Draft Remedial Investigation Report

BOEING KENT SPACE CENTER FACILITY
South 208th Street
KENT, WASHINGTON

December 2017

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This report was prepared by the staff of Dalton, Olmsted, & Fuglevand, Inc., under the supervision of the geologist/hydrogeologist whose seal and signature appear hereon.

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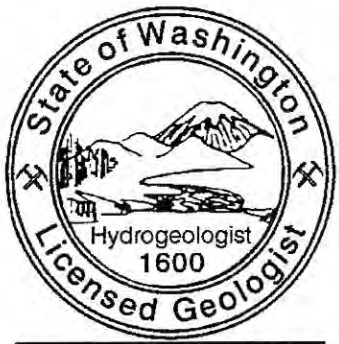

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ACRONYMS AND ABBREVIATIONS

µg/kg ..... micrograms per kilogram
µg/L ..... micrograms per liter
AO..... Agreed Order No. DE 12820
AOC ..... Area of concern
bgs ..... below ground surface
Boeing..... The Boeing Company
BTEX ..... benzene, toluene, ethylbenzene, xylenes
CLARC..... Cleanup Levels and Risk Calculations
CSL..... Cleanup screening level
Ecology..... Washington State Department of Ecology
EIM..... Environmental Information Management
Site..... Boeing Kent Space Center Facility
ISGP..... Industrial Stormwater General Permit
mg/kg..... Milligrams per kilogram
MTCA..... Model Toxics Control Act
PAH ..... polycyclic aromatic hydrocarbon
PCB ..... polychlorinated biphenyl
PCOC..... Potential contaminant of concern
ppm ..... parts per million
QAPP..... Quality assurance project plan
RCRA..... Resource Conservation and Recovery Act
RCW..... Revised Code of Washington
RI..... Remedial investigation
SCO ..... sediment cleanup objective
SMS ..... Washington State Sediment Management Standards
SWMU ..... solid waste management unit
TPH ..... Total petroleum hydrocarbons
UST ..... Underground storage tank
VOC ..... volatile organic compound
WAC..... Washington Administrative Code
EDD.....Electronic data deliverable
ARAR.....Relevant & appropriate regulations

EXECUTIVE SUMMARY

The 121 acre Boeing Kent Space Center (site) is located at the intersection of South 208th Street and 68th Avenue South in Kent, Washington. The site is currently operating under a Resource Conservation and Recovery Act interim-status permit issued by the US Environmental Protection Agency. Boeing seeks to remove the site from coverage under the permit and entered into an Agreed Order with the Department of Ecology as part of that process.

The objectives of this RI are to fulfill the requirements of the 2016 RI Work Plan, characterize the nature and extent of contamination at the site, and meet the general requirements for a RI as defined by MTCA under WAC 173-340-350. All tasks identified in the RI Work Plan have been completed and documented in this RI, with the exception of analysis of stormwater conveyance system sediment trap samples, anticipated in early 2018.

Land use has not significantly changed at the site since it was first developed. The site is industrial and local planning and zoning support continued similar types of use. Geology at the site is consistent with conditions anticipated for this Kent river valley. The site is relatively flat and soil types are predominantly sand, sandy silts, and silt. Shallow groundwater is present at approximately 7 to 11 feet below ground surface and the depth to groundwater varies seasonally by several feet. Groundwater flow is predominantly to the north, but fairly flat, varying in flow direction from Northwest to Northeast with a slow groundwater flow rate anticipated on the order of under 100 feet per year.

Groundwater is not a source of drinking water at the site. The nearest surface water body is Mill Creek, which discharges to the Green River approximately 3.5 miles north of the site. Mill Creek has been the focus of several historical studies that found it did not meet Surface Water Quality criteria under WAC 173-201A-200 that would be expected to support aquatic life, nor did it meet recreational use levels.

Soil, groundwater, and stormwater conveyance system samples were collected as part of this RI. The majority of samples did not reveal concentrations above screening levels and no new sources of contamination were identified.

Arsenic was the only constituent detected above screening levels in soil at a concentration of 8.59 mg/kg, result within the range previously detected in soil as part of earlier studies.

No constituents were detected in groundwater above the MTCA screening levels protective of the vapor intrusion to indoor air pathway which would be the receptor pathway of greatest concern for the site. Vinyl chloride was detected above the screening level in two of three samples. The concentrations at both locations were 0.19 µg/L, over the screening level of 0.025 µg/L. These values are lower than previously detected in groundwater, confirming the area where vinyl chloride is detected is small, and may be declining naturally as concentrations are an order of magnitude lower than detected during the earlier investigations. One groundwater sample showed copper, lead, and zinc at concentrations above screening levels, but consistent with previous groundwater sampling results from earlier investigation in which Ecology concurred that groundwater concentrations did not pose a risk because groundwater is not serving as a drinking water source and the site's relative distance from the downgradient surface water receptor of concern, the Green River. Arsenic concentrations in groundwater collected as part of this RI varied from less than 0.002 to 0.266 mg/L, generally consistent with historical area results, and appear to reflect area-wide groundwater conditions, not due to a site-specific source.

The data collected from the Stormwater Conveyance System are generally consistent with regional and historical data, and with what might be expected for a similar industrial site that is well-maintained with underutilized parking and traffic. Sediment traps yielded low sediment accumulation over the course of a full year, suggesting that the site has low sediment loading that would potentially contribute to contamination in downstream surface water bodies. Concentrations detected in stormwater samples discharging from the site are generally low and meeting Industrial Stromwater General Permit stormwater benchmarks. PCBs were detected in a solids sample collected from an onsite stormwater pond; the concentration was in the range of detections previously detected prior to cleaning of the stormwater conveyance system in 2002. PCBs were only detected in one stormwater sample, at a location downstream of the stormwater pond where PCBs were detected in solids. PCBs were not detected in the stormwater sample collected at the downstream outfall, nor in the solids sample collected at that outfall.

The nature and extent of contamination has been defined and no further evaluation beyond the scope of the RI Work Plan is warranted in order to meet the objectives of the RI, as defined in the AO. No areas were identified during the RI that require cleanup of soil or groundwater.

1.0 INTRODUCTION

This Remedial Investigation report (RI) was prepared by Dalton, Olmsted, and Fuglevand (DOF) on behalf of the Boeing Company (Boeing) in partial fulfillment of the requirements of Agreed Order No. DE 12820 (AO; Ecology 2016a) between Boeing and the Washington State Department of Ecology (Ecology). The project site is the Boeing Kent Space Center (site) located on approximately 121 acres bounded by South 208th Street to the south, 68th Avenue South to the east, South 199th Place to the north, and by 59th Place South and a large distribution center to the west, in Kent, Washington (Figure 1). The Ecology Facility Site Identification number is 2099 and Cleanup Site Identification number is 12671. In addition, stormwater discharges from the site are addressed under Industrial Stormwater General Permit (ISGP) #WAR000481.

1.1 Purpose and Objectives

In accordance with the AO, a work plan was prepared for the RI (Landau, 2016) and approved by Ecology in October 2016 (Ecology, 2016b). The RI was conducted in accordance with this work plan. Deviations from the Work Plan are summarized in Section 3 of this report.

The RI objectives are as follows:

- Fulfill the requirements of the 2016 Work Plan,
- Characterize the nature and extent of contamination at the site, and
- Meet the general requirements for a RI as defined by the Model Toxics Control Act (MTCA) Washington Administrative Code (WAC) 173-340-350.

1.2 Report Organization

The main text is organized into ten sections as follows:

- **Section 1 – Introduction** presents information regarding the objectives and approach for the RI.
- **Section 2** – **Site Description** provides information regarding the site development, use, regulatory history, previous environmental investigations, and areas of confirmed or suspected releases.
- **Section 3** – **Remedial Investigation Activities** provides a description of the fieldwork completed as part of this RI, tabulated results, and an assessment of the data quality.
- **Section 4** – **Environmental Setting** includes the geologic and hydrogeologic information for the site, along with a discussion of general regional environmental features.
- **Section 5** – **Conceptual Site Model** includes an evaluation of site-specific potential chemical transport and exposure pathways, including an assessment of beneficial use of groundwater and local surface water quality and use.
- **Section 6** – **Screening Levels** used in this RI are presented in this section.
- **Section 7** – **Nature and Extent of Contamination** presents analytical results of the RI in relation to the conceptual site model and screening levels.

- **Section 8** – **Conclusions** are summarized in this section along with recommendations for future actions.
- **Section 9** – **References** cited in the report.
- **Section 10** – DOF's standard reporting limitations are presented in the **Closing** section.

The RI report also includes multiple tables, figures, and appendices to support the analyses presented in the text.

2.0 SITE DESCRIPTION

The site occupies 26 parcels of land owned by Boeing and operated by Boeing Defense, Space and Security. Site investigation has been conducted by several environmental consultants on behalf of Boeing, as referenced throughout this RI. Relevant contacts are presented in Table 1.

The site is located in the Green River Valley. The Green River is located approximately 0.3 miles west of the site. The average elevation of the site is approximately 25 to 30 feet above mean sea level. Surface topography at and in the vicinity of the site is generally level and slopes slightly downward to the west-northwest toward the Green River (USGS, 1995). The site is zoned M1 for Industrial Park and surrounded by property also zoned for industrial use (Figure 2). The site is located in Section 2, Township 22N, Range 4E and includes the tax parcels listed in Table 2.

2.1 Property Development and Use

The site was developed in the late 1960s to support the National Aeronautics and Space Administration (NASA) Lunar Rover program and since has been primarily used for US Department of Defense projects. Boeing purchased the property from various entities in 1964. Based on available information, the property was previously used for farming and included private homes and out-buildings (Boeing 1990).

The site is currently used primarily for aerospace engineering, research and development, and light manufacturing. The western portion of the site is developed with offices and a cafeteria. The central portion of the site is developed with laboratory, office, and production facilities and support structures including buildings housing mechanical equipment, a pump house, and an electrical substation. The eastern portion of the site consists of paved parking areas, some of which are leased for rental car storage. The Boeing employees' tennis club is located in the northeastern corner of the site. The site stormwater conveyance system includes a stormwater detention pond in the northwestern portion of the Facility (North Detention Pond), and stormwater detention ponds and Mill Creek along the eastern site boundary, and downstream of the operations areas. The site currently operates as a large-quantity generator of dangerous waste under the Ecology Dangerous Waste Regulations (Chapter 173-303 WAC).

The current site layout is shown on Figure 3.

2.2 Regulatory History

The site is currently operating under a Resource Conservation and Recovery Act (RCRA) interim-status permit issued by the US Environmental Protection Agency (EPA). Boeing seeks to remove the Facility from coverage under the permit and entered into the AO with Ecology, the administrator of the RCRA corrective action program, as part of that process.

Work conducted under the AO is managed by the Boeing Remediation Group under project manager Lindsey Mahrt. The regulatory history for the site, including known historical releases and cleanup actions, is presented in Table 3. Several areas on or neighboring the site have been previously investigated under Ecology's Voluntary Cleanup Program (Figure 4).

2.3 Previous Environmental Investigation

Various environmental investigations and remedial actions have been historically conducted at the site to characterize and evaluate soil, groundwater, and stormwater conveyance system solids. Most of

these were completed when old underground storage tanks (USTs) were removed or replaced, or when a portion of the site was evaluated for potential property sale. These investigations were reviewed as part of developing the AO and RI Work Plan. A list of the primary historic environmental reports and communication are provided in Table 4.

2.4 Known and Suspected Releases

The AO established a number of Solid Waste Management Units (SWMUs) and Areas of Concern (AOC) that were the focus of this RI. Several additional areas were also identified in the RI Work Plan based on historical site use and past investigations. These areas are shown on Figure 3. More detailed historical maps are provided in Appendix A. The known and suspected release areas are discussed below, along with historic and current sampling and analytical work.

2.4.1 SWMU-88 and SWMU-89

SWMU-88 and SWMU-89 is the area of former USTs KS-25 and KS-26 in Building 18-43. The USTs contained microfiche process waste (Landau, 2016).

No historical samples have been collected at these SWMUs. Two soil borings (SB-1 and SB-2) were completed as part of this RI to a depth of 15 feet below ground surface (bgs). Soil and groundwater samples were collected and analyzed for metals.

2.4.2 AOC-1 and AOC-3

AOC-1 and AOC-3 is the area of former USTs KS-5 and KS-6 on the west side of the Building 18-54. The USTs contained fuel oil.

Soil samples were collected from this area in 1986 as part of UST removal. Those samples showed total petroleum hydrocarbon (TPH) concentrations in soil around the former UST as high as 11,000 parts per million (ppm), but the exact location of samples is not known (Landau, 2016). Three soil borings (SB-3, SB-4, and SB-5) were completed as part of this RI to a depth of 15 feet bgs. Soil and groundwater samples were collected and analyzed for diesel- and oil-range hydrocarbons, and arsenic.

2.4.3 AOC-2

AOC-2 is the area of former UST KS-7 on the west side of former Building 18-35. The UST contained diesel fuel and an older UST in the same area contained fuel oil.

Several historical sampling events have occurred in this area, as shown in Figure 3. Soil samples were collected in 1986 as part of UST removal. Those samples showed TPH concentrations in soil around the former UST as high as 2,400 ppm, but the exact location of samples is not known. Additional soil samples (S-1, S-2, and S-3) were collected in the area when the replacement UST was removed in 2015 and no contaminants were detected in those samples (Landau, 2016). Four borings were completed as part of investigation of the neighboring “Clearwater” property in 2002-2003 (18-35-1 through 18-35-4). Figure 4 shows the Clearwater area. The Clearwater samples showed low level detections of benzene and vinyl chloride in groundwater, slightly above screening levels (Landau, 2016). Three borings (SB-6, SB-7, and SB-8) were completed as part of this RI to a depth of 15 feet bgs. Groundwater samples were collected and analyzed for volatile organic compounds (VOCs), diesel-range hydrocarbons, and arsenic.

2.4.4 Former milling machine cooling oil release

The former milling machine cooling oil release area is inside Building 18-62. Several historical sampling events have occurred in this area, as shown in Figure 3. Investigations were conducted in 1995 and

2002, and a soil remediation project was performed to address diesel- and oil-range hydrocarbons in soil as an independent action in 2002 that led to a No Further Action (NFA) determination by Ecology for the area in in 2003 (Landau, 2016). Four borings (SB-9, SB-10, SB-11, and SB-12) were completed as part of this RI to a depth of 15 feet bgs. Groundwater samples were collected and analyzed for diesel-range hydrocarbons, mineral oil, and arsenic.

2.4.5 Former jet fuel USTs

The former jet fuel USTs area is located west of Building 18-67. This area had seven USTs. Historical investigations were conducted in this area (Figure 3) including sampling in 1994, 1997, 1998, 1999, and 2001 as part of a Voluntary Cleanup Program remediation for petroleum and aromatic (BTEX) hydrocarbons that culminated in a NFA determination by Ecology in 2003. One boring (SB-13) was completed as part of this RI to a depth of 15 feet bgs to verify current conditions. A groundwater sample was collected and analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), gasoline and diesel-range hydrocarbons, and arsenic.

