July, and August 2009. Additionally, PCBs greater than or equal to 50 mg/kg were found on flanges inside the 3-322 building during the March 2010 cleanup activities. Sampling activities are described and investigation results are provided in Tables 1 through 4 and on Figures 1 through 4 in the *Storm Drain System Source Investigation Report, North Boeing Field, Seattle, Washington* (Landau Associates 2009). Solids from storm drain structures and surface material and asphalt areas with total PCB concentrations greater than or equal to 50 mg/kg were removed and disposed as waste under TSCA in accordance with the risk-based cleanup and disposal procedures [40 CFR 761.61(c)]. Specific procedures for cleanup of TSCA-regulated waste in storm drain structures, in asphalt, and in surface material are described in the following sections. Storm drain structures that were cleaned under TSCA are identified on Figure 4, and asphalt material and soil that was removed under TSCA are identified on Figure 5.

2.1 REMOVAL OF MATERIAL WITH PCB CONCENTRATIONS GREATER THAN OR EQUAL TO 50 MG/KG

The following section provides information on cleanup of TSCA-regulated material located at NBF including storm drain structures and an area of asphalt, soil, and surface solids to the north of the 3-322 building.

A target cleanup level of 0.5 mg/kg for soil was established under the Agreed Order based on protection of the Lower Duwamish Waterway to prevent contamination to Slip 4, as requested by Ecology. In some areas, the presence of groundwater in the excavation limited the depth of excavation and prevented achievement of the target cleanup level. In the area between the 3-302 building and the 3-322 building, where groundwater was encountered and soil concentrations remained above 0.5 mg/kg, a layer of activated carbon was placed between two layers of geofabric prior to backfilling. The activated carbon/geofabric barrier will provide treatment of groundwater that may rise above excavation elevations, and provide a separation of clean fill material and contaminated soil in the event future explorations are required. Once confirmation sample results indicated that material with concentrations greater than or equal to 50 mg/kg were removed, cleanup activities proceeded as described in Section 3.0 (material with PCBs less than 50 mg/kg). Approximately 50 yards of material (including storm drain structure solids, asphalt material, pipe sections and soil) were removed and disposed of as TSCA-regulated material.

All equipment used for cleaning that contacted TSCA-regulated material was wiped down twice with a 10:1 solution of CAPSUR (an aqueous-based solvent developed specifically for the removal of PCBs) in accordance with the decontamination procedures required under 40 C.F.R. § 761.79.

Decontamination wipes and other disposable equipment that contacted TSCA-regulated material were discarded as contaminated TSCA waste into the roll-off box and disposed of at the Waste Management NW landfill in the same manner as debris and solids described above.

2.1.1 STORM DRAIN STRUCTURE CLEANING AND WASTE DISPOSAL

Solids removed from storm drain structures with total PCB concentrations greater than or equal to 50 mg/kg were managed and disposed of as TSCA waste. Seven storm drain structures with total PCB concentrations greater than or equal to 50 mg/kg were cleaned including: CB191, CB193, MH130, MH179, MH187, MH193, and MH226. These locations are shown on Figure 4.

Each storm drain structure was blocked off at the inlet and outlet of the structure, pressure washed, and vacuum-cleaned by contracted personnel using portable vacuum devices. The decanted liquids and solids from each structure were processed through the NBF decant station. The solids were placed into a lined roll-off box for shipment to the Waste Management NW landfill in Arlington, Oregon, a chemical waste landfill permitted to accept TSCA waste under 40 C.F.R. § 761.75. Wastewater generated from cleanup of the seven storm drain structures was collected and treated in a carbon treatment vessel. Wastewater was treated to less than 3 micrograms per liter (µg/L) PCBs in a carbon treatment vessel prior to entering the NBF Sweeper Decant Station for further treatment through solids settling and/or additional carbon filtration methods. Treated wastewater that met the NBF Sweeper Decant Station's discharge limits as required by Boeing's King County Industrial Waste Permit was discharged to the sanitary sewer. These measures conform to TSCA regulations 40 C.F.R. § 761.50(a)(3) and 40 C.F.R. § 761.79(b)(1)(ii). A process flow diagram for solids and wastewater treatment procedures (for TSCA and non-TSCA regulated material) is provided on Figure 6. No treated wastewater was discharged to the Lower Duwamish Waterway.

2.1.2 ASPHALT REMOVAL AND WASTE DISPOSAL

A section of asphalt and underlying soil to the north of the 3-322 building was removed as TSCA waste, based on PCB results from surface and asphalt sampling. The section of asphalt that was removed includes material in proximity to surface material samples Surface07, Surface13, and Surface14, and asphalt samples ASP01, ASP02, ASP03, and ASP04. PCB concentrations on the surface and in the asphalt in this area were generally above 50 mg/kg and, therefore, the removal was conducted in accordance with TSCA and the removed material was categorized as TSCA waste. Approximately 6 inches to 1 ft of soil immediately under the asphalt was removed and also disposed of as TSCA waste. The location of asphalt and soil that was removed as TSCA waste is shown on Figure 5.

The asphalt was removed by contracted personnel using hand-held tools. The loosened material was transferred via hand or shovel to lined tub-skids and, subsequently, into a lined roll-off box for disposal at the Waste Management NW landfill in Arlington, Oregon, a chemical waste landfill permitted to accept TSCA waste under 40 C.F.R. § 761.75. Access to asphalt was difficult in some locations due to equipment and piping; however, asphalt was removed from all areas where PCB concentrations were known to be greater than or equal to 50 mg/kg.

A segment of abandoned fuel piping was encountered during subsurface soil removal activities in the area where asphalt was removed. The abandoned pipe was tested for PCBs and asbestos prior to removal and, although there were no indications that PCBs were or may have been present in the pipe at concentrations greater than or equal to 50 mg/kg, the abandoned fuel pipe was placed in a TSCA-designated lined roll-off box and disposed of as TSCA waste at the Waste Management NW landfill in Arlington, Oregon.

2.1.3 FLANGE REMOVAL AND DISPOSAL IN THE 3-322 BUILDING

Caulking, fiberboard, and steel piping associated with 15 steel flanges inside the 3-322 building were identified during cleanup activities as containing PCB concentrations equal to or greater than 50 mg/kg. Photographs of the typical flange configuration are shown in Appendix B. Flange removal was performed in accordance with the procedures outlined in Addendum 2 to the Work Plan (Landau Associates 2010b). The caulking around the flange collar, as well as the underlying fiberboard of each flange, was removed and placed in plastic containment bags. The plastic bags were placed in an onsite lined roll-off box and were managed as TSCA waste. Following the removal of the caulking, the flange piping was cut off flush with the building floor. Because the flange gasket materials were found to contain asbestos, and to allow for the proper handling and disposal of the flange gasket, the flanges were cut from the remaining section of fuel piping. The flange and gaskets were then managed in accordance with asbestos disposal requirements. The remainder of the pipe section, collar and other parts in contact with the PCB-containing caulk were placed into the TSCA roll-off box and managed as TSCA waste; Containers were shipped to the Waste Management NW chemical waste landfill in Arlington, Oregon. After removal was completed, the holes were backfilled with concrete even with the building grade. All caulk material identified on the flanges with concentrations of PCBs greater than or equal to 50 mg/kg was found inside the 3-322 building where there is no direct pathway for transport of contaminated materials to the NBF storm drain system.

2.2 CONFIRMATION SAMPLE COLLECTION PROCEDURES

Confirmation samples were collected from all areas where storm drain solids, debris, soil, and asphalt with total PCB concentrations equal to or greater than 50 mg/kg were removed in accordance with the requirement of 40 C.F.R. § 761.61(a)(6). Risk-based cleanup was considered complete when verification samples yielded PCB results less than or equal to the target cleanup level identified in Section 2.1. In the area of asphalt and soil removal, cleanup activities conformed to the procedures outlined in Section 3.0 of this report after confirmation samples indicated that all material with concentrations greater than or equal to 50 mg/kg had been removed. The following section discusses procedures for each area including sample collection methods, sample documentation, handling and laboratory analysis, and sampling equipment decontamination.

2.2.1 SAMPLE COLLECTION METHODS FOR STORM DRAIN LOCATIONS

Cleanout of storm drain structures included removal of all solids from the structure and pressure washing of interior surfaces. As agreed to by EPA, Ecology, and Boeing, confirmation of cleaning at CB191, CB193, MH130, MH179, MH187, MH193, and MH226 was performed via video inspection. Video inspection of all storm drain structures listed above is provided on CD in Appendix C. CB193 and MH179 were grouted/sealed following video inspection to prevent visible infiltrations. Source tracing under the Ecology Remedial Investigation/Feasibility Study (RI/FS) Agreed Order will continue in this drainage area, and these catch basins will be sampled when enough solids are present during future catch basin sampling events to determine if PCB-contaminated solids are re-entering the storm drain system.

2.2.2 SAMPLE COLLECTION METHODS FOR ASPHALT CLEANING AND REMOVAL AREA

Confirmation samples were collected from the exposed soil beneath the areas of removed asphalt according to a 1.5-meter grid overlay system as defined in 40 C.F.R. § 761.280(b)(2). A sample was collected from each grid intersection in the area of asphalt cleaned or removed. Confirmation sampling conformed to 40 C.F.R. § 761 Subpart O. Confirmation samples were also collected from bulk asphalt material at the edges of the TSCA waste excavation area. Confirmation sample locations for soil and bulk asphalt material and their associated PCB concentrations are shown on Figure 5.

Confirmation soil samples were collected from three depths at each location. Near-surface samples from 0 to 0.25 ft below ground surface (BGS), just under the asphalt, were collected using a clean, stainless-steel spoon. Samples from 1 to 1.5 ft BGS and 1.5 to 2 ft BGS were collected by advancing a hand auger with a stainless-steel shaft to the appropriate depth. At some sample locations, it was not possible to advance the hand auger to the desired sample depth due to a concrete footing near the building edge (S24 and S23); therefore, the sample depths of these locations vary slightly from the

majority of the confirmation samples. The soil sample from each depth was homogenized in a clean stainless-steel bowl using a clean stainless-steel spoon, placed into an 8-ounce glass laboratory – provided sample jar, labeled, and stored on ice.

Bulk asphalt material confirmation samples were collected using a sledge hammer or stainless-steel metal hand tool to break off a piece of bulk asphalt material from the edge of the remaining asphalt. Each bulk asphalt material sample was placed in a separate 32-ounce glass laboratory-provided sample jar, labeled, and stored on ice.