2.4.6 Former UST KS-1

The former UST KS-1 area is located on the west side of Building 18-42. The UST contained diesel.

Soil and water samples were historically collected from this area when the former UST was removed in 1993 (Figure 3). Sampling at that time indicated low concentrations of diesel-range hydrocarbons (140 milligrams per kilogram [mg/kg]) remained in soil after the tank removal and excavation, but groundwater was not further investigated. Three borings (SB-14, SB-15, and SB-16) were completed as part of this RI to a depth of 15 feet bgs. Groundwater samples were collected and analyzed for diesel-range hydrocarbons and arsenic.

2.4.7 Former UST KS-3

The former UST KS-3 area is located near Building 18-41. The UST contained unleaded gasoline.

Soil samples were historically collected from this area when the former UST was removed in 1992 (Figure 3). Sampling at that time indicated soil contamination had been removed but groundwater was not sampled. Four borings (SB-17, SB-18, SB-19, and SB-20) were completed as part of this RI to a depth of 15 feet bgs. Groundwater samples were collected and analyzed for BTEX, gasoline-range hydrocarbons, and arsenic.

2.4.8 Area-wide arsenic

Area-wide arsenic concentrations in soil and groundwater were identified as a concern in the AO. Several historical investigations of arsenic have been conducted at or near the site between 2010 and 2012 including collection of 54 soil samples in 2010 and 2011, and an area wide evaluation of arsenic in 2012. These investigations did not identify a probable source of arsenic at the site, showing variable concentrations in groundwater ranging from 3.3 to 115 micrograms per liter (µg/L) and low level soil concentrations generally below the MTCA Method A screening level of 20 mg/kg (Landau, 2016). Ten additional soil samples were collected as part of this RI for analysis of arsenic (SB-1 through SB-3 and at each monitoring well boring MW-1 through MW-7). Groundwater samples for arsenic were collected from each monitoring well and from at least one boring at each of the seven areas of concern listed above (SB-1, SB-2, SB-3, SB-8, SB-12, SB-13, SB-14, and SB-17).

2.4.9 SWMU 86

SWMU-86 is the site stormwater conveyance system. Stormwater at the operational areas of the site either infiltrates into unpaved areas, or is captured by the stormwater conveyance system and discharged to Mill Creek via the North Detention Pond located at the northwest corner of the site, or via a series of detention ponds and outfalls along the eastern site boundary (Landau, 2016). The stormwater conveyance system receives runoff from the entire site, including the SWMUs, AOCs, and other areas where Ecology has determined that further investigation is warranted. Stormwater runoff at the KSC is monitored in accordance with the existing stormwater permit; however, Ecology has requested that stormwater also be addressed in the RI because the permit monitoring does not include all of the potential contaminants of concern (PCOCs) for the RI.

The objective of the stormwater conveyance system sampling conducted under the RI was to confirm that the historical data that was summarized as part of developing the RI Work Plan was still representative of current system conditions (Ecology, 2016c). Therefore this RI included sampling of stormwater and sediment from four manholes and three outfalls (Figure 5).

3.0 REMEDIAL INVESTIGATION ACTIVITIES

This section describes the environmental data collected and used to prepare this RI. The work performed included sampling and analysis of soil, groundwater, stormwater conveyance system solids, sediment and stormwater associated with the SWMUs and AOCs that were identified in the AO as areas where further investigation was warranted. The RI field work conducted over the past year used a phased approach and methods, generally consistent with the RI Work Plan (Landau, 2016). The first phase (Phase 1) included collection of soil and groundwater grab samples from each of the locations identified in the AO using direct-push drilling and sampling techniques. The first phase also included collection of samples of solids, sediments, and stormwater from the stormwater conveyance system at locations downstream of the SWMUs and AOCs identified in Section 2. The second phase of the RI (Phase 2) included the installation of monitoring wells at selected locations throughout the site to allow for the sampling and analysis of groundwater, and to monitor seasonal groundwater flow directions and gradients.

Figure 3 shows the locations of soil and groundwater samples and Figure 5 shows the locations of sediment and stormwater samples collected as part of this RI. A summary of the samples collected is included in Table 5. The investigation was performed by DOF, following the methods described in the RI Work Plan and associated Sampling and Analysis Plan (Landau, 2016).

3.1 Phase I Soil and Groundwater Data Collection

DOF completed the Phase I soil and groundwater sampling, between January 24 and 27, 2017. All borings were hand cleared by vactor truck or hand-augering prior to commencing drilling as a safety precaution. Drilling was completed by Cascade Drilling, of Woodinville, Washington using either a truck-mounted Geoprobe 6600 or track-mounted 7730DT drill rig. Soil was continuously collected for screening, logging, and sampling via two-inch diameter macro samplers with acrylic liner.

Soil samples collected for non-volatile parameters were homogenized using decontaminated or disposable equipment prior to transferring to laboratory-supplied containers. Soil samples collected for volatile parameters were collected in accordance with US Environmental Protection Agency Method 5035A.

Grab groundwater samples were collected using a groundwater sampler consisting of a four-feet long, wire-wrapped, stainless-steel screen (0.010-inch slot size) with a retractable protective steel sheeth. Groundwater samples were collected via low-flow purging with a peristaltic pump and disposable tubing. Samples for dissolved metals were field-filtered using a 0.45 micron, in-line disposable filter.

3.2 Phase 2 Groundwater Monitoring Well Installation, Soil Sampling, and Groundwater Monitoring

DOF completed the Phase 2 soil sampling, groundwater monitoring well installation and development between April 11 and 18, 2017 with some minor modifications to well locations (Figure 3) as discussed with Ecology during a site walk on April 10, 2017. Cascade Drilling installed the monitoring wells using a hollow stem auger drill rig. Soil was continuously collected for screening, logging, and sampling via split spoon samplers. Each monitoring well was constructed with two-inch diameter, flush-threaded, Schedule 40 PVC pipe, and a five-feet long, 0.010-inch slotted screen set to intersect the water table.

Filter pack consisted of pre-washed, pre-sized 20/40 silica sand. Full construction detail is provided on the well construction logs included in Appendix B. Each well was developed following the protocol in the RI Work Plan (Landau, 2016).

DOF completed the Phase 2 water level elevation measurements and groundwater sampling on May 4, 2017. Water level elevations were measured using an electronic water level indicator prior to well purging and sampling. Each well was sampled following low flow sampling techniques via a peristaltic pump and dedicated tubing, as detailed in the RI Work Plan (Landau, 2016). Groundwater samples were collected directly into laboratory containers as soon as groundwater parameters stabilized. Samples for dissolved metals were field-filtered using a 0.45 micron, in-line disposable filter.

DOF performed the second and final round of water level measurements on September 28, 2017.

3.3 Stormwater Conveyance System Sampling

DOF deployed sediment trap samplers in the four manholes (20.237, 20.235, 16.12, and 15.10) on December 15, 2016, in cooperation with Boeing and their confined-space contractor Stericycle. Sediment trap samplers were Ecology-style open mouth bottle traps and were constructed and positioned per the 2009 Ecology Standard Operating Procedures for inline sediment traps, with some minor changes. Changes were made to mounting hardware in order to facilitate inspection and checking of sediment accumulation levels in the bottles. The sediment traps were not bolted into place in the stormwater pipe, but were instead mounted to a stainless steel adjustable rod that was docked on a mounting plate near the top of the manhole. This allowed for a single confined space entry during installation with no confined space necessary for monitoring of the bottles.

DOF monitored rain events during December, 2016 and mobilized to collect water samples from outfalls and manholes but sufficient flow was not observed during field events to allow for sample collection during December. DOF monitored rain events and returned to collect samples on January 18 and 20, 2017. All seven stormwater sample locations identified in the RI Work Plan were sampled and submitted to Analytical Resources Inc. (ARI) for analyses. All samples were collected using a swing sampler.

DOF completed the required sediment sampling between May 4 and June 29, 2017. Sediment samples in the vicinity of outfall OF16 and the North Detention pond were collected in May. Because of difficulty with stream bed armoring, the sample in the vicinity of outfall OF20 was collected during a second attempt in June. Samples were collected from the upper 10 centimeters of the sediment surface using a decontaminated stainless steel spoon or swing sampler.

Sediment traps were periodically checked over the course of the past year. During several inspections, the water level in the larger stormwater pipes (20.237 and 20.235) appeared to be at a level consistent with the creek water level, indicating back flow may occur at times. The RI Work Plan recommended pulling the traps for sample collection after six months; however, field checks showed very little accumulation in the trap samplers after the initial six months so the traps were left in place to collect additional sediment. As of the writing of this report minimal sediment had accumulated. DOF plans to pull the sediment trap samples in December 2017 and send available sample volume to the analytical laboratory to attempt analyses of as many of the RI Work Plan anticipated compounds as feasible.

3.4 Data Quality Assessment

Table 5 lists the samples collected as part of the 2017 RI. Samples were collected following the field and analytical methods described in the RI Work Plan and associated Quality Assurance Project Plan (QAPP) (Landau, 2016). The majority of samples were analyzed by Boeing's contracted environmental laboratory, Eurofins Lancaster Laboratories in Lancaster, Pennsylvania. Stormwater and storm sediment samples were analyzed by Analytical Resources Inc. in Tukwila, Washington as they were already familiar with the Ecology approved stormwater and sediment collection and analysis methods that were implemented as part of this RI.

Once the laboratories produced reports and Electronic Data Deliverables (EDDs) for the data produced as part of the RI, the data were reviewed and validated, consistent with the QAPP by EcoChem, Inc. Analytical and data validation reports have been submitted to Ecology as part of bimonthly progress reports and are included on CD as Appendix C. All data produced as part of this RI has also been uploaded to Ecology's Electronic Information System (EIM), in accordance with the requirements of the AO.

All data were found to be usable with only minor qualification required, as discussed in individual data validation memoranda submitted to Ecology previously with the RI data. Data tables included in this RI include data validation flags where data has been qualified.

4.0 ENVIRONMENTAL SETTING

This section describes the geologic and hydrogeologic information for the site, along with general regional environmental features.

4.1 Physical and Hydrological Setting

The site is located in the Green River Valley, situated between Seattle and Tacoma. The Green River originates on Mt. Rainier and flows generally northward in the Duwamish River which discharges to Elliott Bay in Seattle. The valley is approximately two miles wide and generally flat with higher glacial uplands defining the valley margins.

The site is located at approximately 25 to 30 feet above mean sea level and is part of the Lower Mill Creek drainage basin as shown on the drainage system map for the area of Kent (Figure 6). This map includes stormwater detention facilities such as the North Detention Pond on the site and similar detention ponds located south of the site. Discharge areas and surface water bodies identified in the area surrounding the site include:

- North Detention Pond (stormwater)
- Mill Creek and associated drainage ditch on 68th Avenue South
- The Green River

These areas are shown on Figures 1 and 5. The North Detention Pond is part of the site's stormwater conveyance system. The drainage ditch connected to Mill Creek runs parallel and abuts the site, receiving stormwater discharge from the site, as well as from other stormwater discharges in the area. The Green River is located approximately 0.3 miles west of the site. Mill Creek ultimately discharges to the Green River approximately 3.5 miles north of the site via a tributary named Springbrook Creek.

4.2 Geology

Site and area geology were presented in the RI Work Plan; see Appendix D (Landau, 2016). Additional geologic information was collected as part of the RI by visually logging each boring conducted during the 2017 RI and reviewing information from historical reports. Twenty-seven borings were advanced in 2017, as shown in Figure 3. Boring logs are included in Appendix B. Where available, historical boring logs were also reviewed. These have also been included in Appendix B for reference.

Visual logging performed during this RI revealed soils similar to those anticipated by the regional geology review described in the RI Work Plan. Soils generally consisted of poorly graded sands and silts. Generally the upper six to ten feet below grade was a poorly graded sand with some gravel and silt. Below the upper layer a silt layer was frequently encountered, approximately two to four feet in thickness. This silt layer was not continuous across all borings, though material consistently graded to silt and silty sand below the upper poorly graded sand encountered at the surface. At some locations interbedded silts and sands were noted. The soil lithology observed during this RI is presented in cross-section in Figures 7 and 8.

Boring logs reviewed from historical site investigations conducted on or neighboring the site showed similar lithology. Fine to medium sands were consistently found near the surface grading to finer grained silts and silty sands at greater depths. All localized boring logs reviewed were less than 20 feet bgs.

However, additional logs were identified through Ecology's well database (http://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap) that included borings to a depth of 70 feet. These are included in Appendix B. These deeper borings note similar geology with descriptions such as "unconsolidated sediments" from 0 to 60 feet bgs, "fine to silty sands" from 0 to 20 feet, and other consistent descriptions.

4.3 Hydrogeology

Regionally, the Puget Sound aquifer system is composed of unconsolidated alluvial, glacial, and interglacial sediments of Quaternary age (Vaccaro et al., 1998). This typically consists of alternating coarse and fine grained deposits serving as local aquifers and aquitards. The Green River valley is a glacially carved valley with infilling of alluvial sediments.

In Western Washington, the glacial uplands are generally recharge areas where groundwater flows downward and towards the adjacent valleys. The valleys are generally groundwater discharge areas where groundwater discharges to surface water. Groundwater generally flows towards larger surface water features within these flow systems, such as the Green River. However, local minor surface water features can also influence shallow groundwater flow.

The near-surface groundwater at the site is generally characterized as a shallow, single-aquifer system that is relatively flat (Landau, 2016). Historically shallow groundwater had been encountered between seven and 11 feet bgs, which is generally consistent with the depths measured in monitoring wells as part of this RI.

Table 6 summarizes seasonal groundwater elevations measured at the seven wells installed as part of this RI. All wells were surveyed to allow for translating measurements of depth to water to groundwater elevations. Survey data is included in Appendix E. Water levels were measured during the wet season in May 2017 and dry season in September 2017. Elevations measured during the wet season were 1.7-4.7 feet higher than during the dry season, depending on the area of the site.

Groundwater elevation data were reviewed to determine groundwater flow patterns and rates at the site. Figures 9 and 10 present the groundwater elevation data and flow direction for the May and September monitoring events, respectively. Groundwater flow was generally northward during both events with a north-northeast trend in May towards the surface water ditch that runs parallel to the site along 68th Avenue South. In September, when water levels were lower, flow direction was more north-northwest towards the North Detention Pond, which was potentially acting as a discharge point.

Groundwater flow rates have been calculated based on an assumed hydraulic conductivity of 1E-2 to 1E-3 cm/sec, consistent with the silty sands observed at the site in shallow groundwater zone (Freeze & Cherry, 1979). Using the calculated average hydraulic gradients from May and September 2017), the linear velocities were 0.112 for May and 0.251 feet per day for September where:

$$V = Ki/n_e$$

Where: V= average linear velocity (feet/day)
K = hydraulic conductivity (feet/day)

i = hydraulic gradient
(feet/feet)
n_e = effective porosity (fraction)

Calculations are summarized in Table 7. Actual flow paths are likely to be influenced by seasonal groundwater discharge to or from the ditch on 68th Avenue South and the North Detention Pond.

5.0 CONCEPTUAL SITE MODEL

A preliminary site conceptual model (CSM) was presented in the RI Work Plan (Landau, 2016), based on previous investigations at and near the site. Using the new information collected as part of this RI, the conceptual model was updated and is described below.

The CSM combines the hydrogeologic conceptual model with possible receptors and exposure pathways. Human and environmental receptors are based on land use and identified activities at and near the site, and determines if a receptor has the potential to be exposed to contamination caused by site releases. If a potential likely exposure to contamination is present, a complete exposure pathway is assumed to exist. A potentially complete pathway exists when exposure to contamination is considered possible but unlikely. An incomplete exposure pathway exists when there is no possible exposure.

Separate pathways are evaluated in the CSM for human health and ecological receptors that may have exposure pathways linked to releases. A block diagram visually depicting the CSM is presented in Figure 11. The block diagram illustrates the potential sources of contamination, generalized hydrogeologic information, and constituent distribution and transport at the site that was evaluated as part of this RI.

5.1 Sources

The primary potential sources of contamination at the site are historical aerospace-related operations and leaks from USTs, though in several cases the sources have been removed, as discussed in Section 2.4. This RI also included investigation of the stormwater conveyance system as a potential source of contamination if hazardous substances leave the site.

5.2 Local Land Use

The current and future use of the site is industrial. Based on WAC 173-340-200, the site is defined as "*industrial property*," meaning a property that has been characterized by, or is to be committed to, traditional industrial uses, and that is zoned for industrial use under land use planning under the Revised Code of Washington (RCW), Chapter 36.70A (Growth Management Act) or zoned for industrial use and adjacent to properties currently used or designated for industrial purposes. In addition, the following criteria established under WAC 173-340-745(1) for identification of an industrial property allow for establishing industrial soil cleanup standards for the site if it is expected that the site will remain in industrial land use for the foreseeable future:

- The primary potential exposure is to adult employees of businesses located on the industrial property.
- Access to the industrial property by the general public is not allowed or is highly limited and controlled.
- Food is not grown on the property.
- Operations are characterized by use and storage of chemicals, noise, odors, and truck traffic.
- The land surface is primarily covered by buildings, structures, and paving, minimizing potential exposure to the soil. Part of the site is currently unimproved but the majority of the site is covered.
- Support facilities on the site, such as offices and other facilities, are primarily intended to serve the industrial operations and not the general public.

- If necessary, institutional controls will be established at the site in accordance with WAC 173-340-440 to limit potential exposure to residual hazardous substances. These institutional controls shall include, at a minimum, placement of a covenant on the property restricting use of area impacted with hazardous substances to industrial property uses.

The site is located within the City of Kent's designated manufacturing/industrial center. The City of Kent's Comprehensive Plan adopted implementing zoning regulations under the Growth Management Act (Chapter 36.60A. Revised Code of Washington), which designated a manufacturing/industrial center and discourages and limits land uses other than manufacturing, high technology, and warehousing within the boundaries of the center.

5.3 Groundwater Beneficial Use

The highest beneficial use of groundwater at the site was evaluated to determine whether human or environmental receptors have the potential to be exposed to PCOCs in groundwater. The designation of the highest beneficial use of groundwater in a particular area is established by several different agencies, including Ecology, the Washington State Department of Health, and county and city governments. The requirements, rules, and guidance of each of these agencies were considered in the determination of the highest beneficial use of groundwater.

Public records for wells identified in the vicinity of the site were reviewed as part of this RI. King County's Groundwater Protection Program Groundwater Well Data Search (http://green2.kingcounty.gov/groundwater/well-data-search.aspx) website was used to identify wells near the site. Wells found are shown on Figure 12 and available data is summarized in Table 8. Water level data was available for one of the wells, the deepest one (155 feet); while water quality data was not available for any of them in King County's database.

Data for the City of Kent water supply (Supply ID 38150) was reviewed using the Sentry database (https://fortress.wa.gov/doh/eh/portal/odw/si/findwatersystem.aspx) to review water quality data for site PCOCs identified in the RI Work Plan. No site PCOCs were listed as having shown an exceedance in the Sentry samples. While specific well locations are not provided, this database shows that no supply wells are located in the same Section/Township/Range as the site. All wells are in Section 22N, Range 5E or 6E.

These database reviews confirmed:

- Water quality records are not readily available for any sampling recorded at the nearest water wells identified in this RI.
- Historical City of Kent Sentry water quality data do not indicate elevated concentrations of site PCOCs.

The City of Kent does not allow the installation of private wells in areas serviced by a municipal water purveyor, which includes the site area (Kent City Code Section 11.06.800.F). Land use records, zoning, and public well records indicate that groundwater at the site is not a current source of drinking water.

5.4 Transport and Exposure Mechanisms

The potential contaminant migration pathways and media of concern remain unchanged from those established in the RI Work Plan. Additional site investigation conducted under this RI confirmed that the

site is generally underlain by poorly graded sand with silt fill material, below which a finer grained silt or silty sand is found. Groundwater was typically encountered at depths between 6.5 and 12 feet bgs, and slightly deeper (14 bgs) beneath buildings. Stormwater runoff from the site either discharges to Mill Creek via a series of outfalls or infiltrates into unpaved areas.

The **pathways** of potential concern at the site, as shown in Figure 11 are:

- Leaching of potential soil contaminants from soil to groundwater.
- Possible discharge of shallow groundwater to nearby surface water bodies (North Detention Pond and Mill Creek).
- Potential volatilization of volatile contaminants in soil or groundwater to soil gas and air with migration into buildings.
- Transport of potential contaminants to surface water via the stormwater conveyance system.

Assessment of these pathways identified the **media** of potential concern to be soil, groundwater, air, stormwater conveyance system solids, and surface/stormwater, as was described in detail in the RI Work Plan (Landau, 2016).

Potential **receptors** include those that could contact the media of potential concern via the pathways. Based on current and anticipated future land use of the site potential receptors are:

- Site workers – Current use of the site is industrial, though commercial use could be considered in the future. Workers include construction and industrial working at the site.
- Terrestrial ecological receptors (i.e., wildlife) – Most of the site is paved or covered with buildings; however, undeveloped and vegetated areas are present on and neighboring the site, as discussed below. Wildlife are considered potential receptors for the site.
- Freshwater benthic and aquatic organisms – Based on the site's proximity to Mill Creek, benthic organisms in sediment and aquatic organisms in Mill Creek are considered potential receptors if contaminants present at the site migrate to the creek above screening levels.

Under MTCA, a terrestrial ecological evaluation (TEE) is required unless the site is shown to be exempt under WAC 173-340-7491. The site was assessed following the TEE procedures under WAC 173-340-7491 and- 7492. The site does not qualify for an exemption to the TEE (based on undeveloped land on and near the site) so a simplified TEE was performed under WAC 173-340-7492(2), as shown in Table 9. Based on those results, per WAC 173-340-7492(1)(d) the soil cleanup values in MTCA Table 749-2 still apply for screening of site data. These values were incorporated in the RI Work Plan screening levels initially defined for the site.

6.0 RI SCREENING LEVELS

This section outlines the screening levels used in this RI. Screening levels were established for affected media appropriate for the land use and relevant exposure pathways identified in the CSM.

The site meets criteria established in WAC 173-340-200 and 173-340-745 for a site to be defined as an industrial property, as described in Section 5. Although there is a potential for the property to be used sometime in the future for residential use (and therefore residential exposure was considered in the CSM as a potentially complete exposure pathway), the property and surrounding industrial park are industrial and are expected to remain industrial for the foreseeable future, and institutional controls will be evaluated for inclusion as part of any cleanup action, to restrict use of affected areas of the property to industrial uses.

Screening levels must be protective of the pathways established in the CSM, including the following media exposure pathways:

- Groundwater – the groundwater-to-surface water pathway;
- Groundwater – Incidental ingestion and dermal contact by construction workers of hazardous substances that are present in groundwater;
- Groundwater – Inhalation by site workers of volatile hazardous substances migrating to air;
- Soil – Incidental ingestion or dermal contact by site utility workers with hazardous substances that are present in subsurface soil;
- Soil – Exposure by site workers through inhalation of hazardous substances that are present in surface soil that have migrated as windblown or fugitive dust during construction activities;
- Soil – Inhalation by site workers of volatile hazardous substances migrating to air;
- Soil – Contact by terrestrial wildlife with hazardous substances that are present in soil;
- Soil – Groundwater pathway (protective of a groundwater level that accounts for all groundwater-related pathways including use as a drinking water supply);
- Stormwater Conveyance System Solids – If contaminants at the site exceed screening levels and reach the waters or sediments of Mill Creek (e.g., through stormwater runoff), benthic organisms may be exposed to hazardous substances present in the biologically active zone of sediment or contaminated organisms may be ingested as prey, as well as incidental ingestion of contaminated sediment, by higher trophic-level organisms (e.g., foraging fish, aquatic birds, etc.); and
- Stormwater - If contaminants at the site exceed screening levels and reach the surface water of Mill Creek (e.g., through stormwater runoff), aquatic organisms may be exposed to hazardous substances in surface water, or aquatic organisms contaminated by hazardous substances may be ingested as prey by higher trophic-level organisms in the food chain (e.g., foraging fish, aquatic birds, marine mammals, etc.), or surface water and aquatic organisms contaminated by hazardous substances may be incidentally ingested by site workers.

PCOCs were identified in the RI Work Plan (Landau, 2016) based on the potential sources identified in the AO and those detected in historical sampling and remediation, as discussed in Section 2. PCOCs are as follows:

- Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc),
- Petroleum hydrocarbons,
- Selected VOCs, and
- Polycylic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) specifically for SWMU 86, the stormwater conveyance system only.

The RI Work Plan (Landau Associates 2016) identified screening levels that were used in the RI Work Plan to screen existing data and to evaluate proposed reporting limits for analytical data collected during the RI. These screening levels were reviewed and updated where necessary, as described in the subsections below.

6.1 Soil Screening Levels

Soil screening levels developed in the RI Work Plan were based on MTCA Method B cleanup levels; however given the industrial nature of the site, MTCA Method C levels are appropriate, but do not change the screening levels for the site. Soil screening levels developed in the RI Work Plan were reviewed and updated in this RI by determining the lower values between the following:

- MTCA Method C - Industrial Cleanup Level based on direct contact/ingestion obtained from the CLARC database website (Ecology, 2017).
- MTCA Method A Soil Cleanup Levels for Industrial Land Use (MTCA Table 745-1) for constituents with no available Method C cleanup levels.
- Soil cleanup levels protective of groundwater (Ecology, 2017)
- Levels protective of terrestrial ecological receptors (WAC 173-340-900 Table 749-2).

Cleanup levels also include consideration of natural background concentrations in soil (WAC 173-340-709) and therefore RI screening levels were adjusted up where relevant. The RI soil screening levels are presented in Table 10.

6.2 Groundwater Screening Levels

Groundwater screening levels were developed in the RI Work Plan to be protective of drinking water and surface water. As discussed in Section 5 the site is zoned industrial, groundwater at the site is not a current source of drinking water.

Groundwater screening levels were developed in the RI Work Plan and reviewed and updated in this RI by determining the lower of the value between the following:

- MTCA groundwater table values obtained from the CLARC website (Ecology, 2017):
  - MTCA Method A levels for constituents that do not have a Method B level available; and
  - MTCA standard Method B levels based on drinking water, which include Federal

maximum contaminant levels.

- MTCA groundwater values protective of indoor air obtained from the CLARC database (Ecology, 2017). These values were not initially included in the RI Work Plan screening levels but have been included for consideration in the RI.

In addition, surface water standards were considered as part of screening groundwater data in this RI, including consideration of:

- Surface water applicable or relevant and appropriate regulations (ARARs):
  - Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A) – Acute and Chronic effects, Aquatic Life, Freshwater;
  - National Recommended Water Quality Criteria (Clean Water Act §304) – Freshwater, Acute and Chronic effects, Aquatic Life and for the Protection of Human Health, Consumption of Water and Organisms and Consumption of Organisms Only; and
  - National Toxics Rule (40 Code of Federal Regulations 131) – Freshwater, Acute and Chronic effects, Aquatic Life, and Human Health, Consumption of Water and Organisms.
- MTCA Method B Surface Water levels, calculated using CLARC tables if a federal or local surface water value is not found in the ARARs (Ecology, 2017).

The RI groundwater screening levels are presented in Table 11. The screening level changed for four PCOCs from the levels presented in the RI Work Plan; chromium was lowered to 10 µg/L based on conservatively including values for hexavalent chromium, selenium was raised to 5 µg/L and benzene was lowered to 0.58 µg/L based on current values in CLARC (Ecology, 2017), and xylenes was lowered to 310 µg/L based on levels protective of the vapor intrusion pathway.

6.3 Stormwater Conveyance System Screening Levels

The RI Work Plan (Landau, 2016) established screening levels for material sampled in relation to the stormwater conveyance system, for both solids and stormwater. These values were reviewed and updated in this RI.

As described in the Work Plan, there are no screening criteria under MTCA or Sediment Management Standards (SMS) for stormwater conveyance system solids. Given that stormwater at the site discharges to Mill Creek the screening levels used to evaluate these stormwater conveyance system data in this RI provide conservative values to use in evaluating potential sources of contamination to Mill Creek. For solids, the levels were based on the SMS, WAC 173-240 (which MTCA references) and consider:

- Freshwater sediment cleanup objectives (SCOs; WAC 173-204-340), the concentration below which effects to biological resources are unlikely.
- Freshwater sediment cleanup screening levels (CSL; WAC 173-204-53), the concentration above which minor adverse biological effects may be expected.

Similarly, for stormwater data collected as part of the RI, the RI Work Plan proposed screening levels based on:

- MTCA Method B levels for fresh surface water, protective of aquatic organisms and human ingestion of water and aquatic organisms.

The stormwater conveyance system is subject to routine maintenance as required by the site Stormwater Pollution Prevention Plan, which includes catch basin and system-wide periodic cleaning, and water is monitored as part of the site ISGP permit, but is not monitored for all PCOCs. However, the ISGP does include stormwater criteria (benchmarks) for additional constituents measured as part of this RI. Those benchmarks have been applied in screening stormwater data.

Under WAC 173-340-730 Surface Water Cleanup Standards "*Surface water cleanup levels shall be based on estimates of the highest beneficial use and the reasonable maximum exposure expected to occur under both current and potential future site use conditions. The classification and the highest beneficial use of a surface water body, determined in accordance with chapter 173-201A WAC, shall be used to establish the reasonable maximum exposure for that water body*." Therefore the status of Mill Creek was further evaluated as part of this RI to determine applicability of the surface water screening levels used in the RI Work Plan.