Confirmation sample results from the TSCA material removal area are summarized in Table 1. The concentrations of total PCBs in confirmation samples of soil and bulk asphalt were less than 50 mg/kg total PCBs at all sample depths collected, except in surface soil sample S24. The surface soil sample collected at S24 (S24-Surface) had a total PCB concentration of 140 mg/kg; the soil sample collected from 0.5 ft to 1 ft BGS at S24 (S24-0.5-1) had a total PCB concentration of 6.7 mg/kg, below the 50 mg/kg threshold for classification of a TSCA waste. An additional 0.5 ft of soil at and surrounding S24 was removed as TSCA waste. With confirmation samples in the asphalt removal area indicating that all TSCA waste had been removed (i.e., all confirmation samples were below 50 mg/kg), excavation in this area then proceeded as outlined in Section 3.0.

2.3 SAMPLE DOCUMENTATION, HANDLING, AND ANALYSIS

A complete record of all field activities was maintained. All recordkeeping will conform to 40 C.F.R. § 761.61(a)(9) and 40 C.F.R § 761.125(c)(5). Documentation included field logbooks, field sampling forms, photographs, sample labels, chain-of-custody forms, and project and data management file copies.

2.4 CHEMICAL ANALYSES

Samples were transported to Boeing's contracted analytical laboratory, Analytical Resources Inc., (ARI) in Tukwila, Washington, within 24 hours of sample collection. All samples were analyzed for PCB aroclors by EPA Method 8082 in accordance with 40 C.F.R. § 761.272. The reporting limit for PCB aroclors was 35 micrograms per kilogram (µg/kg). Sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures that were used are described in ARI's standard operating procedures (SOPs) SOP 350S and SOP 403S. Copies of these SOPs are provided in Appendix D.

3.0 MATERIAL WITH PCB CONCENTRATIONS LESS THAN 50 MG/KG

Soil and solids from surface locations with total PCB concentrations less than 50 mg/kg and greater than 0.5 mg/kg, as identified during the storm drain system source investigation sampling events, were removed and managed as other waste. The cleanup level, 0.5 mg/kg total PCBs, was the same as that established for the excavation areas with material greater than or equal to 50 mg/kg. Soil excavation areas, along with the approximate depth of excavation and associated excavation activities, are shown on Figure 7. Surface Cleaning locations are shown on Figure 8. Specific procedures for cleanup of material less than 50 mg/kg at surface locations and in soil excavation areas are outlined in the following sections.

3.1 REMOVAL OF MATERIAL WITH PCB CONCENTRATIONS LESS THAN 50 MG/KG

The following section provides information on cleanup of surface areas around the 3-322 building and an area of soil to the north of the 3-322 building where sample concentrations of PCBs were less than 50 mg/kg.

As described in Section 2.1, a target cleanup level of 0.5 mg/kg was established by Ecology based on protection of the Lower Duwamish Waterway to prevent contamination to Slip 4, with the assumption that PCB-containing soil could enter storm drain systems. In some areas, the presence of groundwater in the soil excavation limited the depth of excavation and prevented achievement of the target cleanup level. In areas between the 3-322 building and 3-302 building, where groundwater was encountered and soil concentrations remained above 0.5 mg/kg, a layer of activated carbon was placed between two layers of geofabric prior to backfilling. The activated carbon/geofabric barrier will provide treatment of groundwater that may rise above excavation elevations, and provide a separation of clean fill material and contaminated soil in the event future explorations are required. All storm drains were removed from the excavated areas; therefore, infiltration of any remaining PCBs into the storm drain system is not considered to be a complete pathway from the excavation area.

3.1.1 SOIL REMOVAL

Soil in the areas surrounding and near the 3-302 and 3-322 Buildings, and directly adjacent to the asphalt material removed as TCSA waste, was removed based on subsurface soil sample concentrations greater than 0.5 mg/kg. In addition, soil beneath the asphalt with concentrations less than 50 mg/kg, but greater than 0.5 mg/kg, was removed. A small area of soil was also excavated near the NBF/GTSP fence line. A total of approximately 344 cubic yards of soil were excavated during cleanup activities.

Soil was removed by contracted personnel using a combination of digging bars, shovels, and air-driven jack-hammer type tools, where necessary. The loosened material was removed using a Vactor truck or other excavation equipment and was transported under a bill of lading to the Alaska Street Transfer Facility in Seattle, Washington.

CB-191 was abandoned and backfilled during excavation activities. The structure of CB-191 was removed to approximately 3 ft BGS before the structure was backfilled with concrete. Storm drain pipes connecting CB-191 to CB-184 and MH-187 were also abandoned and removed during excavation activities. Concrete pipe plugs were installed at CB-184 and MH-187 at the connections to the removed piping. The abandoned storm drain pipes and plug locations are shown on Figure 7.

Soil excavation in most areas reached groundwater elevations (at approximately 2.5 to 3 ft BGS). Excavation was not extended below the groundwater table. In some areas, soil with PCB concentrations above 0.5 mg/kg was left in place when the excavation area could not expand laterally due to existing concrete footings or asphalt roadways.

Following soil excavation and the installation of the geofabric/carbon/geofabric barrier, the excavation area was backfilled with clean material. Following backfill, the entire area to the west of the 3-302 and 3-322 Buildings was paved with asphalt, including areas not excavated and the area of excavation between the two buildings. Only a small area underneath an airplane fuselage test stand was not paved with asphalt. Asphalt was graded to help direct stormwater runoff to CB-165A and CB-165B. An asphalt curb was also installed over the area of soil removal along the NBF/GTSP fenceline to prevent soil from entering the NBF storm drains from the GTSP property. The areas of asphalt paving are shown on Figure 9.

3.1.2 SURFACE CLEANING

Surface locations with PCB concentrations less than 50 mg/kg (non-TSCA) were cleaned by contracted personnel in general accordance with NBF operation and maintenance programs. Surface areas with total PCB concentrations less than 50 mg/kg were cleaned utilizing various methods including sweeping, low-pressure or high-pressure washing, and vacuum collection of solids and liquids. Areas where surface cleaning was performed include locations where PCBs were detected below 50 mg/kg in surface samples as shown on Figure 3 of the *Storm Drain System Source Investigation Report, North Boeing Field, Seattle, Washington* (Landau Associates 2009). A process flow diagram for solids and wastewater treatment procedures is provided on Figure 6. Surface cleaning areas are shown on Figure 8.

3.2 SAMPLE COLLECTION METHODS FOR SOIL REMOVAL AREA

Soil samples consisted of samples for additional soil characterization to determine excavation depth and lateral extent prior to soil excavation and confirmation samples following soil excavation. Sample results are presented in Tables 2 through 4, as described below.

Samples for additional characterization of the soil removal area were collected as excavation activities proceeded. Characterization sample results are provided in Table 2. Characterization sample locations and results that defined the lateral extent of the excavation areas are shown on Figure 7. Characterization samples from below grade were collected by advancing a hand auger with a stainless-steel shaft to the appropriate depth. At each location, soil samples from each depth were homogenized in a clean stainless-steel bowl using a clean stainless-steel spoon, placed into a laboratory-provided 8-ounce glass sample jar, labeled, and stored on ice.

Confirmation soil samples were collected in the soil removal area following soil excavation. Confirmation samples were collected from the excavation bottom and side walls at intervals appropriate to demonstrate removal of contaminated media. One discrete soil sample was collected from each location. Soil samples were collected using a clean, stainless-steel spoon. Soil samples from each location were placed into a laboratory-provided 8-ounce glass sample jar, labeled, and stored on ice. Table 3 provides soil sample results from locations and/or depths that were subsequently excavated; Table 4 provides soil sample results from locations that represent soil that is currently *in situ*. Soil sample results from locations subsequently excavated and locations remaining *in situ* are also presented on Figure 10.

When confirmation sample results indicated that the target cleanup level had not been achieved, and further excavation in either the vertical or lateral direction was possible, the excavation area was expanded and additional confirmation samples were collected in the new excavation area as described in the paragraph above. When further excavation was not possible in the vertical direction and the target cleanup level had not been achieved (i.e., the excavation was at groundwater elevation), the geofabric/activated carbon/geofabric barrier was placed prior to backfilling. The only other case where soil was left in place above the target cleanup level was where confirmation samples indicated the presence of soil above the target cleanup level, but excavation in the lateral direction was not possible due to the presence of concrete footings or asphalt roadways.

3.3 SAMPLE DOCUMENTATION, HANDLING, AND ANALYSIS

A complete record of all field activities was maintained. Documentation includes field logbooks, field sampling forms, photographs, sample labels, chain-of-custody forms, and project and data management file copies.

3.4 CHEMICAL ANALYSES

Samples were transported to Boeing's contracted analytical laboratory, ARI, in Tukwila, Washington, within 24 hours of sample collection. All samples were analyzed for PCB aroclors by EPA Method 8082 in accordance with 40 C.F.R. § 761.272. The reporting limit for PCB aroclors was 35 µg/kg. Sample preparation procedures, extraction procedures, and instrument/chemical analysis procedures that were used are described in ARI's SOP 350S and SOP 403S. Copies of these SOPs are provided in Appendix D.

4.0 SUMMARY

As described in Section 2.0, all asphalt and surface material identified as containing total PCBs at a concentration equal to or greater than 50 mg/kg was removed in accordance with the TSCA requirements and the work plan (Landau Associates 2009) approved by EPA and Ecology.

During the investigation, seven storm drain structures with total PCB concentrations greater than or equal to 50 mg/kg were identified. Solids removed from these storm structures were managed and disposed of as TSCA waste at the Waste Management NW landfill in Arlington, Oregon.