Tables 12 and 13 summarize the different stormwater conveyance system screening levels used to evaluate data in this RI.

7.0 NATURE AND EXTENT OF CONTAMINATION

This section presents and compares the current analytical results to screening levels and historical results to refine the list of COPCs and media of concern. The results of this evaluation are also used to determine if data gaps exist or further action is warranted for the different areas of concern identified in the AO.

7.1 Soil

Soil sample results are presented in Table 14. Arsenic was the only constituent that was detected above screening levels. Arsenic was detected in all 10 soil samples collected as part of the RI and slightly exceeded the screening level in the two soil borings conducted near SWMU-88/89, the former USTs under Building 18-43 in the north end of the site. The highest concentration was 8.59 mg/kg, slightly above the screening level of 7.3 mg/kg; however, the average concentration calculated from the 10 samples collected as part of this RI is 4.89 mg/kg.

These values are consistent with historical data from nearby areas such as the former Striker property where two of 12 soil samples were also above 7.3 mg/kg with a high of 8.6 mg/kg and with the site's location with respect to the Tacoma Asarco Smelter Plume1[1].

No high concentration source areas for arsenic were identified. The two samples (SB-1 and SB-2) that had detections above 7.3 mg/kg were collected near the water table from locations beneath a building; whereas other samples were collected from shallower zones, generally 2.5 feet bgs. It is not expected that arsenic in soil at this location presents a risk to the receptors identified in the CSM or creates a complete pathway for exposure because the area is underneath an existing building, at a depth of over 10 feet bgs, and concentrations are relatively low and not indicative of a direct release.

7.2 Groundwater

Groundwater sample results are presented in Table 15. Twenty locations (SB-1 through SB-20) were sampled via temporary borings and seven permanent monitoring wells installed and sampled as part of this RI (in addition to being used for seasonal water level measurement).

Petroleum-related CPOCs

Petroleum hydrocarbons and petroleum-related VOC CPOCs were not detected above screening levels in any of the groundwater samples.

VOCs

Vinyl chloride was detected near the laboratory detection limit, and above the screening level, in two of the three samples analyzed for vinyl chloride (SB-6 and SB-8). The concentrations at both locations were 0.19 µg/L, over the screening level of 0.025 µg/L. While above the screening level, these values are not indicative of an unidentified source of contamination contributing to the detections initially detected during the Clearwater investigation. These values are lower, confirming the area where vinyl chloride is detected is small, and may be declining naturally as concentrations are an order of magnitude lower than detected during the Clearwater investigation. Nor were other VOCs detected above screening

[1] http://www.ecy.wa.gov/programs/tcp/sites_brochure/tacoma_smelter/2011/ts-hp.htm

levels at these two locations (or any others at the site). Concentrations in the area of SB-6 and SB-8 do not warrant remedial action because:

- No chlorinated VOCs were detected in any of the samples collected in the downgradient surface water bodies (Section 7.3);
- Detected concentrations are relatively low in comparison to drinking water based screening levels (below both Maximum Contaminant Levels and MTCA Method A cleanup levels) and groundwater is not expected to be a source for drinking water as described in Section 5; and
- Concentrations are below screening levels protective of the vapor intrusion pathway (0.347 ug/L), as shown in Table 11, which would be the receptor pathway of greatest concern for the site, if future construction developed a building in this area of the site.

Metals

One groundwater sample, from well MW1, showed copper (0.0398 mg/L), lead (0.0014 mg/L), zinc (0.0356 mg/L), and arsenic (0.0852 mg/L) detected at concentrations above screening levels. Metal concentrations were below screening levels in all other samples except for arsenic.

MW1 is the farthest north sampling point conducted as part of the RI at the downgradient end of the site. Concentrations of copper, lead, and zinc were relatively low and not indicative of a previously unidentified source area. Historical results were reviewed to determine if the detections at MW1 are consistent with previous sampling evaluations at or near the site. Twenty-six groundwater samples were analyzed for metals as part of the Clearwater investigations of the east side of the site between 2001 and 2003 (Figure 4). This area of the site was issued a No Further Action letter by Ecology for soil and groundwater under the Voluntary Cleanup Program and removed from the Kent Space Center Site in 2012 contingent on filing a restrictive covenant (Ecology, 2003 and 2012). These samples showed similar results (Table 15):

- Copper concentrations less than 0.0005 to 0.0303 mg/L vs. 0.0398 mg/L detected at MW1 in 2017
- Lead concentrations less than 0.001 to 0.007 mg/L vs. 0.0014 mg/L detected at MW1 in 2017
- Zinc concentrations less than 0.004 to 0.122 mg/L vs. 0.0356 mg/L detected at MW1 in 2017

Ecology basis for decision on the Striker property presumed similar site conditions to the full Kent Space Center site including groundwater not serving as a drinking water source and the site's relative distance from the downgradient surface water receptor of concern, the Green River. Based on these consistent results these COPCs, results do not warrant further investigation.

Previous investigations of area-wide arsenic did not identify a probable source at the site, showing variable concentrations in groundwater ranging from 0.0033 to 0.115 mg/L (Boeing, 2011 and 2012). Concentrations collected as part of this RI were similarly highly variable ranging from less than 0.002 to 0.266 mg/L from direct push samples and 0.0033 to 0.0852 mg/L from monitoring well samples. As part of this RI, historical data previously presented to Ecology in relation to the former Striker property have been tabulated and included in this RI (Table 15) to provide area wide context. The 2011 and 2012 memoranda that presented available data and assessment of nature and extent are included in

Appendix F. Similar to those past sampling results, the RI investigation data indicate that the elevated concentrations of arsenic detected in groundwater at several locations appear to be isolated and are not associated with known or potential sources of arsenic.

Iron oxides containing arsenic can be dissolved in groundwater in the presence of total organic carbon, whether from naturally-occurring organic matter (as in the case of former wetlands) or from anthropogenic sources of organic carbon, such as releases of chlorinated compounds or TPH. In areas with high total organic carbon concentrations (whether natural or anthropogenic), background arsenic concentrations may appear elevated due to arsenic becoming more mobile in the resulting reducing conditions (Welch et al., 2000). The soil at the site showed high silt content, potentially rich in total organic carbon and influencing higher arsenic concentrations in groundwater.

An updated map of area-wide detections is included as Figure 13. Based on the consistent analytical data, the arsenic appears to reflect area-wide groundwater conditions and does not appear to be due to a site-specific source; therefore; no further investigation is warranted regarding the concentrations of arsenic detected in groundwater at the site. The site is in an industrial area where the shallow groundwater is not used for drinking purposes (Section 5 above); therefore, the contamination is not considered to pose a threat or potential threat to human health or the environment Additionally, Boeing is willing to file an environmental covenant for the property to restrict the use of groundwater from the site.

General Chemistry

General chemistry data were collected as part of the RI to refine the understanding of site groundwater conditions. Data are included in Table 16 and summarized below.

- Nitrate – less than 0.1 to 1.6 mg/L
- Sulfate – less than 0.1 to 36.7 mg/L
- Ferrous Iron – 1.5 to 6.5 mg/L
- pH – 6.20 to 7.21
- Redox – Negative 18.6 to positive 7.5 mV
- Dissolved Oxygen – 0.12 to 1.52 mg/L
- Specific Conductivity – 93 to 1092 µS/cm

These data indicate that the groundwater is consistent with what is to be expected of the regional geology and hydrogeology. Groundwater onsite has a neutral pH, low conductivity, and varies between slightly reducing and slightly oxidized (with nitrate, sulfate, and iron concentrations varying generally consistent based on those parameters). This is typical of silty sands with limited bioavailable organic material at relatively shallow depths where local recharge of oxygenated rain water or slightly higher amounts of organic material in the near vicinity of a well could lead to minor variations in general chemistry.

7.3 Stormwater Conveyance System

This section describes the results of investigation of the stormwater conveyance system at the site including review of historical assessment, regional studies, and specific data collected in accordance with the RI Work Plan.

7.3.1 Potential Sources of Contamination

Potential sources of PCBs, metals, oils, and sediment that might get into the stormwater conveyance system are building materials, landscaping, and vehicular traffic onsite. No significant industrial operations currently occur outside. The majority of the site is impervious (buildings, paving, concrete) with some areas of landscaping or grass covered lots. The majority of buildings are steel which may have zinc oxide paints on siding and roofs. The majority of parking onsite is administrative, with some delivery vehicles and outdoor forklift traffic. Additionally, some areas of the site are subleased for commercial parking of vehicles. Most of the site is enclosed by chain link fence, a potential source of zinc. Traffic is relatively low compared to other industrial facilities and parking is underutilized. Sediment buildup and oil leaks from the current use are expected to be low.

As part of developing the RI Work Plan Boeing reviewed building construction information for the site and compared it to other Boeing properties where building materials were linked to being a source of PCB contamination in their respective stormwater systems. Based on that review, Boeing found that the majority of the PCB-containing caulk that was found to be a PCB source at other Washington properties was found in concrete joints within flight line apron areas. Where PCBs were found in building materials, the buildings were constructed with pre-cast concrete panels joined together with PCB-containing caulk. The Kent Space Center site does not have this type of concrete panel building construction, and there are no flight line areas at the site. The one area identified as having had a potential PCB release was the Puget Sound Energy (PSE) substation. PSE investigated the soil and groundwater near the substation in 2009 and provided that data to Ecology in 2016. No soil or groundwater samples from that investigation had detections of PCBs above MTCA Method A cleanup levels (Boeing, 2016).

There is no indication of a known or suspected release of PCBs from manufacturing or processing areas. Other low-level sources of PCBs that have shown to be prevalent and challenging to eliminate in Washington include de-icers and paints used on roads on public and private property. Several studies have been conducted in Washington to evaluate these types of background levels and sources including:

- Seattle Public Utilities published a study in 2009 that showed PCBs were prevalent in street sweeping solids collected throughout the City, particularly in industrial neighborhoods where the study found PCBs in 87% of samples collected at concentrations ranging from 34 to 910 µg/kg and over 1 ppm in one sample (SPU and Herrera, 2009).
- The City of Spokane published a study in 2015 summarizing results of testing nearly 50 samples of municipal products for PCBs (City of Spokane, 2015). PCBs were detected in all but two of the products that were sampled in the parts per trillion to ppm range.
- Ecology published a similar study in 2016 that evaluated the presence of PCBs in 201 consumer products (in 216 total samples). Three samples contained total PCBs over one ppm, 10 samples contained PCBs over 0.1 ppm, and 156 samples contained PCBs over 0.001 ppm (1 part per billion) (Ecology, 2016d).

7.3.2 Historical Evaluations

Regional Studies

King County collected sediment samples in Mill Creek as part of its Lower Duwamish Waterway Source Control Report (King County, 2014). Samples were collected immediately upstream and downstream of the site. Samples FS318 (upstream) and DT318 (downstream), shown on Figure 14, contained PCB sediment concentrations of 52 micrograms per kilogram (µg/kg) and 74 ug/kg, respectively and total PAH concentrations of 2,878 ug/kg and 5,117 ug/kg, respectively. The detected concentrations of both PCBs and PAHs in these samples are below the SMS sediment cleanup objectives (SCOs: 110 ug/kg for PCBs and 17,000 ug/kg for total PAHs) and the sediment cleanup screening levels (CSLs 2,500 ug/kg for PCBs and 30,000 ug/kg for total PAHs).

In 2005, Ecology conducted a study of zinc and copper concentrations in Lower Mill Creek based on the area being a heavily industrial area with many IGSP holders discharging to the creek, and results of an earlier study conducted by King County in 2002-2003 that found that the Lower Mill Creek exhibited high fecal coliform bacteria, low dissolved oxygen, and high total nitrogen. The creek was assigned a Water Quality Index score of 1 in that study, where values under 40 are "of concern" and values above 80 are "likely meeting expectations for water quality" (Herrera, 2004). Specific results from the King County's Lower Mill Creek sampling location B317 (Figure 14) showed:

- Temperature - 16.5 degrees C
- Dissolved Oxygen - 5.8 mg/L
- Alkalinity - 85.6 mg/L
- Turbidity - 13.1 NTU (during base flow) and 27.4 NTU (during storm flow)
- Median Total Suspended Solids - 6.6 mg/L (during base flow) and 31.5 mg/L (during storm flow)
- Hardness - 31.5 mg/L (during storm flow)
- Fecal coliform bacteria – 662 CFU/100 mL
- E. Coli Bacteria – 12,000 CFU/100 mL (during base flow)
- Total nitrogen - >1 mg/L

These results do not meet Surface Water Quality criteria under WAC 173-201A-200 that would be expected to support aquatic life, which specify minimum dissolved oxygen levels of 6.5 to 9.5 mg/L, amongst other things, nor do they meet recreational uses which specify fecal coliform levels of no more than 50-200 CFU/100 mL. This sampling location was not directly up or downgradient of the site, but was less than one mile southeast on the portion of Mill Creek that flows past the site as it continues north.

Ecology's later 2005 study of specific metals found levels of copper ranging from 0.67 to 14.1 ug/L and zinc ranging from 4 to 105 ug/L in surface water collected approximately 500 feet from the mouth of Mill Creek (Ecology, 2006).

Site Specific Testing

In 2002, Boeing voluntarily analyzed catch basin solids for PCBs when the catch basins were cleaned out as part of routine maintenance required under the ISGP. In four of the 10 samples, PCBs were not detected above the laboratory reporting limits, which ranged from 6 µg/kg to 180 µg/kg. PCBs were detected in 5 of the 10 samples at concentrations ranging from 66 to 970 µg/kg; the PCB concentration in one sample was 1,400 µg/kg (Landau, 2016).

In 2010, the 54-inch-diameter culverts between the North Detention Pond and the outfalls at Mill Creek were cleaned (Figure 5). Each culvert is approximately 2,000 feet in length (Landau, 2016).

Sediment sampling was conducted in the North Detention Pond in 2011 by Boeing as part of construction and reconfiguration of the site when several parcels were sold (Landau, 2011). Sediments were tested for diesel- and heavy oil-range hydrocarbons, which were not detected, and for metals, which were generally low (Table 17).

7.3.3 RI Results

Sediment Traps/Sediment Loading

Sediment trap samplers placed in Man Holes 20.237, 20.235, 16.12, and 15.10 had been in place nearly one full year as of the writing of this RI (Figure 5). Traps were installed and positioned per Ecology guidance and regularly checked to ensure positioning was correct for capture of sediment during storm events.

Over the year, the trap samplers have captured very little sediment, consistent with the general visual observations of site conditions made over the year during inspections, which indicate relatively little sediment is present at the site and available to build up in the stormwater conveyance system.

The most recent sediment trap check in November 2017 showed the greatest accumulation in the trap in Manhole 15.10 (approximately ½ inch), the least accumulation at Manhole 16.12 (trace), and about ¼ inch in the traps at Manholes 20.235 and 20.237. The traps are scheduled to be pulled for analysis in December 2017 and results will be reported to Ecology in early 2018.

Stormwater Conveyance Solids Results

Results of stormwater conveyance system solids sampled at three locations at the site (Outfall 20/20B, Outfall 16, and the North Detention Pond) are shown in Table 17 and Figure 14, with data from historical studies provided for reference. These data show that results are consistent or lower than those anticipated by earlier studies, specifically:

- Petroleum hydrocarbons were detected at low levels, below the screening levels.
- PAHs were detected at low levels, below screening levels and several orders of magnitude below concentrations detected in Mill Creek by King County in 2014.
- PCBs were only detected in the sample collected from the North Detention Pond, and the concentration was in the range of detections previously detected prior to cleaning of the stormwater conveyance system in 2002, and only slightly higher than detections from 2014 sampling offsite by King County.
- Metals concentrations were all below the screening levels with the exception of the sample

from the North Detention Pond. Results of that sample showed arsenic and nickel slightly above screening levels. Arsenic was detected at a concentration of 38.4 mg/kg which is slightly above the concentrations previously detected in the North Detention Pond in 2011. Results for other metals in the 2017 North Detention Pond solids sample were all similar to those detected in the 2011 sample that had a detection of 21 mg/kg arsenic. All other metals were below screening levels in all of the 2011 samples.

Stormwater

Results of stormwater sampled at four manholes (MH 20.235, MH 20.237, MH 16.12, and MH 15.10) and three outfalls at the site (Outfall 20/20B, Outfall 16, and Outfall 15) are shown in Table 18 and Figure 14, with data from historical studies provided for reference. These data show that results are consistent with those anticipated by earlier studies, conditions expected at an industrial site operating under a IGSP, and meet industrial stormwater benchmarks, where applicable, specifically:

- Petroleum hydrocarbons were only detected in one sample (OF 16) and at a concentration below surface water screening levels and industrial stormwater benchmarks.
- VOCs were not detected except for acetone, a common laboratory contaminant, at low levels ranging from 5.22 to 20.2 ug/L.
- Only one PAH, chrysene, was detected above the surface water screening level (0.003 ug/L) at a concentration of 0.01 ug/L, which was the limit of detection by the laboratory.
- PCBs were only detected in one sample, from MH 20.235, at 0.012 ug/L. This location is downstream of the North Detention Pond where there was a detection of PCBs in the solids sample collected as part of the RI. PCBs were not detected in the stormwater sample collected at the Outfall 20, downstream of MH 20.235, nor in the solids sample collected at Outfall 20.
- No metals were detected above the industrial stormwater benchmarks, though arsenic, copper, lead, and zinc were detected in several stormwater samples above the surface water screening level, as shown in Table 13.

7.3.4 Stormwater Conveyance System Conclusions

The data collected as part of the RI are generally consistent with regional and historical data, and with what might be expected for a similar industrial site that is well-maintained with underutilized parking and traffic. The low accumulation in sediment traps over the course of a full year provide evidence that the site has low sediment loading that would potentially contribute to contamination in downstream surface water bodies. Concentrations detected in stormwater samples discharging from the site are generally low and meeting ISGP stormwater benchmarks. While the stormwater sample results did not meet surface water based screening levels in all cases, results do not indicate an unknown source of contamination and are typical for industrial stormwater. In addition, the Lower Mill Creek surface water body that the site discharges to has been assessed for quality in historical studies that have shown that the water would not meet Surface Water Quality standards for Washington, as discussed above in Section 7.3.2. Therefore, no additional action is warranted to address surface water quality.

Boeing does plan to remove sediment traps and analyze available samples in early 2018. Analysis will be determined based on available volume and in conjunction with Ecology. Based on results of the RI, the

RI Work Plan order of analyses priority is still recommended (PCBs, metals, petroleum hydrocarbons, and PAHs).

8.0 CONCLUSIONS

The objectives of this RI are to fulfill the requirements of the 2016 Work Plan, characterize the nature and extent of contamination at the site, and meet the general requirements for a RI as defined by MTCA under WAC 173-340-350. In doing so, the RI will meet the requirements of Section VII.A of the AO to investigate the subsurface soil and groundwater at the site and characterize the concentration, chemical nature, extent, and the direction and rate of migration of dangerous constituents released into the environment at or from each of the SWMUs, AOCs, and other areas identified for further evaluation.

All tasks identified in the RI Work Plan have been completed and documented in this RI, with the exception of analysis of stormwater conveyance system sediment trap samples, anticipated in early 2018. The results of the RI are summarized below:

- Land use has not significantly changed at the site since it was first developed, is industrial, and local planning and zoning support continued similar types of use.
- Geology at the site is consistent with conditions anticipated for this Kent river valley. The site is relatively flat and soil types are predominantly sand, sandy silts, and silt.
- Shallow groundwater is present at approximately 7 to 11 feet bgs and the depth to groundwater varies seasonally by several feet. Groundwater flow is predominantly to the north, but fairly flat, varying in flow direction from Northwest to Northeast with a slow groundwater flow rate anticipated on the order of under 100 feet per year.
- Groundwater is not a source of drinking water at the site and regional wells do not indicate concentrations of PCOCs at levels of concern in groundwater.
- The nearest surface water body is Mill Creek, which discharges to the Green River approximately 3.5 miles north of the site. Mill Creek has been the focus of several historical studies that found it did not meet Surface Water Quality criteria under WAC 173-201A-200 that would be expected to support aquatic life, which specify minimum dissolved oxygen levels of 6.5 to 9.5 mg/L, amongst other things, nor did it meet recreational uses which specify fecal coliform levels of no more than 50-200 CFU/100 mL.
- The majority of soil, groundwater, and stormwater conveyance system samples collected as part of the RI did not reveal concentrations above screening levels or identify any new sources of contamination.
- Soil Results:
    - Arsenic was the only constituent detected above screening levels in soil, near SWMU 88/89, at a concentration of 8.59 mg/kg and location (greater than 10 feet deep) of these results. This result is still within the range previously detected in soil as part of the Striker studies. All other RI sampling results were below the screening level of 7.3 mg/kg.
- Groundwater Results:

- No COPCs were detected in groundwater above the MTCA screening level protective of the vapor intrusion to indoor air pathway which would be the receptor pathway of greatest concern for the site.
- Vinyl chloride was detected above the screening level, in two of the three samples analyzed for vinyl chloride (SB-6 and SB-8). The concentrations at both locations were 0.19 µg/L, over the screening level of 0.025 µg/L. These values are lower than previously detected in groundwater, confirming the area where vinyl chloride is detected is small, and may be declining naturally as concentrations are an order of magnitude lower than detected during the Clearwater investigation.
- One groundwater sample, from well MW1, showed copper (0.0398 mg/L), lead (0.0014 mg/L), and zinc (0.0356 mg/L) detected at concentrations above screening levels. These results are consistent with previous groundwater sampling results from the Striker investigation in which Ecology concurred that groundwater concentrations did not pose a risk because groundwater is not serving as a drinking water source and the site's relative distance from the downgradient surface water receptor of concern, the Green River.
- Arsenic concentrations in groundwater collected as part of this RI varied from less than 0.002 to 0.266 mg/L, generally consistent with historical area results, and appear to reflect area-wide groundwater conditions, not due to a site-specific source.

- Stormwater Conveyance System Results:
  - The data collected as part of the RI are generally consistent with regional and historical data, and with what might be expected for a similar industrial site that is well-maintained with underutilized parking and traffic.
  - Sediment traps have yielded low sediment accumulation over the course of a full year, suggesting that the site has low sediment loading that would potentially contribute to contamination in downstream surface water bodies.
  - Concentrations detected in stormwater samples discharging from the site are generally low and meeting ISGP stormwater benchmarks.
  - PCBs were detected in the solids sample collected from the North Detention Pond, and the concentration was in the range of detections previously detected prior to cleaning of the stormwater conveyancesystem in 2002. PCBs were only detected in one stormwater sample, from MH 20.235, at 0.012 ug/L. This location is downstream of the North Detention Pond. PCBs were not detected in the stormwater sample collected at the Outfall 20, downstream of MH 20.235, nor in the solids sample collected at Outfall 20.
  - The North Detention Pond solids sample showed arsenic and nickel slightly above screening levels, while all other metals concentrations in solids were below the screening levels. These metals, along with copper, lead, and zinc were detected in

several stormwater samples above the surface water screening levels, though all were below the IGSP stormwater benchmarks.

- Only one PAH, chrysene, was detected above the surface water screening level (0.003 ug/L) at a concentration of 0.01 ug/L, which was the limit of detection by the laboratory. PAHs were not detected in any solids samples above screening levels.
- The Lower Mill Creek surface water body that the site discharges to has been assessed for quality in historical studies that have shown that the water would not meet Surface Water Quality standards for Washington.

The nature and extent of contamination has been defined and no further evaluation beyond the scope of the RI Work Plan is warranted in order to meet the objectives of the RI, as defined in the AO. No areas were identified during the RI that require cleanup of soil or groundwater and therefore a Feasibility Study (FS) is not recommended. Boeing is prepared to enter an environmental covenant for the property, as was completed for the Striker property, restricting the use of groundwater from the site. Boeing plans to continue to operate under the ISGP as well, monitoring and maintaining the stormwater conveyance system at the site for operations consistent with the industrial levels allowed under that permit.

9.0 REFERENCES

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10.0 CLOSING

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Tables

Table 1
Site Contacts
Remedial Investigation
Boeing Kent Space Center

Title	Name	Address	Phone Number	Email Address
Project Consultant	Dalton, Olmsted, & Fuglevand	1001 SW Klickitat Way, Suite 200 B Seattle, WA 98134	(206) 731-7550	ngray@dofnw.com
Property Owner	Boeing	20402 68th Ave S, Kent, WA 98032	--	--
Facility Operations	Paul Yount, Boeing	Kent, WA	(206) 669-1490	paul.d.yount@boeing.com
Project Manager	Lindsay Mahrt, Boeing	Seattle, WA	(206) 327-0404	lindsey.e.mahrt@boeing.com

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Table 2
Site Tax Parcels
Remedial Investigation
Boeing Kent Space Center

Site Parcel Number
660007090
6600070120
6600070130
6600070140
6600070150
6600070160
6600070170
6600070180
6600070190
6600070200
6600070210
6600070220
6600070230
6600070240
6600070250
6600070260
6600070270
6600070300
6600070310
6600070320
0222049064
0222049069
0222049072
0222049074
0222049075
0222049076
0222049077
0222049078

Notes:
Source= http://gismaps.kingcounty.gov/parcelviewer2/
Date accessed 11/30/2017

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Table 3
Regulatory Chronology
Remedial Investigation
Boeing Kent Space Center

Date	Description	Associated SWMU or AOC
November 1980	Boeing notified the EPA of hazardous waste activities at the KSC property and filed a Part A permit application.	--
March 1981	UST KS-25 and UST KS-26 were 1,000-gallon stainless steel USTs located beneath the west-central portion of Building 18-43 that were formerly used to store microfiche process waste. The USTs were installed in 1977 and were closed in place in March 1981 by removing the contents of the tanks, rinsing the interiors, and filling with sand. There are no known releases associated with the USTs; however, no soil or groundwater sampling was conducted during the UST closure activities. The potential contaminants of concern associated with the microfiche process waste are arsenic, chromium, copper, lead, nickel, silver, and zinc, and these metals will be included in the list of analytes for investigation of this area.	SWMU-88 and SWMU-89
June 17, 1981	The Part A permit was issued	--
October 25, 1983	The Part A permit was revised	--
January 30, 1986	The Part A permit was revised	--
1986	UST KS-5 and UST KS-6 were 10,000-gallon carbon steel USTs, formerly used to store fuel oil, that were removed in 1986. The installation dates for the USTs are not known. The tanks are shown on a facility drawing dated 1966 and were located near the southwest corner of Building 18-54. During the tank removal, soil samples were collected from the sides of the excavation and TPH were detected in soil near AOC-1 (2,400 ppm) and AOC-3 (11,000 ppm). Records regarding the tank removal and the locations of the soil samples are not available. The associated potential contaminants of concern are diesel- and oil-range TPH.	AOC-1 and AOC-3
May 19, 1988	The Part A permit was revised	--
1988	A RCRA Part B permit application for TSD of hazardous waste was submitted; however, finalization of a Part B permit for TSD status for the Facility was never pursued.	--
1990	EPA initiated corrective action for the Facility by notifying Boeing of a pending RFA	--
August 1991	RFA Completed	--
1992	KS-3 was a 10,000-gallon UST formerly located near the northwest corner of Building 18-41 that was removed in 1992. The UST stored unleaded gasoline, which was dispensed through a pump located within the footprint of the tank. During the tank removal, approximately 10 to 15 cubic yards of gasoline-stained soil was removed. Soil confirmation samples were collected from the base and sidewalls of the excavation and analyzed for gasoline-range TPH, BTEX, and lead. Gasoline-range TPH and BTEX were not detected at concentrations greater than the laboratory reporting limits. Lead was detected in soil at concentrations below the MTCA Method A cleanup level. Groundwater was not encountered or sampled.	UST KS-3, Building 18-41
1992	Boeing began communications with Ecology requesting procedural closure of regulated units at the Facility. Ecology responded that it could not make a determination on procedural closure at that time.	--
1993	Ecology stated that it could no longer procedurally close regulated units. Ecology notified Boeing that, if Boeing did not intend to seek final status for the KSC as a dangerous waste TSD facility, closure plans would need to be submitted for the regulated units at the Facility. Boeing subsequently began closure of the regulated units at the Facility.	--
1993	KS-1 was a 200-gallon diesel UST formerly located on the west side of Building 18-42 that was removed in 1993. The UST stored fuel for an emergency generator inside the building and was removed after a failed integrity test. Upon removal, the tank was noted to be in poor condition. 6 soil samples were collected from the excavation during tank removal. The detected concentrations of diesel-range TPH were greater than the MTCA Method A cleanup level in the samples from the north and east sidewalls and from the bottom of the excavation, with a maximum detected concentration of 53,000 mg/kg. Additional soil was subsequently removed and the excavation was extended laterally and deepened to 13 ft bgs. The detected concentrations of TPH in soil samples collected from the base and sidewalls of the final excavation were all less than the Method A cleanup levels, with a maximum concentration of diesel-range TPH of 140 mg/kg. Groundwater was noted entering the excavation at a depth of approximately 12 feet. A water sample collected directly from the excavation indicated a concentration of diesel-range TPH of 3.9 mg/L, which is greater than the MTCA Method A cleanup level.	UST KS-1, Building 18-42
1995	A milling machine cooling oil release in Building 18-62 was reported to Ecology on July 13, 1995. An independent cleanup was conducted and no further action opinion was issued by Ecology.	--
1997	RCRA closure completed for a storage tank in Building 18-67. Jet fuel had been released from USTs and cleanup completed under Ecology's Voluntary Cleanup Program.	--
1998	RCRA closure completed for a container storage area in Building 18-59	--
1999	RCRA closure completed for2 storage tanks in Building 18-62	--
2001	all eight of the regulated units identified in the 1991 RFA had received clean closure certification from Ecology	--