Approximately 50 cubic yards of material was removed during investigation and cleanup activities. Management of removed material was based on the concentration of total PCBs; material with PCB concentrations greater than or equal to 50 mg/kg was managed in accordance with TSCA requirements and material with concentrations of PCBs less than 50 mg/kg was managed as non-TSCA waste. The extent of the area of excavation was determined by identifying subsurface soil sample concentrations greater than 0.5 mg/kg. Soil and asphalt was removed by contracted personnel using a combination of digging bars, shovels, and air-driven jack-hammer type tools where necessary. The loosened material was removed using a Vactor truck or other excavation equipment and was transported under a bill of lading to the appropriate disposal facility. All TSCA material with PCBs greater than or equal to 50 mg/kg was disposed of at the Waste Management NW chemical waste landfill in Arlington, Oregon. All material with PCBs less than 50 mg/kg was transported under bill of lading to the Alaska Street Transfer Facility in Seattle, Washington. In some areas, the excavation depth was limited by the presence of groundwater, and soil containing PCBs at concentrations greater than the cleanup level extended below the water table. In the area between the 3-302 building and the 3-322 building, a layer of geofabric, activated carbon, and another layer of geofabric were placed in the bottom of the excavation prior to backfilling. The area surrounding the 3-322 building and 3-302 building was paved with asphalt after all excavation and backfilling activities were completed. Other cleanup activities included surface cleaning via pressure washing, removal of abandoned fuel pipes along the side of the 3-322 building, and removal of PCB-containing caulk associated with the fuel pipes located inside the 3-322 building.

5.0 USE OF THIS REPORT

This report has been prepared for the exclusive use of The Boeing Company and applicable regulatory agencies for specific application to the NBF locality. No other party is entitled to rely on the information and recommendations included in this document without the express written consent of Landau Associates. Further, the reuse of information 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 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 as 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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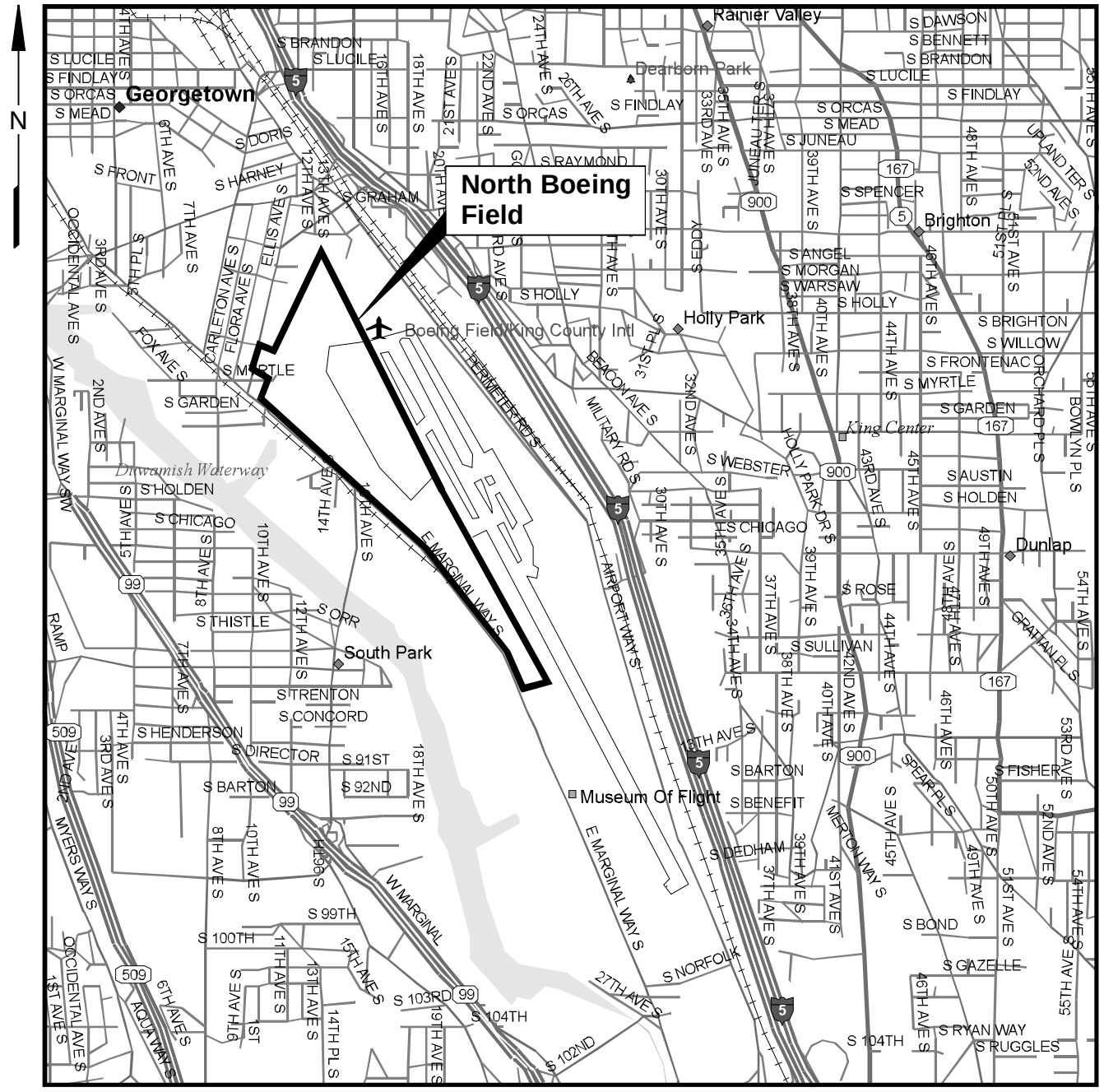

Flume Realignment| V:\025\0821210.001\SD Structure & Surface Investigation\Figure 1.cdr 6/16/2010

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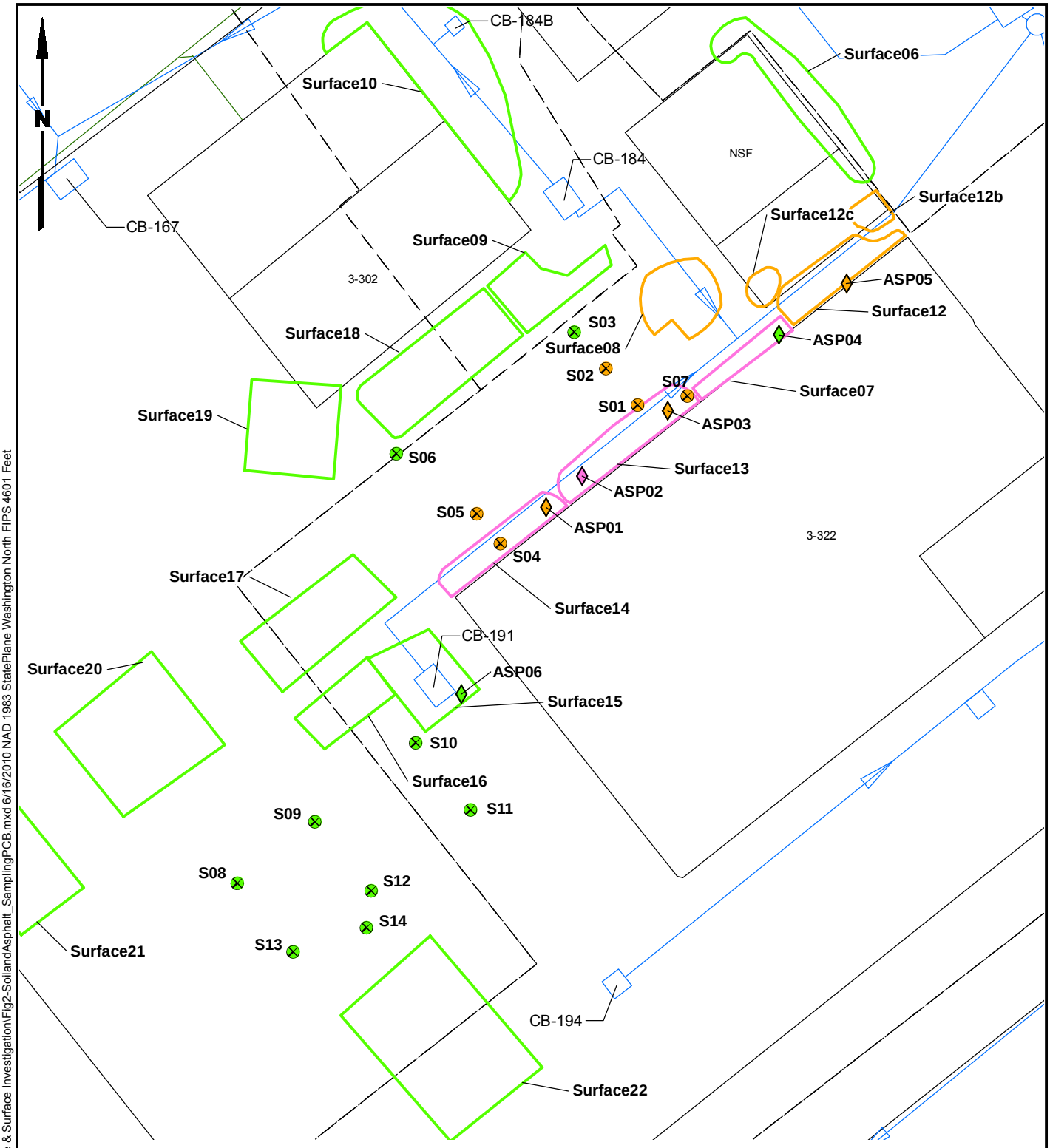
North Boeing Field Seattle, Washington	**Vicinity Map**	Figure 1



Legend

- Asphalt Sample Location
- Soil Sample Location
- Result < 10 mg/kg
- Result 10-50 mg/kg
- Result ≥ 50 mg/kg

Note

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

0 20 40

Scale in Feet

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig2-SoilandAsphalt_SamplingPCB.mxd 6/16/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet

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North Boeing Field
Seattle, Washington

Soil, Asphalt, and Surface Sample Locations and Total PCB Results

Figure 2

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig3-ExcavationAreaswithSamples.mxd 6/16/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet

N

3-331

3-332

NSF

3-302

3-322

3-306

S44 S70 S48 S16 S45 S46 S72 S15 S59 S60 S61 S73 S80 S63 S62 S81 S64 S65 S68 S69 S75 S71 S47 S66 S36 S34 S67 S76 S35 S77 S33 S03 S79 S02 S78 S74 S54 S50 S51 S05 S56 S04 S55 S26 S25 S24 S23 S22 S21 S20 S58 S49 S01 S07 S19 S18 S53 S17 S52 S57 ASP-BULK01 ASP-BULK02 ASP-BULK03 ASP-BULK04 ASP-BULK05 S31 S32 S29 S30 S27 S28 S38 S40 S43 S37 S42 S39 S83 S41 S82 S84

Legend

- TSCA Material Confirmation Sample
- Soil Characterization Sample
- Confirmation Sample Location Later Excavated
- Confirmation Sample Location Remaining in Situ
- Excavation Areas
- North Lateral
- Catch Basin
- Manhole

0 20 40

Scale in Feet

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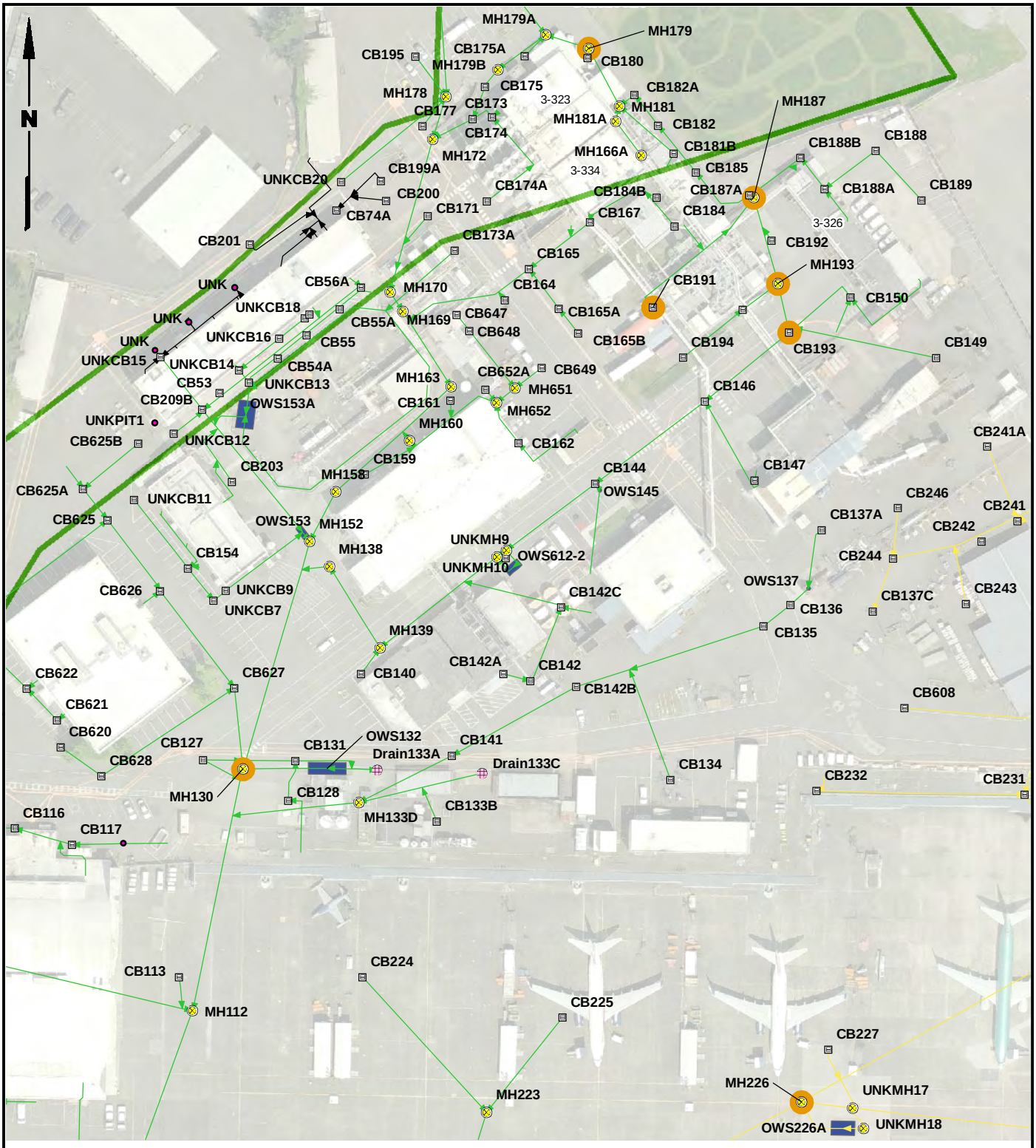
Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

North Boeing Field
Seattle, Washington

Excavation Areas with Sample Locations

Figure 3



Legend

- Storm Drain Structures Cleaned Under TSCA
- Approximate Seattle City Light Property Boundary
- Catch Basin
- Other Structure
- Drain
- Manhole
- North Lateral
- North-Central Lateral
- Other lines
- Oil Water Separator

Note

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

0 120 240

Scale in Feet

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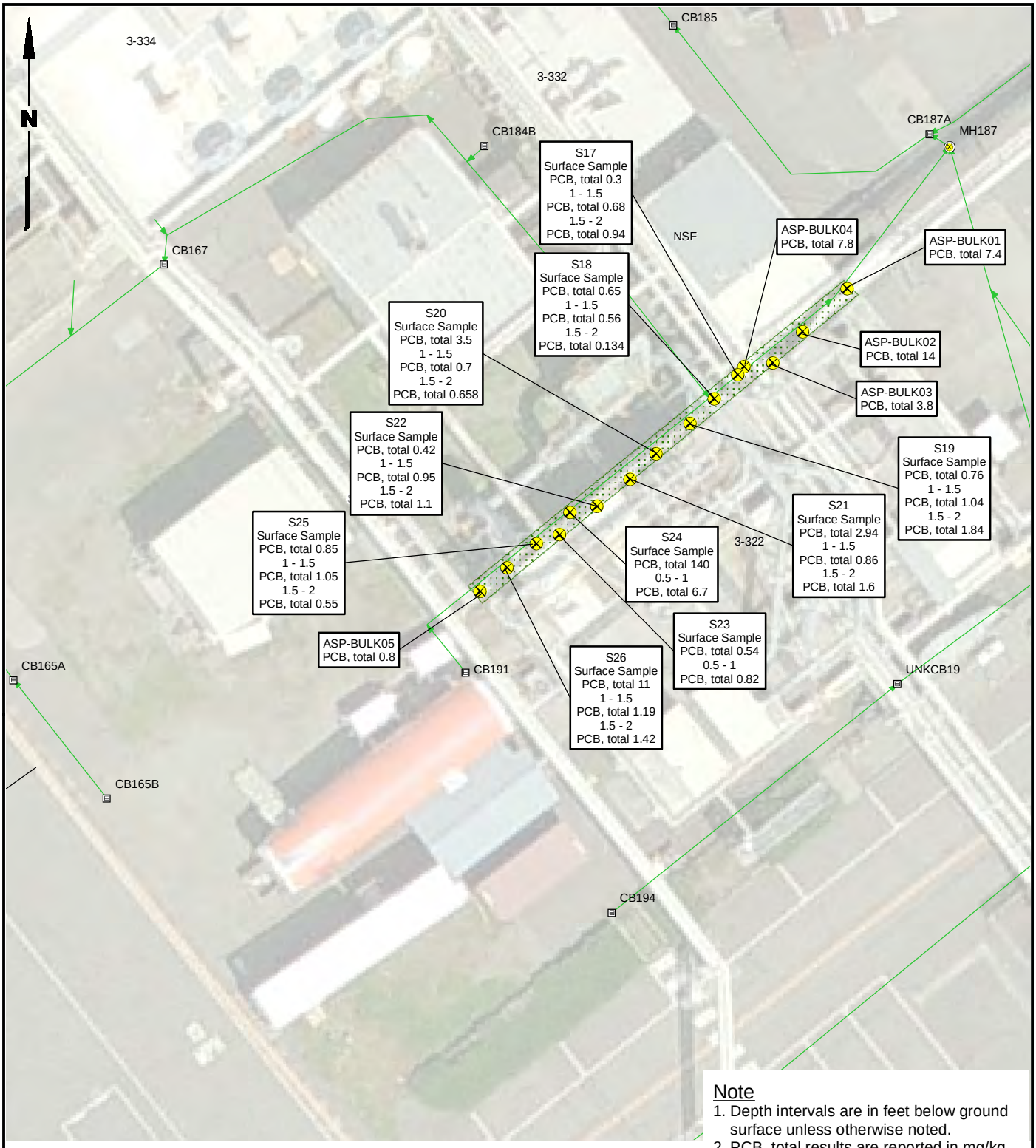
North Boeing Field
Seattle, Washington

Storm Drain Structures Cleaned Under TSCA

Figure
4



Legend

- TSCA Material Confirmation Sample
- Excavation Area of TSCA Material
- SXX Soil Sample
- ASP-BULKXX Bulk Asphalt Sample
- Catch Basin
- Manhole
- North Lateral

Note

1. Depth intervals are in feet below ground surface unless otherwise noted.
2. PCB, total results are reported in mg/kg
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 25 50

Scale in Feet

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig5-TSCA_Material.mxd 6/16/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet