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Table 3
Regulatory Chronology
Remedial Investigation
Boeing Kent Space Center

Date	Description	Associated SWMU or AOC
1995-2002	Historical operations at Building 18-62 included various machining operations on the first floor and office space on the second floor. Operations on the first floor of Building 18-62 included two profiler/milling machines formerly located in the north-central portion of the building. A leak associated with one of the machines resulted in a release of coolant to soil underlying the floor between the beds of the two adjacent profiling/milling machines. The coolant released was a 2 to 6 percent solution of 4000 Strong (Boeing MSD #68547), a mineral-oil based product. Boeing conducted an initial soil investigation in the area of the leak and subsequently reported the release to Ecology on July 13, 1995. Based on an assessment that the release did not pose a potential threat to human health or the environment, further evaluation of the nature and extent was deferred until the machines were removed from the building. Additional investigation of soil and groundwater quality was completed in 2002. to document the extent of soil contamination associated with the release, and the collection and laboratory analysis of groundwater samples along the north side of Building 18-62 at locations hydraulically downgradient of the coolant release area. Remedial action was conducted in 2002 to remove soil containing concentrations of diesel-range, motor oil-range, and mineral oil-range TPH greater than the MTCA Method A soil cleanup levels. The remedial action included concrete removal, soil excavation, and disposal of soil. Approximately 458 tons of soil was excavated and disposed offsite. Confirmation soil samples indicated that the applicable cleanup levels were met at the limits of the remedial action area. Groundwater was not encountered beneath the building during the investigation or remedial action in the former milling machine area. The groundwater samples collected downgradient did not contain concentrations of diesel-range or motor oil-range TPH greater than the laboratory reporting limit. An Independent Remedial Action Report was submitted for Ecology review, and a No Further Action determination was subsequently issued by Ecology.	Former Milling Machine Area, Building 18-62
2002	Stormwater at the site either infiltrates into unpaved areas, or is accumulated by the storm sewer system and discharged to Mill Creek via the North Detention Pond located at the northwest corner of the site or via a series of detention ponds and outfalls along the eastern site boundary. Catch basins, which collect solids transported by site stormwater, are located throughout the storm sewer system. During one maintenance event in 2002, 10 solids samples were voluntarily collected from catch basins throughout the storm sewer system and analyzed for PCBs. In 4 of the 10 samples, PCBs were not detected above the laboratory reporting limits, which ranged from 6 µg/kg to 180 µg/kg. PCBs were detected in 5 of the 10 samples at concentrations ranging from 66 to 970 µg/kg; the PCB concentration in one sample was 1,400 µg/kg. In 2010, the 54-inch-diameter culverts between the North Detention Pond and the outfalls at Mill Creek (each culvert being approximately 2,000 ft in length) were cleaned. The potential contaminants of concern identified by Ecology for stormwater discharged via the storm sewer system are metals (total and dissolved), PAHs, PCBs, VOCs, gasoline-range TPH, diesel-range TPH, and oil-range TPH.	SWMU 86
1994-2003	Seven USTs located on the west side of Building 18-67, consisting of one waste jet fuel UST and six jet fuel USTs were removed in 1994. At the time of the removal, the tanks were observed to be in good condition; however, evidence of minor soil contamination was observed in the area of pipe connections associated with the waste fuel UST at the south end of the tank area. Petroleum hydrocarbons and benzene were detected in water samples collected directly from the tank excavation. A remedial action was completed that consisted of overexcavation of soils within and around the tank cavity. TPH and BTEX constituents were not detected at concentrations greater than laboratory reporting limits in any of the confirmation soil samples. Diesel-range TPH was detected above the MTCA Method A groundwater cleanup level in a sample of standing water collected from the excavation. A soil and groundwater investigation was completed in 1997. TPH was detected in 5 of the 17 soil samples, but at concentrations below Method A cleanup levels. TPH were not detected at concentrations greater than the laboratory reporting limits in any of the 4 groundwater samples. Benzene was detected in one groundwater sample but at a concentration less than the Method A cleanup level. Four quarterly groundwater monitoring events were completed between February 1998 and January 1999. Gasoline-range TPH and BTEX were not detected at concentrations greater than the laboratory reporting limits in any of the groundwater samples. Diesel-range TPH was detected in one sample during the January 1999 sampling event at a concentration less than the Method A cleanup level. Based on the results of the quarterly groundwater monitoring, Ecology issued a No Further Action determination for the former UST area under the Voluntary Cleanup Program. Groundwater conditions were also investigated in 2001 during a Phase II environmental site assessment completed for a portion of the site. Groundwater samples were collected from 3 of the 4 monitoring wells installed in October 1997. TPH and VOCs were not detected at concentrations greater than the laboratory reporting limits. Dissolved copper and nickel were detected at concentrations less than the screening levels identified at the time.	Jet fuel USTs, Building 18-67
2003	As part of property transactions, Boeing completed independent, voluntary cleanup action and received No Further Action determination from Ecology's Hazardous Waste and Toxics Reduction Program for soil and groundwater at portions of the site known as the Clearwater property.	--

Table 3
Regulatory Chronology
Remedial Investigation
Boeing Kent Space Center

Date	Description	Associated SWMU or AOC
2010-2012	Investigations completed in 2010 and 2011 at the former Boeing parcel known as the Striker Property, to the west and south of the current site, detected dissolved arsenic in groundwater at concentrations ranging from 0.3 to 114 µg/L. 54 soil samples were collected and analyzed for arsenic with detected concentrations of arsenic less than the MTCA Method A soil cleanup level (20 mg/kg), except for one at 20.1 mg/kg. In 2012, Boeing collected additional groundwater samples to document dissolved arsenic concentrations in shallow groundwater at locations in and around the site including locations that are hydraulically upgradient and downgradient of the site based on overall shallow groundwater flow to the west-northwest toward the Green River. The groundwater samples were collected at the site, at the Western Processing site (located to the northeast of the site), and on City of Kent property. The selected City of Kent locations included the closest upgradient, accessible locations that appeared to be the least affected by development/human activities. The selected Western Processing wells consisted of a background/upgradient well, and a shallow downgradient well that are part of the Western Processing monitoring network, but that have not been affected by activities at the Western Processing site. Dissolved arsenic was detected at concentrations above the laboratory reporting limit in 14 of the 18 groundwater samples, at concentrations ranging from 3.3 to 115 µg/L. Of the detected dissolved arsenic concentrations, 11 were greater than the screening level of 5 µg/L.	Site-Wide Arsenic in Soil and Groundwater
2013	As part of property transactions, Boeing completed independent, voluntary cleanup action and received No Further Action determination from Ecology's Hazardous Waste and Toxics Reduction Program for soil and groundwater at portions of the site known as the Striker property.	--
2013	Ecology removed the Striker property, which included a portion of the Clearwater property, from the footprint of the RCRA Interim Status facility.	--
October 8, 2014	Ecology issued a PLP determination letter to Boeing.	--
November 2015	UST KS-7 was an 840-gallon carbon steel UST used to store fuel oil that was installed in 1965 and removed in 1986 from the west side of former Building 18-35. Records indicate that after removal of the UST, soil samples were collected from the sides of the excavation and TPH was detected at a concentration of 2,400 ppm. The locations of the samples were not identified. Boeing records indicate that an 850-gallon fiberglass UST was installed in 1988 at the same location as the original KS-7. The newer UST stored diesel fuel and served an emergency generator located on the west side of Building 18-35. The generator was taken out of service in 2015 in preparation for demolition of the building, and KS-7 was removed on November 10, 2015. The UST site assessment report indicates that the tank was observed to be in good condition following removal and there was no indication of a release from the UST. Three soil samples were collected from the sidewalls and bottom of the tank excavation and were analyzed for diesel- and oil-range TPH. The bottom sample was also analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) and polycyclic aromatic hydrocarbons (PAHs). None of the compounds analyzed for were detected at concentrations greater than the laboratory reporting limits. Groundwater was not encountered during the tank removal. Based on the use of the USTs (both designated as KS-7), the associated potential contaminants of concern are diesel- and oil-range TPH. Based on data from the 2015 UST removal report, no residual soil contamination was identified at the former UST location, but groundwater was not sampled. Results of groundwater sampling and analysis near Buildings 18-24 and 18-35 for the Clearwater property in 2002 and 2003 indicated localized detections (locations 18-35-3 and 18-35-4) of the volatile organic compounds (VOCs) vinyl chloride and benzene at concentrations slightly greater than the current MTCA Method B groundwater cleanup levels.	AOC-2
January 2016	Boeing entered into Agreed Order No, DE 12820	--
October 2016	Remedial Investigation Work Plan approved by Ecology	--
December 2017	Draft Remedial Investigation Report submitted	--

Notes:
MTCA Model Toxic Control Act
RIWP- Remedial Investigations Work Plan
TSD- Treatment, Storage & Disposal
VOCs- volatile organic compound
TPH- Total petroleum hydrocarbons
ppm- parts per million
PAHs- polucuclic aromatic hydrocarbons
RCRA- Resources Conservation and Recovery Act
RFA- RCRA facility accessment
BTEX- Benzene, tolulene, ethylbenzene, xylenes
µg/kg - micrograms per kilogram
mg/kg- milligrams per killograms
bgs- below ground surface
EPA- US Environmental Protection Agency
KSC- Kent Space Center
UST- Underground storage tank
PCBs- poluchlorinated biphenyls

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Table 4
Historical Investigations
Remedial Investigation
Boeing Kent Space Center

Date	Title	Author
8/1/1991	RCRA Facility Assessment PR/VSI	SAIC
8/26/1992	Building 18-62 Process Tank Line Subsurface Environmental Investigation Report	Groundwater Technology
11/4/1992	Closure Report, UST KS-3, Kent Space Center	Groundwater Technology
11/29/1993	Tanks Removal and Site Assessment, UST KS-1, Boeing Space Center	Groundwater Technology
9/3/1997	Letter from Ecoogy to Boeing RE: Ecology's Acceptance of Certification for Boeing Kent Space Center, Building 18-67 2000 Gallon Waste Jet Fuel UST	Ecology
4/1/1999	Final Report, Soil and Groundwater Assessment, Former Jet Fuel UST Installation Area, Building 18-67, Boeing Space Center	Tetra Tech
1/30/2002	Phase I Environmental Site Assessment Report, Boeing Clearwater	Landau
6/5/2002	Phase II Environmental Site Assessment, Boeing Clearwater	Landau
11/13/2002	Indepenedent Remedial Action Report, Boeing Space Center, Building 18-62	Landau
7/10/2003	Letter from Roger Nye, Ecology, to Paul Johansen, Boeing RE: Independent Remedial Actions, Clearwater Property at the Boeing Space Center	Ecology
11/21/2003	Letter from Landau to Paul Johansen, Boeing, RE: Additional Groundwater Sampling and Analysis, Clearwater Property at The Boeing Company Space Center (WAD 061670766)	Landau
12/11/2003	Letter from Ecoogy to Boeing RE: Clearwater Property NFA	Ecology
11/30/2010	Report, Phase I Environnmental Assessment, Boeing Striker Property	Landau
12/6/2010	Technical Memo: Phase II Environmental Site Assessment Findings, Boeing Striker Property	Landau
4/29/2011	Supplemental Phase II Environmental Site Assessment Findings, Boeing Striker Property	Landau
7/15/2011	Phase II Environmental Site Assessment, Striker Property South, Boeing Space Center, 20403 68th Avenue South	Landau
9/2/2011	Indepenedent Remedial Action Report, Former Diesel Generator/Aboveground Storage Tank KSA-46 Area, Boeing Space Center	Landau
10/11/2011	Letter from Joe Flaherty, Boeing, to Byung Maeng, Ecology RE: Evaluation of Arsenic in Groundwater, Striker Property South, Boeing Space Center	Boeing
12/12/2011	Technical Memo: North Detention Pond Sampling Results, Boeing Striker Property	Landau
3/16/2012	Letter from Joe Flaherty, Boeing, to Byung Maeng, Ecology RE: Additional Evaluation of Arsenic in Groundwater, Boeing Space Center Area	Boeing
12/17/2012	Technical Memo: North Detention Pond/Tract X Excavation, Boeing Kent Space Center	Landau
3/17/2016	Email from Nick Garson, Boeing, to Byung Maeng, Ecology, RE: Boeing Kent Space Center -Response to Ecology Request for Storm Sewer Sampling	Boeing
7/29/2016	Ecology Review Draft RI Work Plan, Boeing Kent Space Center Facility	Landau
9/8/2016	Letter from Byung Maeng, Ecology, to Nick Garson, Boeing, RE: Ecology Comments on the Boeing Kent Space Center RI Draft Work Plan, dated July 29, 2016	Ecology
10/12/2016	Final RI Work Plan, Boeing Kent Space Center Facility	Landau
--	Leaking UST Data Summary (Building 18-41)	Ecology