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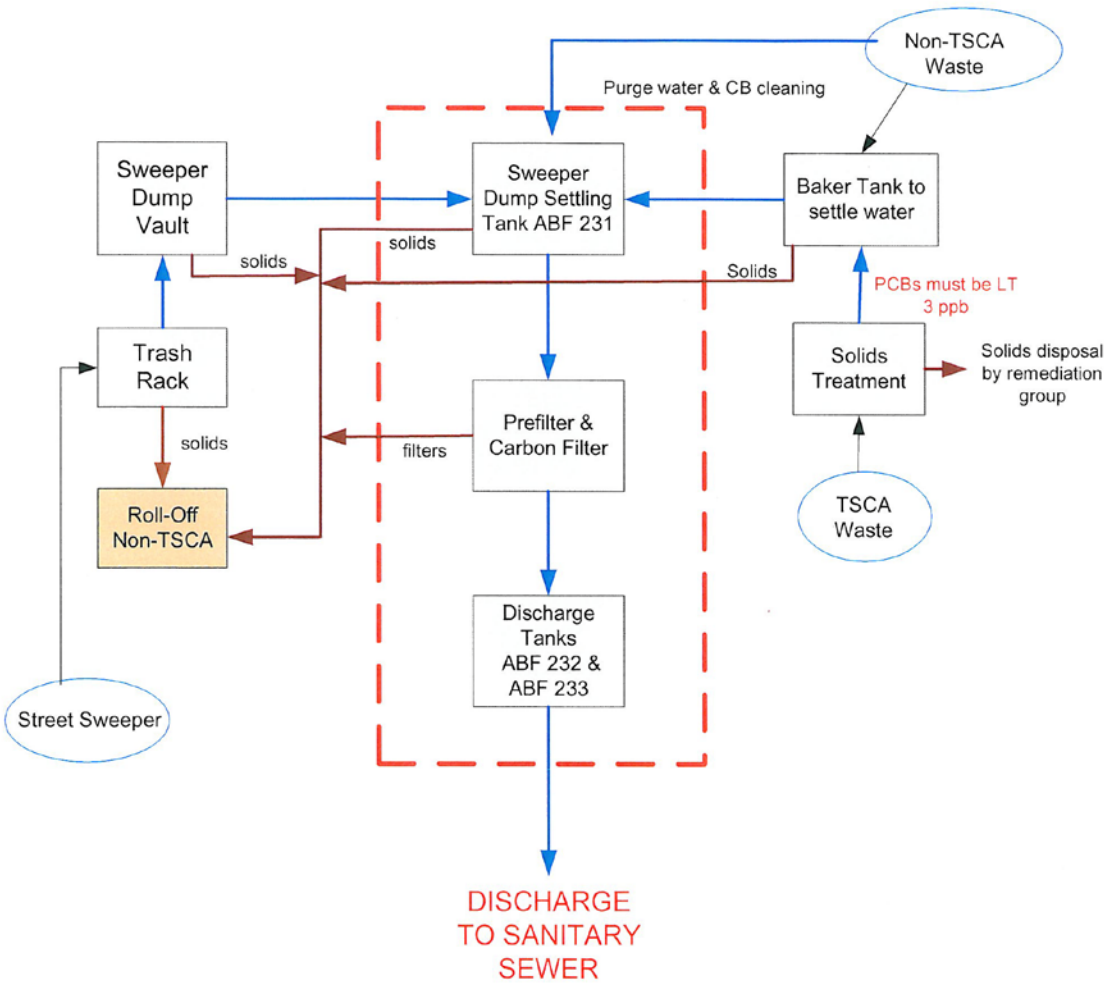
North Boeing Field
Seattle, Washington

Confirmation Sample Results - TSCA Material Excavation Areas

Figure 5

North Boeing Field
Sweeper Decant Station
Process Flow Diagram
Site A4229-C



Source: The Boeing Company.

6/18/10 P:\025\082\PCB Activities\FileRm\R\SD & Surf CU Rpt\Figures\SD & Surf CU Rpt_Fig 6.doc

LANDAU ASSOCIATES

North Boeing Field Seattle, Washington	**North Boeing Field Sweeper Decant Station Process Flow Diagram**	Figure 6

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig7-Excavation Activities.mxd 6/18/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet

N

MH166A
CB181B
3-331
CB185
Excavation Depth to Approximately 0.5ft BGS
3-334
3-332
CB184B
CB187A
MH187
Concrete Plug
Storm Drain Piping Abandoned/Not in Use
Storm Drain Piping Abandoned/Not in Use
NSF
CB167
3-302
Concrete Plug
CB184
CB192
Excavation Depth to Approximately 0.5ft BGS
Storm Drain Piping Plugged with Concrete at this Location
Excavation Depth to Approximately 3ft BGS (at Water Table)
S62
0 - 0.5
PCB, Total 0.265
1.5 - 2
PCB, Total 0.041
2.5 - 3
PCB, Total <0.031U
Excavation Depth to Approximately 2.5 to 3ft BGS
3-322
S64
0 - 0.5
PCB, Total 0.206
1.5 - 2
PCB, Total <0.033U
2.5 - 3
PCB, Total <0.033U
Concrete Plugged
Removed Storm Drain Line
Storm Drain Piping Abandoned/Not in Use
CB165A
Surface 17
PCB, Total 0.77
Surface 20
PCB, Total 0.138
CB191 -
Partially Removed and Backfilled with Concrete
UNKCB19
S10
0 - 0.25
PCB, Total 0.31
0.25 - 0.5
PCB, Total 0.165
CB165B
Excavation Depth to Approximately 0.5ft BGS
Surface 21
PCB, Total 0.192
S11
0 - 0.25
PCB, Total 0.236
0.25 - 0.5
PCB, Total 0.36
0.5 - 0.75
PCB, Total 0.27
S12
0 - 0.25
PCB, Total 0.068
0.25 - 0.5
PCB, Total 0.224
CB194
S13
0 - 0.25
PCB, Total 0.25
0.25 - 0.5
PCB, Total 0.086
Excavation Depth to Approximately 0.5ft BGS
S14
0 - 0.25
PCB, Total 0.176
0.25 - 0.5
PCB, Total 0.15
Excavation Depth to Approximately 1ft BGS
CB146
3-306

Legend

- Soil Characterization Sample
- Layer of Activated Carbon and Geofabric
- Surface Solids Composite Sampling Areas
- Excavation Areas
- Catch Basin
- Manhole
- North Lateral

0 20 40
Scale in Feet

LANDAU ASSOCIATES

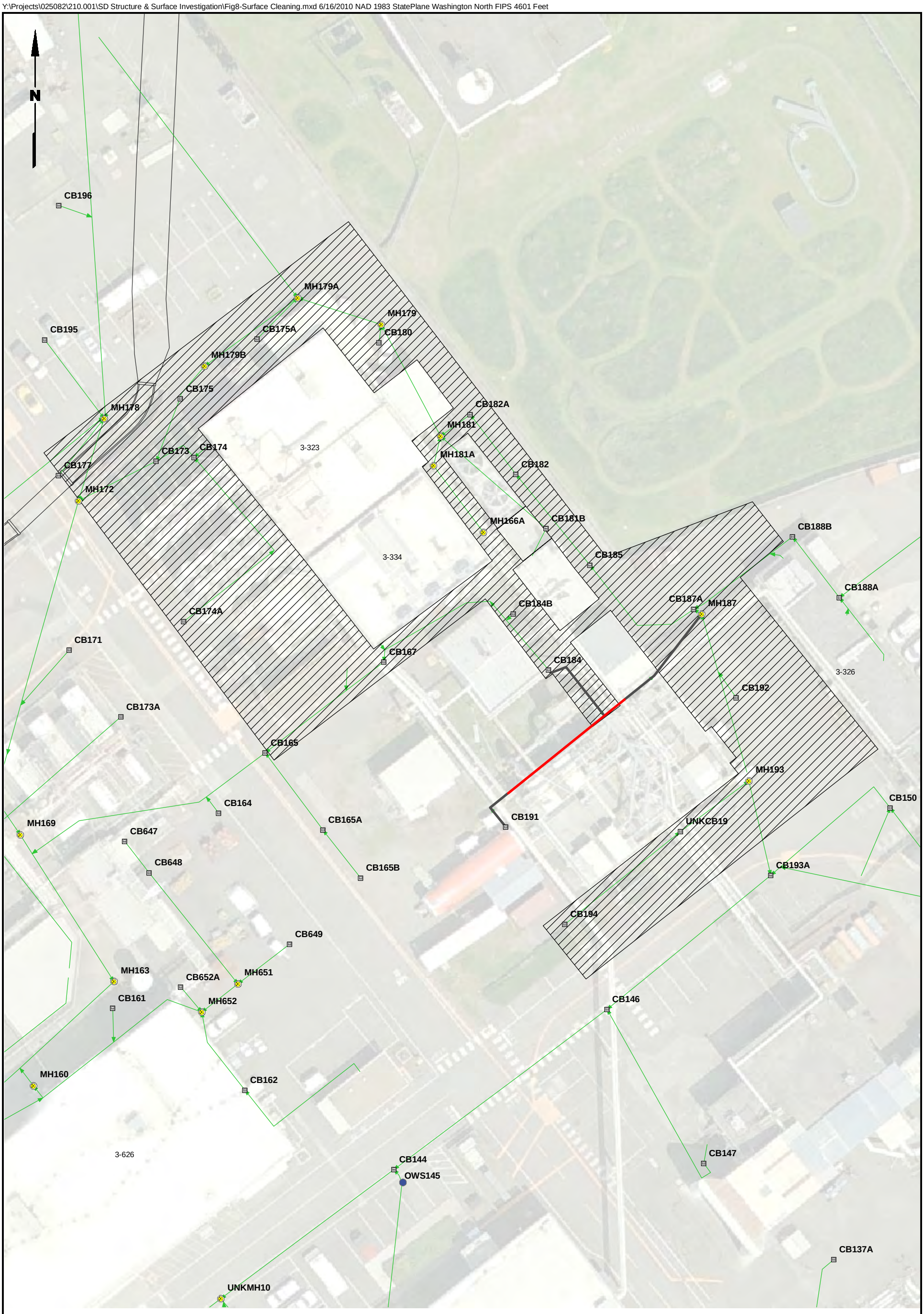
Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

North Boeing Field
Seattle, Washington

Excavation Activities, and Bounding Sample Results

Figure
7

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig8-Surface Cleaning.mxd 6/16/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Legend

Surface Cleaning Areas
Catch Basin
Manhole
North Lateral
Storm Drain Piping Abbandoned/Not in Use
Storm Drain Piping Removed