Table 5
Sampling Information
Remedial Investigation
Boeing Kent Space Center

DATE	Matrix	Area	Location	Site ID	Sample ID	Sample Depth (feet)	Method	BTEX	TPH-G	TPH-D	TPH-O	mineral oil	VOC	PAHs	PCBs	Specific Metals									Sulfate, Nitrate
																As	Cr	Ag	Cu	Pb	Ni	Zn	Cd	Se	Hg	
1/24/2017	soil	SWMU 88/89	Building 18-43	SB-1	KSCRI-SB1-(11.5-12.5)	11.5-12.5	direct push	--	--	--	--	--	--	--	--	X	X	X	X	X	X	X	--	--	--	--
1/24/2017	soil	SWMU 88/89	Building 18-43	SB-2	KSCRI-SB2-*11.5-12.5)	11.5-12.5	direct push	--	--	--	--	--	--	--	--	X	X	X	X	X	X	X	--	--	--	--
1/27/2017	soil	AOC-1/3	Building 18-54	SB-3	KSCRI-SB3-(8.5-9.5')	8.5-9.5	direct push	--	--	X	X	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/27/2017	soil	AOC-1/3	Building 18-54	SB-4	KSCRI-SB4-(8-9')	8-9	direct push	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/27/2017	soil	AOC-1/3	Building 18-54	SB-5	KSCRI-SB5-(11-12')	11-12	direct push	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/12/2017	soil	north	monitoring well	MW-1	KSCRI-MW1-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
4/11/2017	soil	northeast	monitoring well	MW-2	KSCRI-MW2-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
4/11/2017	soil	east	monitoring well	MW-3	KSCRI-MW3-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
4/11/2017	soil	southeast	monitoring well	MW-4	KSCRI-MW4-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
4/11/2017	soil	southwest	monitoring well	MW-5	KSCRI-MW5-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
4/13/2017	soil	west	monitoring well	MW-6	KSCRI-MW6-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
4/11/2017	soil	northwest	monitoring well	MW-7	KSCRI-MW7-2.5	2.5	hollow stem auger	--	--	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/24/2017	groundwater	SWMU 88/89	Building 18-43	SB-1	KSC-SB1-GW	11.0-15.0	direct push	--	--	--	--	--	--	--	--	X	X	X	X	X	X	X	--	--	--	--
1/24/2017	groundwater	SWMU 88/89	Building 18-43	SB-2	KSC-SB2-GW	11.0-15.0	direct push	--	--	--	--	--	--	--	--	X	X	X	X	X	X	X	--	--	--	--
1/27/2017	groundwater	AOC-1/3	Building 18-54	SB-3	KSC-SB3-GW	8.0-12.0	direct push	--	--	X	X	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/27/2017	groundwater	AOC-1/3	Building 18-54	SB-4	KSC-SB4-GW	8.0-12.0	direct push	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/27/2017	groundwater	AOC-1/3	Building 18-54	SB-5	KSC-SB5-GW	10.0-14.0	direct push	--	--	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/24/2017	groundwater	AOC-2	Building 18-35	SB-6	KSC-SB6-GW	8.0-12.0	direct push	X	--	X	--	--	X1	--	--	--	--	--	--	--	--	--	--	--	--	--
1/24/2017	groundwater	AOC-2	Building 18-35	SB-7	KSC-SB7-GW	10.0-14.0	direct push	X	--	X	--	--	X1	--	--	--	--	--	--	--	--	--	--	--	--	--
1/24/2017	groundwater	AOC-2	Building 18-35	SB-8	KSC-SB8-GW	8.0-12.0	direct push	X	--	X	--	--	X1	--	--	X	--	--	--	--	--	--	--	--	--	--
1/25/2017	groundwater	18-62 Milling	Building 18-62	SB-9	KSC-SB-9-GW	8.0-12.0	direct push	--	--	X	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/25/2017	groundwater	18-62 Milling	Building 18-62	SB-10	KSC-SB-10-GW	11.0-15.0	direct push	--	--	X	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/25/2017	groundwater	18-62 Milling	Building 18-62	SB-11	KSC-SB-11-GW	11.0-15.0	direct push	--	--	X	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/25/2017	groundwater	18-62 Milling	Building 18-62	SB-12	KSC-SB-12-GW	11.0-15.0	direct push	--	--	X	--	X	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/26/2017	groundwater	18-67 UST	Building 18-67	SB-13	KSC-SB13-GW	8.0-12.0	direct push	X	X	X	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/26/2017	groundwater	KS-1	Building 18-42	SB-14	KSC-SB14-GW	11.0-15.0	direct push	--	--	X	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/26/2017	groundwater	KS-1	Building 18-42	SB-15	KSC-SB15-GW	11.0-15.0	direct push	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/26/2017	groundwater	KS-1	Building 18-42	SB-16	KSC-SB16-GW	11.0-15.0	direct push	--	--	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/26/2017	groundwater	KS-3	Building 18-41	SB-17	KSC-SB17-GW	9.5-13.5	direct push	X	X	--	--	--	--	--	--	X	--	--	--	--	--	--	--	--	--	--
1/27/2017	groundwater	KS-3	Building 18-41	SB-18	KSC-SB18-GW	11.0-15.0	direct push	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/25/2017	groundwater	KS-3	Building 18-41	SB-19	KSC-SB19-GW	10.0-14.0	direct push	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1/27/2017	groundwater	KS-3	Building 18-41	SB-20	KSC-SB20-GW	10.0-14.0	direct push	X	X	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/4/2017	groundwater	north	monitoring well	MW-1	KSCRI-MW1-050417	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
5/3/2017	groundwater	northeast	monitoring well	MW-2	KSCRI-MW2-050317	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
5/3/2017	groundwater	east	monitoring well	MW-3	KSCRI-MW3-050317	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
5/3/2017	groundwater	southeast	monitoring well	MW-4	KSCRI-MW4-050317	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
5/3/2017	groundwater	southwest	monitoring well	MW-5	KSCRI-MW5-050317	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
5/4/2017	groundwater	west	monitoring well	MW-6	KSCRI-MW6-050417	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
5/4/2017	groundwater	northwest	monitoring well	MW-7	KSCRI-MW7-050417	across water table	peristalitc pump, low flow	--	--	X	X	--	--	--	--	X	X	X	X	X	X	X	X	X	X	X
1/18/2017	stormwater	SWMU 86	Manhole	MH-20.237-W	KSC-MH-20.237-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
1/18/2017	stormwater	SWMU 86	Manhole	MH-20.235-W	KSC-MH-20.235-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
1/19/2017	stormwater	SWMU 86	Manhole	MH-16.12-W	KSC-MH-16.12-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
1/20/2017	stormwater	SWMU 86	Manhole	MH-15.10-W	KSC-MH-15.10-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
1/18/2017	stormwater	SWMU 86	Outfall- East Drainage Ditch 16	OF-16-W	KSC-OF-16-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
1/20/2017	stormwater	SWMU 86	Outfall-Mill Creek 20/20B	OF-20-W	KSC-OF-20-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
1/18/2017	stormwater	SWMU 86	Outfall-North Detention Pond	OF-NDP-W	KSC-OF-NDP-W	NA	grab	--	X	X	X	--	X	X	X	X	X	X	X	X	X	X	X	X	X	--
12/15/16 [1]	sediment	SWMU 86	Manhole	MH-20.237	NA	NA	sediment trap	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--
12/15/16 [1]	sediment	SWMU 86	Manhole	MH-20.235	NA	NA	sediment trap	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--
12/15/16 [1]	sediment	SWMU 86	Manhole	MH-16.12	NA	NA	sediment trap	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--
12/15/16 [1]	sediment	SWMU 86	Manhole	MH-15.10	NA	NA	sediment trap	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--
5/4/2017	sediment	SWMU 86	Outfall-East Drainage Ditch 17	KSC-OF-16-0.3	KSC-OF-16-0.3	<10 cm	grab	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--
6/29/2017	sediment	SWMU 86	Outfall-Mill Creek 20/20B	OF-20	KSC-OF-20-0.3	<10 cm	grab	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--
5/4/2017	sediment	SWMU 86	Outfall-North Detention Pond	OF-DP-0.3	KSC-OF-DP-0.3	<10 cm	grab	--	--	X	X	--	--	X	X	X	X	X	X	X	X	X	X	X	X	--

Notes:
[1] Sediment traps remain in place as of writing this report.
X1 = VC, TCE, cis-1,2-DCE, trans-1,2-DCE)
BTEX=benzene, toluene, ethylbenzene, xylenes
TPH-G = gasoline-range total petroleum hydrocarbons
TPH-D = diesel-range total petroleum hydrocarbons
VOC = volatile organic compound
PAHs = polycyclic aromatic hydrocarbon
PCBs = polychlorinated biphenyl
-- = not analyzed
X = analyzed

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Table 6
Groundwater Elevations
Remedial Investigation
Boeing Kent Space Center

Monitoring Well ID	TOC Elevation (feet)	Event Date	Depth to Water Elevation (feet)	Groundwater Elevation (feet)
MW-1	29.59	5/4/2017	8.30	21.29
		9/28/2017	12.99	16.60
MW-2	28.58	5/3/2017	8.53	20.05
		9/28/2017	10.20	18.38
MW-3	28.47	5/3/2017	6.11	22.36
		9/28/2017	8.96	19.51
MW-4	28.86	5/3/2017	6.12	22.74
		9/28/2017	8.59	20.27
MW-5	29.83	5/3/2017	6.30	23.53
		9/28/2017	8.83	21.00
MW-6	29.17	5/4/2017	7.44	21.73
		9/28/2017	11.74	17.43
MW-7	27.92	5/4/2017	6.77	21.15
		9/28/2017	11.01	16.91
Historical Data				
KGW001	--	10/3/1997	--	21.56
	--	8/5/1998	--	20.43
	--	1/14/1999	--	22.7
KGW002	--	10/3/1997	--	21.27
	--	8/5/1998	--	20.56
	--	1/14/1999	--	22.56
KGW003	--	10/3/1997	--	21.15
	--	8/5/1998	--	20.59
	--	1/14/1999	--	22.58
KGW004	--	10/3/1997	--	21.09
	--	8/5/1998	--	20.67
	--	1/14/1999	--	22.65

Notes:
TOC = top of casing
Datum= NAVD88
-- = not available

Table 7
Groundwater Flow Estimations
Remedial Investigation
Boeing Kent Space Center

Quarter	Well Pair		Head difference (ft)	Distance (ft)	Estimated Horizontal Hydraulic Gradient	Estimated Horizontal Groundwater Velocity (ft/day)
					Magnitude	
May-17	MW-1	MW-6	0.44	735	6.0E-04	0.068
	MW-1	MW-3	1.07	1233	8.7E-04	0.098
	MW-1	MW-4	1.45	1581	9.2E-04	0.104
	MW-1	MW-5	2.24	1440	1.6E-03	0.176
May 2017 Average					**9.8E-04**	**0.112**
Q4-14	MW-1	MW-6	0.83	735	1.1E-03	0.128
	MW-1	MW-3	2.91	1233	2.4E-03	0.268
	MW-1	MW-4	3.67	1581	2.3E-03	0.263
	MW-1	MW-5	4.4	1440	3.1E-03	0.346
Septemeber 2017 Average					**2.2E-03**	**0.251**

Notes:
Hydraulic values estimated based on literature values for silty sands.
Average effective porosity 0.250
Average hydraulic conductivit 1.00E-02 cm/s

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TABLE 8

King County Groundwater Protection Program Well Summary

Remedial Investigation

Boeing Kent Space Center

Well ID	S_472536122143101	S_472535122143301	S_472534122143301	S_472450122143501	S_472509122143401	S_472556122144101	S_472435122144501
Location Name	US EPA	USEPA	US EPA	TANAKA	USEPA	LOVE WILLIAM	ONCHI
Well Type	Well	Well	Well	Well	Well	Well	Well
Well Depth (ft)	20	22	19	20	155	33	200
Surface Elevation (ft)	24.03	24.46	23.35	26	22.14	31	27
X Coord (WAN-SPF)	1291753.5	1291613	1291611.125	1291390.875	1291495.5	1291102.625	1290677.25
Y Coord (WAN-SPF)	158828.0781	158728.5	158626.375	154172.2344	156096.5938	160864.7969	152663.9844
Has Water Level Data?	No	No	No	No	Yes	No	No
Has Water Quality Data?	No	No	No	No	No	No	No
Local Number	22N/04E-01F03	22N/04E-01F01	22N/04E-01F02	22N/04E-12D01	22N/04E-01N01	23N/04E-36N01	22N/04E-12E01
Ecology Well Tag	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
GWMA Code	South King County	South King County	South King County	South King County	South King County	South King County	South King County
Basin	Black River	Black River	Black River	Black River	Black River	Black River	Black River
CARA Area	None	None	None	None	None	None	None
City	Kent	Kent	Kent	Kent	Kent	Kent	Kent
Water Level Data	No water level sampling data exists for the searched well.	No water level sampling data exists for the searched well.	No water level sampling data exists for the searched well.	No water level sampling data exists for the searched well.	**Measurement Date** / **Measurement Time** / **Water Level Depth (ft)** / **Well Depth (ft)** / **Measure Method** 4/29/1987 / 8:50 / 4.12 / 155 / Steel tape 9/4/1986 / 10:00 / 6.41 / 155 / Electric tape	No water level sampling data exists for the searched well.	No water level sampling data exists for the searched well.
Water Quality Data	No water quality sampling data exists for the searched well.	No water quality sampling data exists for the searched well.	No water quality sampling data exists for the searched well.	No water quality sampling data exists for the searched well.	No water quality sampling data exists for the searched well.	No water quality sampling data exists for the searched well.	No water quality sampling data exists for the searched well.

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Table 9
Terrestrial Ecological Evaluation Calculations
Remedial Investigation
Boeing Kent Space Center

Table 749-1 (WAC 173-340-900)

Criteria	Points	Score
1 - Area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site		
0.025 acres or less	4	
0.5 acres	5	
1.0 acres	6	
1.5 acres	7	
2.0 acres	8	
2.5 acres	9	
3.0 acres	10	
3.5 acres	11	
4.0 acres or more	12	12
2 - Is this an industrial or commercial property?		
yes	3	3
no	1	
3 - Habitat quality of the site		
High	1	
Intermediate	2	
Low	3	3
4 - Is the undeveloped land likely to attract wildlife?		
Yes	1	
No	2	2
5 - Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene?		
Yes	1	
No	4	4
6 - Add the numbers in the boxes on lines 2 through 5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified terrestrial ecological evaluation may be ended under WAC 173-340-7492 (2)(a)(ii).		**12**

Table 10
Soil Screening Levels
Remedial Investigation
Boeing Kent Space Center

Chemical Name	Method B Non-cancer	Method B Cancer	Protective of Groundwater Vadose @ 25°C	Protective of Terrestrial Ecological Receptors Unrestricted Land Use[b]	Protective of Terrestrial Ecological Receptors Commercial or Industrial Site[b]	Method A Unrestricted Land Use	Soil Method A Industrial Properties	Soil Method C Non cancer	Soil Method C Cancer	Natural Background Concentrations for Puget Sound Region[a]	RI Screening Level
Arsenic, inorganic	24	1	3	20	20	20	20	1,050	88	7.3	**7.3**
Cadmium	80	--	1	25	36	2	2	3,500	--	1	**1.0**
Chromium (III)	120,000	--	480,000	42[d]	135[d]	2,000	2,000	5,250,000	--	48[d]	**48.0**
Copper	3,200	--	284	100	550	--	--	140,000	--	36	**100**
Lead	--	--	3,000	220	220	250	1,000	--	--	24	**220**
Mercury	--	--	2	9	9	2	2	--	--	0	**2.0**
Nickel	1,600	--	130	100	1,850	--	--	70,000	--	48	**100**
Selenium	400	--	5	1	1	--	--	17,500	--	--	**0.8**
Silver	400	--	14	--	--	--	--	17,500	--	--	**13.6**
TPH, diesel-range organics	--	--	--	460	15,000	2,000	2,000	--	--	--	**460**
TPH, heavy oils	--	--	--	--	--	2,000	2,000	--	--	--	**2,000**
TPH, mineral oil	--	--	--	--	--	4,000	4,000	--	--	--	**4,000**
TPH, gasoline-range organics	--	--	--	200	12,000	30[f]	100	--	--	--	**30/100**
Zinc	24,000	--	5,971	270	570	--	--	1,050,000	--	85	**270**

Notes:
Bolded value represents lowest Method B criteria and basis for site screening level.
[a] Ecology 1994.
[b] WAC 173-340-900, Table 749-2.
[c] Value is based on protection of potable groundwater.
[d] Value is for total chromium.
[e] Value is Method A cleanup level for unrestricted land uses.
[f] Cleanup level is 100 mg/kg if benzene is not present.
All units in mg/kg
mg/kg = Milligrams per kilogram.
TPH = Total petroleum hydrocarbons.