0 40 80
Scale in Feet

LANDAU ASSOCIATES

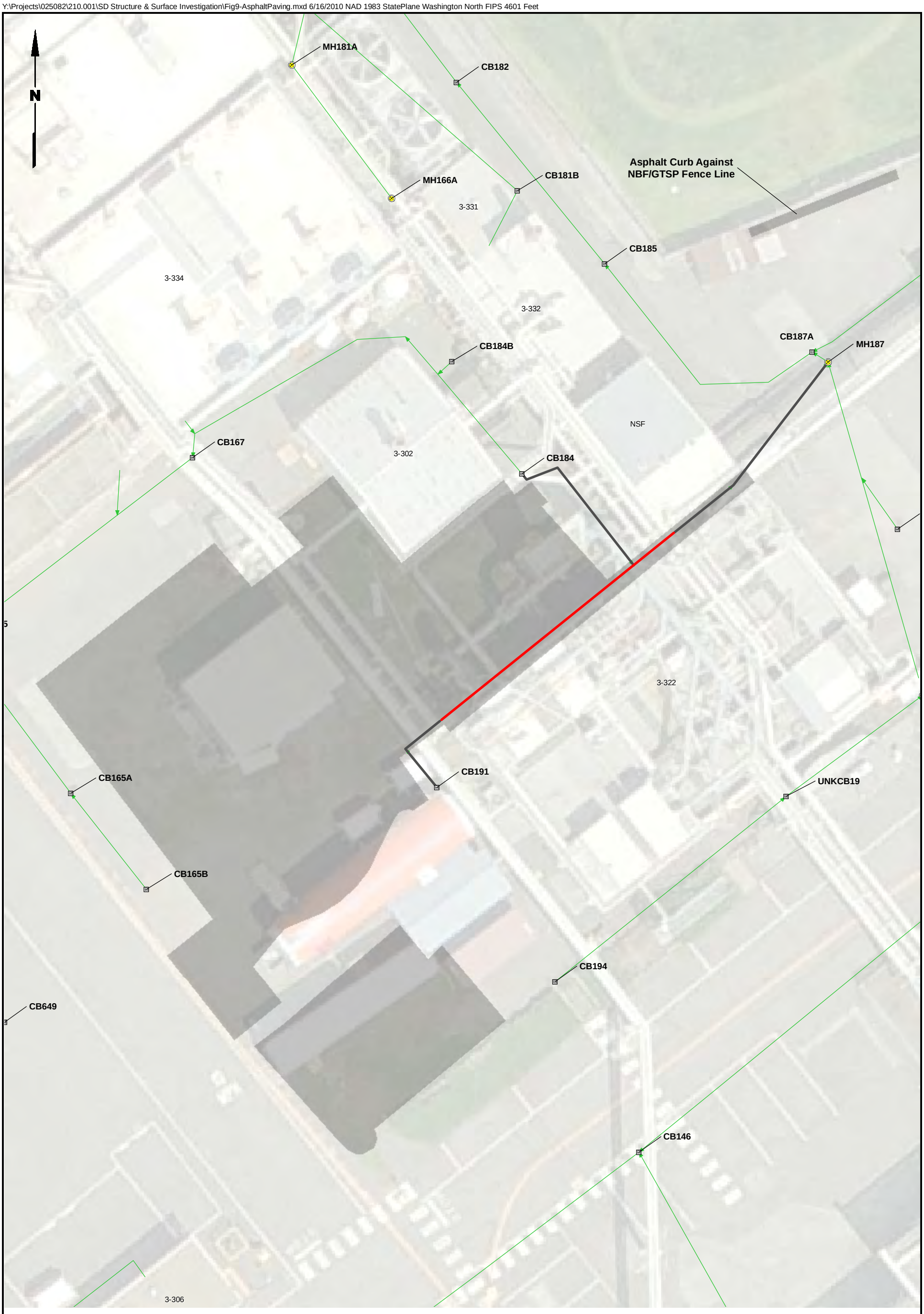
Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

North Boeing Field
Seattle, Washington

Surface Cleaning Areas

Figure
8

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig9-AsphaltPaving.mxd 6/16/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Legend

Asphalt Paving Area
Catch Basin
Manhole
North Lateral
Storm Drain Piping Abbandoned/Not in Use
Storm Drain Piping Removed

0 20 40
Scale in Feet

LANDAU ASSOCIATES

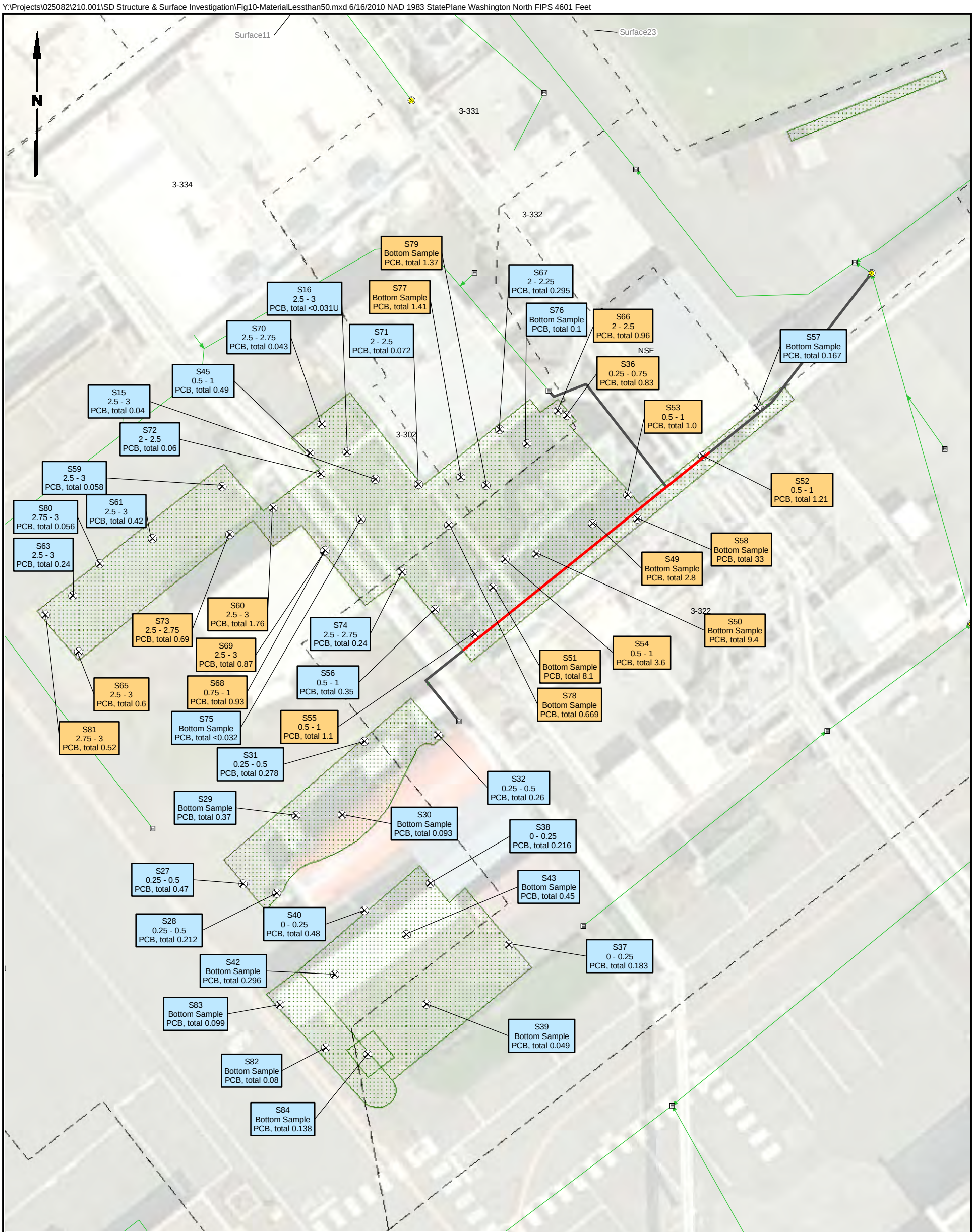
Note
1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

North Boeing Field
Seattle, Washington

Asphalt Paving Areas

Figure
9

Y:\Projects\025082\210.001\SD Structure & Surface Investigation\Fig10-MaterialLessthan50.mxd 6/16/2010 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Legend

- Soil Confirmation Sample Locations
- Excavation Areas
- Catch Basin
- Manhole
- North Lateral
- Storm Drain Piping Abbandoned/Not in Use
- Storm Drain Piping Removed

S39 Bottom Sample PCB, total 0.049 — Confirmation Sample Results Below 0.5 mg/kg

S78 Bottom Sample PCB, total 0.669 — Confirmation Sample Results Above 0.5 mg/kg

0 20 40

Scale in Feet

Note

1. Depth intervals are in feet below ground surface unless otherwise noted.
2. PCB, Total results are reported in mg/kg.
3. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Material with PCB Concentrations Less than 50 mg/kg Excavation Areas Confirmation Sample Results

Figure 10

TABLE 1
TSCA MATERIAL CONFIRMATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S17-1.5-2 QN98C 3/15/2010	S17-1-1.5 QN98B 3/15/2010	S17-surface QN98A 3/15/2010	S18-1.5-2 QN98F 3/15/2010	S18-1-1.5 QN98E 3/15/2010	S18-surface QN98D 3/15/2010	S19-1.5-2 QN98I 3/15/2010	S19-1-1.5 QN98H 3/15/2010	S19-surface QN98G 3/15/2010	S20-1.5-2 QN98L 3/15/2010	S20-1-1.5 QN98K 3/15/2010
PCBs (mg/kg)											
Method SW8082											
Aroclor 1016	0.055 U	0.031 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.031 U
Aroclor 1242	0.055 U	0.031 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.031 U
Aroclor 1248	0.055 U	0.078 U	0.031 U	0.031 U	0.032 U	0.16 U	0.16 U	0.032 U	0.12 U	0.046 U	0.031 U
Aroclor 1254	**0.16**	**0.11**	0.031 U	**0.034**	0.032 U	**0.32**	**1**	**0.14**	**0.3**	**0.068**	0.077 U
Aroclor 1260	**0.78**	**0.57**	**0.3**	**0.1**	**0.56**	**0.33** P	**0.84** P	**0.9**	**0.46**	**0.59**	**0.7**
Aroclor 1221	0.055 U	0.031 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.031 U
Aroclor 1232	0.055 U	0.031 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.032 U	0.031 U	0.031 U	0.031 U
PCBs, Total	**0.94**	**0.68**	**0.3**	**0.134**	**0.56**	**0.65**	**1.84**	**1.04**	**0.76**	**0.658**	**0.7**

TABLE 1
TSCA MATERIAL CONFIRMATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S20-surface QN98J 3/15/2010	S21-1.5-2 QO26C 3/16/2010	S21-1-1.5 QO26B 3/16/2010	S21-Surface QO26A 3/16/2010	S22-1.5-2 QO26F 3/16/2010	S22-1-1.5 QO26E 3/16/2010	S22-Surface QO26D 3/16/2010	S23-0.5-1 QO26H 3/16/2010	S23-Surface QO26G 3/16/2010	S24-0.5-1 QO26J 3/16/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	0.19 U	0.062 U	0.031 U	0.11 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.38 U
Aroclor 1242	0.19 U	0.062 U	0.031 U	0.11 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.38 U
Aroclor 1248	0.19 U	0.16 U	0.031 U	0.41 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.58 U
Aroclor 1254	0.48 U	**0.98**	0.047 U	**2.3**	0.079 U	0.032 U	**0.1**	**0.21**	**0.19**	**5.2**
Aroclor 1260	**3.5**	**0.62** P	**0.86**	0.64 P	**1.1**	**0.95**	**0.32** J	**0.61**	**0.35** P	**1.5** P
Aroclor 1221	0.19 U	0.062 U	0.031 U	0.11 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.38 U
Aroclor 1232	0.19 U	0.062 U	0.031 U	0.11 U	0.032 U	0.032 U	0.032 U	0.032 U	0.032 U	0.38 U
PCBs, Total	**3.5**	**1.6**	**0.86**	**2.94**	**1.1**	**0.95**	**0.42**	**0.82**	**0.54**	**6.7**

TABLE 1
TSCA MATERIAL CONFIRMATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S24-Surface QO26I 3/16/2010	S25-1.5-2 QO26M 3/16/2010	S25-1-1.5 QO26L 3/16/2010	S25-Surface QO26K 3/16/2010	S26-1.5-2 QO26P 3/16/2010	S26-1-1.5 QO26O 3/16/2010	S26-Surface QO26N 3/16/2010	Asphalt ASP-Bulk01 QO26Q 3/16/2010	Asphalt ASP-Bulk02 QO26R 3/16/2010	Asphalt ASP-Bulk03 QO26S 3/16/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	18 U	0.032 U	0.031 U	0.033 U	0.063 U	0.064 U	0.4 U	1.6 U	1.6 U	1.6 U
Aroclor 1242	18 U	0.032 U	0.031 U	0.033 U	0.063 U	0.064 U	0.4 U	1.6 U	1.6 U	1.6 U
Aroclor 1248	44 U	0.032 U	0.031 U	0.049 U	0.32 U	0.32 U	3 U	2.4 U	4 U	2.4 U
Aroclor 1254	**140**	**0.15**	**0.12**	**0.41**	**0.6**	**0.63**	**11**	**7.4**	**14**	**3.8**
Aroclor 1260	18 U	**0.4**	**0.93**	**0.44**	**0.82**	**0.56** P	0.99 U	1.6 U	1.6 U	1.6 U
Aroclor 1221	18 U	0.032 U	0.031 U	0.033 U	0.063 U	0.064 U	0.4 U	1.6 U	1.6 U	1.6 U
Aroclor 1232	18 U	0.032 U	0.031 U	0.033 U	0.063 U	0.064 U	0.4 U	1.6 U	1.6 U	1.6 U
PCBs, Total	**140**	**0.55**	**1.05**	**0.85**	**1.42**	**1.19**	**11**	**7.4**	**14**	**3.8**

TABLE 1
TSCA MATERIAL CONFIRMATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	Asphalt ASP-Bulk04 QO26T 3/16/2010	Asphalt ASP-Bulk05 QO26U 3/16/2010
PCBs (mg/kg)		
Method SW8082		
Aroclor 1016	1.6 U	0.8 U
Aroclor 1242	1.6 U	0.8 U
Aroclor 1248	4 U	0.8 U
Aroclor 1254	**7.8**	0.8 U
Aroclor 1260	1.6 U	0.8 U
Aroclor 1221	1.6 U	0.8 U
Aroclor 1232	1.6 U	0.8 U
PCBs, Total	**7.8**	ND

U = Indicates the compound was undetected at the reported concentration.

ND = Not detected.

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

P = The analyte was detected on both chromatographic columns but the quantified values differ by 40% RPD with no obvious chromatographic interference. The higher of the two values is reported by the laboratory.

Bold = Detected compound.

TABLE 2
SOIL CHARACTERIZATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S01-1.5-2 QN41C 3/10/2010	S01-2.5-3 QN41D 3/10/2010	S02-1.5-2 QN41E 3/10/2010	S02-2.5-3 QN41F 3/10/2010	S04-1.5-2 QN41G 3/10/2010	S04-2.5-3 QN41H 3/10/2010	S05-1.5-2 QN41I 3/10/2010	S05-2.5-3 QN41J 3/10/2010	S07-1.5-2 QN41A 3/10/2010	S07-2.5-3 QN41B 3/10/2010	S15-0-0.5 QN41K 3/10/2010	S15-1.5-2 QN41L 3/10/2010
PCBs (mg/kg)												
Method SW8082												
Aroclor 1016	0.35 U	0.22 U	0.19 U	0.043 U	0.032 U	0.032 U	0.48 U	0.031 U	0.039 U	0.058 U	0.033 U	0.032 U
Aroclor 1242	0.35 U	0.22 U	0.19 U	0.043 U	0.032 U	0.032 U	0.48 U	0.031 U	0.039 U	0.058 U	0.033 U	0.032 U
Aroclor 1248	0.86 U	1.1 U	0.46 U	0.22 U	0.16 U	0.079 U	0.95 U	0.078 U	0.39 U	0.43 U	0.17 U	0.04 U
Aroclor 1254	**4.3**	**5.1**	**2.2**	**1.5**	**1.3**	**0.14**	**6**	**0.18**	**1.6**	**2**	**0.98**	**0.084**
Aroclor 1260	0.52 U	**1.3**	0.28 U	0.15 U	**0.89** P	**0.062**	**3.1** P	**0.12**	0.14 U	0.17 U	**0.29**	0.032 U
Aroclor 1221	0.35 U	0.22 U	0.19 U	0.043 U	0.032 U	0.032 U	0.48 U	0.031 U	0.039 U	0.058 U	0.033 U	0.032 U
Aroclor 1232	0.35 U	0.22 U	0.19 U	0.043 U	0.032 U	0.032 U	0.48 U	0.031 U	0.039 U	0.058 U	0.033 U	0.032 U
PCBs, Total	**4.3**	**6.4**	**2.2**	**1.5**	**2.19**	**0.202**	**9.1**	**0.30**	**1.6**	**2**	**1.27**	**0.084**

TABLE 2
SOIL CHARACTERIZATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S16-0-0.5 QN41N 3/10/2010	S16-1.5-2 QN41O 3/10/2010	S59-0-0.5 QP92A 3/26/2010	S59-1.5-2 QP92B 3/26/2010	S60-0-0.5 QP92D 3/26/2010	S60-1.5-2 QP92E 3/26/2010	S61-0-0.5 QP92G 3/26/2010	S61-1.5-2 QP92H 3/26/2010	S62-0-0.5 QP92J 3/26/2010	S62-1.5-2 QP92K 3/26/2010	S62-2.5-3 QP92L 3/26/2010
PCBs (mg/kg)											
Method SW8082											
Aroclor 1016	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.033 U	0.36 U	0.03 U	0.03 U	0.031 U
Aroclor 1242	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.033 U	0.36 U	0.03 U	0.03 U	0.031 U
Aroclor 1248	0.15 U	0.062 U	0.16 U	0.031 U	0.031 U	0.031 U	0.033 U	0.9 U	0.03 U	0.03 U	0.031 U
Aroclor 1254	**0.79**	**0.14**	**0.79**	**0.11**	**0.14**	0.031 U	**0.25**	**5.2**	**0.18**	**0.041**	0.031 U
Aroclor 1260	**0.16**	0.031 U	**0.18**	0.031 U	**0.07**	**0.05**	**0.095**	0.45 U	**0.085**	0.03 U	0.031 U
Aroclor 1221	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.033 U	0.36 U	0.03 U	0.03 U	0.031 U
Aroclor 1232	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.031 U	0.033 U	0.36 U	0.03 U	0.03 U	0.031 U
PCBs, Total	**0.95**	**0.14**	**0.97**	**0.11**	**0.21**	**0.05**	**0.345**	**5.2**	**0.265**	**0.041**	ND

TABLE 2
SOIL CHARACTERIZATION SAMPLES
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S63-0-0.5 QP92M 3/26/2010	S63-1.5-2 QP92N 3/26/2010	S64-0-0.5 QP92P 3/26/2010	S64-1.5-2 QP92Q 3/26/2010	S64-2.5-3 QP92R 3/26/2010
PCBs (mg/kg)					
Method SW8082					
Aroclor 1016	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U
Aroclor 1242	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U
Aroclor 1248	0.05 U	0.079 U	0.033 U	0.033 U	0.032 U
Aroclor 1254	**0.15**	**0.64**	**0.14**	0.033 U	0.032 U
Aroclor 1260	**0.084**	**0.27**	**0.066**	0.033 U	0.032 U
Aroclor 1221	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U
Aroclor 1232	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U
PCBs, Total	**0.234**	**0.91**	**0.206**	ND	ND

U = Indicates the compound was undetected at the reported concentration.

ND = Not detected.

P = The analyte was detected on both chromatographic columns but the quantified values differ by 40% RPD with no obvious chromatographic interference. The higher of the two values is reported by the laboratory.

Bold = Detected compound.

TABLE 3
CONFIRMATION SAMPLES REPRESENTING EXCAVATED SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S33-0.25-0.75 QP11G 3/19/2010	S35-Bottom QP11J 3/19/2010	S41-0-0.25 QP11O 3/19/2010	S47-0.5-1.0 QP25N 3/22/2010	S48-Bottom QP25O 3/22/2010	S54-0.5-1.0 QP25G 3/22/2010	Concrete CB191-SIDE CONC QO81A 3/18/2010
PCBs (mg/kg)							
Method SW8082							
Aroclor 1016	0.064 U	0.034 U	0.03 U	0.071 U	0.031 U	0.36 U	0.034 U
Aroclor 1242	0.064 U	0.034 U	0.03 U	0.071 U	0.031 U	0.36 U	0.034 U
Aroclor 1248	0.32 U	0.17 U	0.15 U	0.35 U	0.077 U	0.89 U	0.26 U
Aroclor 1254	**1.7**	**1.1**	**0.63**	**2.9**	**0.61**	**3.6**	**1.1**
Aroclor 1260	**0.32**	**0.27**	**0.21**	0.28 U	**0.23**	0.54 U	0.28 P
Aroclor 1221	0.064 U	0.034 U	0.03 U	0.071 U	0.031 U	0.36 U	0.034 U
Aroclor 1232	0.064 U	0.034 U	0.03 U	0.071 U	0.031 U	0.36 U	0.034 U
PCBs, Total	**2.02**	**1.37**	**0.84**	**2.9**	**0.84**	**3.6**	**1.38**

U = Indicates the compound was undetected at the reported concentration.

P = The analyte was detected on both chromatographic columns but the quantified values differ by 40% RPD with no obvious chromatographic interference. The higher of the two values is reported by the laboratory.

Bold = Detected compound.

TABLE 4
CONFIRMATION SAMPLES REPRESENTING IN SITU SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S15-2.5-3 QN41M 3/10/2010	S16-2.5-3 QN41P 3/10/2010	S27-0.25-0.5 QP11A 3/19/2010	S28-0.25-0.5 QP11B 3/19/2010	S29-Bottom QP11C 3/19/2010	S30-Bottom QP11D 3/19/2010	S31-0.25-0.5 QP11E 3/19/2010	S32-0.25-0.5 QP11F 3/19/2010	S34-0.25-0.5 QP11H 3/19/2010	S36-0.25-0.75 QP11I 3/19/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	0.032 U	0.031 U	0.032 U	0.032 U	0.033 U	0.03 U	0.03 U	0.032 U	0.035 U	0.035 U
Aroclor 1242	0.032 U	0.031 U	0.032 U	0.032 U	0.033 U	0.03 U	0.03 U	0.032 U	0.035 U	0.035 U
Aroclor 1248	0.032 U	0.031 U	0.079 U	0.032 U	0.049 U	0.03 U	0.03 U	0.048 U	0.17 U	0.088 U
Aroclor 1254	**0.04**	0.031 U	**0.33**	**0.13**	**0.25**	**0.034**	**0.078**	**0.16**	**1**	**0.6**
Aroclor 1260	0.032 U	0.031 U	**0.14** P	**0.082** P	**0.12**	**0.059**	**0.2**	**0.1** P	**0.31**	**0.23**
Aroclor 1221	0.032 U	0.031 U	0.032 U	0.032 U	0.033 U	0.03 U	0.03 U	0.032 U	0.035 U	0.035 U
Aroclor 1232	0.032 U	0.031 U	0.032 U	0.032 U	0.033 U	0.03 U	0.03 U	0.032 U	0.035 U	0.035 U
PCBs, Total	**0.04**	ND	**0.47**	**0.212**	**0.37**	**0.093**	**0.278**	**0.26**	**1.31**	**0.83**

TABLE 4
CONFIRMATION SAMPLES REPRESENTING IN SITU SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S37-0-0.25 QP11K 3/19/2010	S38-0-0.25 QP11L 3/19/2010	S39-Bottom QP11M 3/19/2010	S40-0-0.25 QP11N 3/19/2010	S42-Bottom QP11P 3/19/2010	S43-Bottom QP11Q 3/19/2010	S44-0.5-1.0 QP25K 3/22/2010	S45-0.5-1.0 QP25L 3/22/2010	S46-0.5-1.0 QP25M 3/22/2010	S49-Bottom QP25B 3/22/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	0.032 U	0.028 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.03 U	0.033 U	0.072 U
Aroclor 1242	0.032 U	0.028 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.03 U	0.033 U	0.072 U
Aroclor 1248	0.032 U	0.028 U	0.032 U	0.08 U	0.065 U	0.079 U	0.15 U	0.076 U	0.083 U	0.36 U
Aroclor 1254	**0.089**	**0.12**	**0.049**	**0.29**	**0.2**	**0.31**	**1.1**	**0.32**	**0.62**	**2.8**
Aroclor 1260	**0.094**	**0.096**	0.032 U	**0.19** P	**0.096**	**0.14**	0.12 U	**0.17** P	**0.72**	0.29 U
Aroclor 1221	0.032 U	0.028 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.03 U	0.033 U	0.072 U
Aroclor 1232	0.032 U	0.028 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.03 U	0.033 U	0.072 U
PCBs, Total	**0.183**	**0.216**	**0.049**	**0.48**	**0.296**	**0.45**	**1.1**	**0.49**	**1.34**	**2.8**

TABLE 4
CONFIRMATION SAMPLES REPRESENTING IN SITU SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S50-Bottom QP25C 3/22/2010	S51-Bottom QP25D 3/22/2010	S52-0.5-1.0 QP25E 3/22/2010	S53-0.5-1.0 QP25F 3/22/2010	S55-0.5-1.0 QP25H 3/22/2010	S56-0.5-1.0 QP25I 3/22/2010	S57-Bottom QP25J 3/22/2010	S58-Bottom QP25A 3/22/2010	S59-2.5-3 QP92C 3/26/2010	S60-2.5-3 QP92F 3/26/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	0.95 U	0.56 U	0.03 U	0.032 U	0.031 U	0.031 U	0.031 U	2 U	0.031 U	0.039 U
Aroclor 1242	0.95 U	0.56 U	0.03 U	0.032 U	0.031 U	0.031 U	0.031 U	2 U	0.031 U	0.039 U
Aroclor 1248	2.4 U	1.4 U	0.076 U	0.16 U	0.16 U	0.046 U	0.031 U	10 U	0.031 U	0.39 U
Aroclor 1254	**9.4**	**6.3**	**0.23**	**0.77**	**0.65**	**0.16**	**0.047**	**33**	**0.058**	**1.5**
Aroclor 1260	0.95 U	**1.8**	**0.98** P	**0.23** P	**0.45** P	**0.19**	**0.12**	2 U	0.031 U	**0.26**
Aroclor 1221	0.95 U	0.56 U	0.03 U	0.032 U	0.031 U	0.031 U	0.031 U	2 U	0.031 U	0.039 U
Aroclor 1232	0.95 U	0.56 U	0.03 U	0.032 U	0.031 U	0.031 U	0.031 U	2 U	0.031 U	0.039 U
PCBs, Total	**9.4**	**8.1**	**1.21**	**1**	**1.1**	**0.35**	**0.167**	**33**	**0.058**	**1.76**

TABLE 4
CONFIRMATION SAMPLES REPRESENTING IN SITU SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S61-2.5-3 QP92I 3/26/2010	S63-2.5-3 QP92O 3/26/2010	S65-2.5-3.0 QS16A 4/9/2010	S66-2.0-2.5 QS16B 4/9/2010	S67-2.0-2.25 QS16C 4/9/2010	S68-0.75-1.0 QS16D 4/9/2010	S69-2.5-3.0 QS16E 4/9/2010	S70-2.5-2.75 QS16F 4/9/2010	S71-2.0-2.5 QS16G 4/9/2010	S72-2.0-2.5 QS16H 4/9/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.032 U	0.03 U	0.032 U	0.031 U
Aroclor 1242	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.032 U	0.03 U	0.032 U	0.031 U
Aroclor 1248	0.05 U	0.048 U	0.079 U	0.24 U	0.079 U	0.15 U	0.048 U	0.03 U	0.032 U	0.031 U
Aroclor 1254	**0.42**	**0.24**	**0.38**	**0.79**	**0.25**	**0.48**	**0.38**	**0.043**	**0.072**	**0.06**
Aroclor 1260	0.042 U	0.04 U	**0.22**	**0.17**	**0.045**	**0.45**	**0.49**	0.03 U	0.032 U	0.031 U
Aroclor 1221	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.032 U	0.03 U	0.032 U	0.031 U
Aroclor 1232	0.033 U	0.032 U	0.032 U	0.032 U	0.032 U	0.03 U	0.032 U	0.03 U	0.032 U	0.031 U
PCBs, Total	**0.42**	**0.24**	**0.6**	**0.96**	**0.295**	**0.93**	**0.87**	**0.043**	**0.072**	**0.06**

TABLE 4
CONFIRMATION SAMPLES REPRESENTING IN SITU SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S73-2.5-2.75 QS16I 4/9/2010	S74-2.5-2.75 QS16J 4/9/2010	S75-Bottom QS16K 4/9/2010	S76-Bottom QS16L 4/9/2010	S77-Bottom QS16M 4/9/2010	S78-Bottom QS16N 4/9/2010	S79-Bottom QS16O 4/9/2010	S80-2.75-3.0 QS16P 4/9/2010	S81-2.75-3.0 QS16Q 4/9/2010	S82-Bottom QS16R 4/9/2010
PCBs (mg/kg)										
Method SW8082										
Aroclor 1016	0.032 U	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U	0.039 U	0.032 U	0.032 U	0.031 U
Aroclor 1242	0.032 U	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U	0.039 U	0.032 U	0.032 U	0.031 U
Aroclor 1248	0.16 U	0.033 U	0.032 U	0.05 U	0.16 U	0.16 U	0.39 U	0.032 U	0.048 U	0.031 U
Aroclor 1254	**0.53**	**0.12**	0.032 U	**0.1**	**1.2**	**0.58**	**1.2**	**0.056**	**0.38**	**0.08**
Aroclor 1260	**0.16**	**0.12**	0.032 U	0.033 U	**0.21**	**0.089**	**0.17**	0.032 U	**0.14**	0.031 U
Aroclor 1221	0.032 U	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U	0.039 U	0.032 U	0.032 U	0.031 U
Aroclor 1232	0.032 U	0.033 U	0.032 U	0.033 U	0.033 U	0.032 U	0.039 U	0.032 U	0.032 U	0.031 U
PCBs, Total	**0.69**	**0.24**	ND	**0.1**	**1.41**	**0.669**	**1.37**	**0.056**	**0.52**	**0.08**

TABLE 4
CONFIRMATION SAMPLES REPRESENTING IN SITU SOIL
PCB ANALYTICAL RESULTS
NORTH BOEING FIELD

	S83-Bottom QS16S 4/9/2010	S84-Bottom QS16T 4/9/2010
PCBs (mg/kg)		
Method SW8082		
Aroclor 1016	0.033 U	0.031 U
Aroclor 1242	0.033 U	0.031 U
Aroclor 1248	0.033 U	0.031 U
Aroclor 1254	**0.064**	**0.069**
Aroclor 1260	**0.035**	**0.069**
Aroclor 1221	0.033 U	0.031 U
Aroclor 1232	0.033 U	0.031 U
PCBs, Total	**0.099**	**0.138**

U = Indicates the compound was undetected at the reported concentration.

ND = Not detected.

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

P = The analyte was detected on both chromatographic columns but the quantified values differ by 40% RPD with no obvious chromatographic interference. The higher of the two values is reported by the laboratory.

Bold = Detected compound.

APPENDIX B

Typical Flange Configuration Photographs

Typical Flange Configuration

Caulk material typically located around flange collar

LANDAU ASSOCIATES

North Boeing Field
Seattle, Washington

Steel Flange Removal Inside the 3-322 Building

Figure 1