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Table 11
Groundwater Screening Levels
Remedial Investigation
Boeing Kent Space Center

Basis	Groundwater									Lowest Surface Water Based Criteria (see Table 13)	RI Screening Level
Chemical Name	Method B Non-cancer	Method B Cancer	Maximum Contaminant Level	WA Maximum Contaminant Level	Method A Cleanup Levels	Vapor Intrusion Method B Noncancer	Vapor Intrusion Method B Cancer	Vapor Intrusion Method C Noncancer	Vapor Intrusion Method C Cancer		
Metals											
Arsenic	4.8	0.06	10	10	5	--	--	--	--	0.02	**0.02**
Cadmium	8	--	5	5	5	--	--	--	--	0.25	**0.25**
Chromium (total)	--	--	100	100	50	--	--	--	--	10.0	**10.0**
Copper	640	--	1,300	1,300	--	--	--	--	--	3.5	**3.5**
Lead	--	--	15	15	15	--	--	--	--	0.54	**0.54**
Mercury	--	--	2	2	2	--	--	--	--	0.01	**0.012**
Nickel	320	--	--	100	--	--	--	--	--	48.7	**49**
Selenium	80	--	50	50	--	--	--	--	--	5.0	**5.0**
Silver	80	--	--	--	--	--	--	--	--	0.32	**0.32**
Zinc	4,800	--	--	--	--	--	--	--	--	32.3	**32**
TPH											
TPH, diesel-range organics	--	--	--	--	500	--	--	--	--	--	**500**
TPH, heavy oils	--	--	--	--	500	--	--	--	--	--	**500**
TPH, mineral oil	--	--	--	--	500	--	--	--	--	--	**500**
TPH, gasoline-range	--	--	--	--	800b	--	--	--	--	--	**800**
VOCs											
Benzene	32	0.80	5	5	5	102.7	2.4	224.6	24	0.58	**0.58**
Dichloroethylene;1,2-,cis	16	--	70	70	--	--	--	--	--	--	**16**
Dichloroethylene;1,2-,trans	160	--	100	100	--	--	--	--	--	100	**100**
Ethylbenzene	800	--	700	70	700	2783	--	6087	--	68.0	**68**
Toluene	640	--	1,000	1,000	1,000	15584	--	34091	--	57.0	**57**
Trichloroethylene (TCE)	4	0.54	5	5	5	3.8	1.6	8.4	26.5	0.60	**0.54**
Vinyl chloride	24	0.03	2	2	0.2	56.7	0.35	124	3.5	0.02	**0.02**
Xylenes (total)	1,600	--	10,000	10,000	1,000	310	--	678.1	--	--	**310**

Notes:
Bolded value represents lowest Method B criteria and basis for site screening level.
[a] Value is MTCA Method A cleanup level based on use of groundwater as drinking water.
[b] Cleanup level is 1,000 µg/L if benzene is not present.
All units in microgram per liter
TPH = Total petroleum hydrocarbons.
VOC = volatile organic compound
Chromium values based on Cr^{+6}

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Table 12
Stormwater System Solids Screening Levels
Remedial Investigation
Boeing Kent Space Center

Chemical Name	SMS Freshwater Sediment		MTCA Method B Soil Screening Level	Screening Level
	SCO[a]	CSL[b]		Solids and Sediment
Metals (mg/kg)				
Arsenic	14	120	7.3	**14**
Barium	--	--	1,600	**--**
Cadmium	2.1	5.4	0.69	**2.1**
Chromium	72	88	48[d]	**72**
Copper	400	1,200	100	**400**
Lead	360	>1,300	220	**360**
Mercury	0.66	0.8	2.1	**0.66**
Nickel	26	110	100	**26**
Selenium	11	>20	0.8	**11**
Silver	0.57	1.7	14	**0.57**
Zinc	3,200	>4,200	270	**3,200**
PAHs (µg/kg)				
Naphthalene	--	--	4,500	**see total PAHs**
2-Methylnaphthalene	--	--	320,000	**see total PAHs**
1-Methylnaphthalene	--	--	34,000	**see total PAHs**
Acenaphthylene	--	--	--	**see total PAHs**
Acenaphthene	--	--	98,000	**see total PAHs**
Fluorene	--	--	100,000	**see total PAHs**
Phenanthrene	--	--	--	**see total PAHs**
Anthracene	--	--	2,300,000	**see total PAHs**
Fluoranthene	--	--	630,000	**see total PAHs**
Pyrene	--	--	650,000	**see total PAHs**
Benzo(a)anthracene	--	--	see cPAH TEQ	**see total PAHs**
Chrysene	--	--	see cPAH TEQ	**see total PAHs**
Benzo(a)pyrene	--	--	see cPAH TEQ	**see total PAHs**
Indeno(1,2,3-cd)pyrene	--	--	see cPAH TEQ	**see total PAHs**
Dibenz(a,h)anthracene	--	--	see cPAH TEQ	**see total PAHs**
Benzo(g,h,i)perylene	--	--	--	**see total PAHs**
Dibenzofuran	200	680	80,000	**see total PAHs**
Total Benzofluoranthenes	--	--	see cPAH TEQ	**see total PAHs**
cPAH TEQ	--	--	140	**--**
Total PAHs	17,000	30,000	--	**17,000**
PCBs (µg/kg)				
Total PCBs	110	2,500	500	**110**
Petroleum Hydrocarbons (mg/kg)				
TPH-Diesel	340	510	2,000	**340**
TPH-Residual	3,600	4,400	2,000	**3,600**

Notes:
SMS = Washington State Sediment Management Standards
SCO[a] = sediment cleanup objective
CSL[b] = cleanup screening level
MTCA = Model Toxics Control Act
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
mg/kg = milligrams per kilogram
µg/kg = micrograms per kilogram

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Table 13
Stormwater Screening Levels
Remedial Investigation
Boeing Kent Space Center

Chemical Name	Surface Water											Screening Level for Stormwater	WA Industrial Stormwater Benchmarks [1]
	Method B Non-cancer	Method B Cancer	Aquatic life fresh/ acute 173-201A WAC	Aquatic life fresh/ acute CWA §304	Aquatic life fresh/ acute NTR 40 CFR 131	Aquatic life fresh/ chronic 173-201A WAC	Aquatic life fresh/ chronic CWA §304	Aquatic life fresh/ chronic NTR 40 CFR 131	Human health fresh water CWA §304	Human health fresh water NTR 40 CFR 131	Human health for consumption of water + organism (NRWQC)		
METALS													
Arsenic, inorganic	18	0.10	360.00	340	360	190	150	190	0.02	0.02	0.02	**0.02**	**150**
Cadmium	41	--	0.82	2.00	3.9	0.37	0.25	1.0	--	--	--	**0.25**	**2.1**
Chromium (III)	243,000	--	176	570	550	57	74	180	--	--	--	**57**	
Copper	2,880	--	461.0	13	17	3.5	9.0	11	--	--	1,300	**3.5**	**14**
Lead	--	--	14	65	65	0.54	2.5	2.5	--	--	--	**0.54**	**81.6**
Mercury	--	--	2.1	1.4	2.1	0.01	0.77	0.01	--	0.14	--	**0.012**	**1.4**
Nickel	1,100	--	438	470	1,400	49	52	160	610	610	610	**49**	
Selenium	2,700	--	20	--	20	5.0	5.0	5.0	170	--	170	**3.1**	**5**
Silver	26,000	--	0.32	3.20	3.4	--	--	--	--	--	--	**0.32**	**3.8**
Zinc	16,500	--	35	120	110	32	120	100	7400	--	7,400	**32**	**117**
PAHs													
Acenaphthene	648	--	--	--	--	--	--	--	670	--	70	**70**	**--**
Acenaphthylene		--	--	--	--	--	--	--	--	--	--	**--**	**--**
Anthracene	25,900	--	--	--	--	--	--	--	8300	9,600	300	**300**	**--**
Benzo[g,h,i]perylene	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**
Benzo[a]anthracene	--	0.30	--	--	--	--	--	--	0.004	0.003	0.0012	**0.0012**	**--**
Benzo[a]pyrene	--	0.03	--	--	--	--	--	--	0.004	0.003	0.00012	**0.00012**	**--**
Benzo[b]fluoranthene	--	0.30	--	--	--	--	--	--	0.004	0.003	0.001	**0.0012**	**--**
Benzo[k]fluoranthene	--	3.0	--	--	--	--	--	--	0.004	0.003	0.012	**0.0028**	**--**
Chrysene	--	30.0	--	--	--	--	--	--	0.004	0.003	0.120	**0.0028**	**--**
Dibenzo[a,h]anthracene	--	0.03	--	--	--	--	--	--	0.004	0.003	0.00012	**0.00012**	**--**
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**
Fluoranthene	86		--	--	--	--	--	--	130	300	20	**20**	**--**
Fluorene	3,460	--	--	--	--	--	--	--	1100	1,300	50	**50**	**--**
Indeno[1,2,3-cd]pyrene	--	0.30	--	--	--	--	--	--	0.0038	0.0028	0.0012	**0.0012**	**--**
Methyl naphthalene;1-	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**
Methyl naphthalene;2-	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**
Naphthalene	4,710	--	--	--	--	--	--	--	--	--	--	**4,700**	**--**
Phenanthrene	--	--	--	--	--	--	--	--	--	--	--	**--**	**--**
Pyrene	2,590	--	--	--	--	--	--	--	830	960	20	**20**	**--**

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Table 13
Stormwater Screening Levels
Remedial Investigation
Boeing Kent Space Center

Chemical Name	Surface Water											Screening Level for Stormwater	WA Industrial Stormwater Benchmarks [1]
	Method B Non-cancer	Method B Cancer	Aquatic life fresh/ acute 173-201A WAC	Aquatic life fresh/ acute CWA §304	Aquatic life fresh/ acute NTR 40 CFR 131	Aquatic life fresh/ chronic 173-201A WAC	Aquatic life fresh/ chronic CWA §304	Aquatic life fresh/ chronic NTR 40 CFR 131	Human health fresh water CWA §304	Human health fresh water NTR 40 CFR 131	Human health for consumption of water + organism (NRWQC)		
PCB													
Aroclor 1016	0.006	0.003	--	--	--	--	--	0.014	--	--	--	**0.003**	
Aroclor 1254	0.002	0.00010	--	--	--	--	--	0.014	--	--	--	**0.0001**	
Aroclor 1260	--	--	--	--	--	--	--	0.014	--	--	--	**0.014**	
Total PCBs	--	0.0001	2.00			0.014	0.014	0.14	0.00006	0.00017	0.00006	**0.00006**	
TPH													
Diesel range organics	500	--	--	--	--	--	--	--	--	--	--	**500**	**10000**
Heavy oils	500	--	--	--	--	--	--	--	--	--	--	**500**	**10000**
Gasoline range organics, benzene present	800	--	--	--	--	--	--	--	--	--	--	**800**	
Gasoline range organics, no detectable benzene	1000	--	--	--	--	--	--	--	--	--	--	**1,000**	
VOCs													
Acetone	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzene	1,990	23	--	--	--	--	--	--	2.2	1.2	0.58-2.1	**1.2**	--
Bromodichloromethane	13,600	28	--	--	--	--	--	--	0.55	0.27	0.95	**0.27**	--
Bromoform	13,600	216	--	--	--	--	--	--	4.3	4.3	7.0	**4.3**	--
Bromomethane	955	--	--	--	--	--	--	--	47	48	100	**47**	--
Carbon disulfide	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Carbon tetrachloride	546	4.9	--	--	--	--	--	--	0.23	0.25	0.4	**0.23**	--
Chlorobenzene	5,190	--	--	--	--	--	--	--	130	680	100	**100**	--
Chloroform	6,820	55	--	--	--	--	--	--	5.7	5.7	60	**5.7**	--
Chloromethane	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Dibromochloromethane	13,600	20	--	--	--	--	--	--	0.4	0.41	0.8	**0.40**	--
Dichloroethane;1,1-	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Dichloroethane;1,2-	13,000	59	--	--	--	--	--	--	0.38	0.38	9.9	**0.38**	--
Dichloroethylene;1,1-	23,100	--	--	--	--	--	--	--	330	0.06	300	**0.06**	--
Dichloroethylene;1,2-,cis	--	--	--	--	--	--	--	--	--	--	--	**--**	--

Table 13
Stormwater Screening Levels
Remedial Investigation
Boeing Kent Space Center

Chemical Name	Surface Water											Screening Level for Stormwater	WA Industrial Stormwater Benchmarks [1]
	Method B Non-cancer	Method B Cancer	Aquatic life fresh/ acute 173-201A WAC	Aquatic life fresh/ acute CWA §304	Aquatic life fresh/ acute NTR 40 CFR 131	Aquatic life fresh/ chronic 173-201A WAC	Aquatic life fresh/ chronic CWA §304	Aquatic life fresh/ chronic NTR 40 CFR 131	Human health fresh water CWA §304	Human health fresh water NTR 40 CFR 131	Human health for consumption of water + organism (NRWQC)		
Dichloroethylene;1,2-,trans	32,400	--	--	--	--	--	--	--	140,000	--	100	**100**	--
Dichloropropane;1,2-	56,900	44	--	--	--	--	--	--	0.50	--	0.9	**0.50**	--
Dichloropropene;1,3-	40,900	34	--	--	--	--	--	--	0.34	10	0.27	**0.27**	--
Ethyl chloride (chloroethane)	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Ethylbenzene	6,820	--	--	--	--	--	--	--	530	3,100	68	**68**	--
Methyl ethyl ketone	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Methyl isobutyl ketone	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Methylene chloride	17,300	3,600	--	--	--	--	--	--	4.6	4.7	20	**4.6**	--
Styrene	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Tetrachloroethane;1,1,2,2-	10,400	6.5	--	--	--	--	--	--	0.17	0.17	0.2	**0.17**	--
Tetrachloroethylene (PCE)	500	100.0	--	--	--	--	--	--	0.69	0.8	10	**0.69**	--
Toluene	18,900	--	--	--	--	--	--	--	1,300	6,800	57	**57**	--
Trichloro-1,2,2-trifluoroethane;1,1,2-	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Trichloroethane;1,1,1-	926,000	--	--	--	--	--	--	--	--	--	10,000	**10,000**	--
Trichloroethane;1,1,2-	2,300	25	--	--	--	--	--	--	0.59	0.60	0.55	**0.55**	--
Trichloroethylene (TCE)	120	13	--	--	--	--	--	--	2.5	2.7	0.6	**0.6**	--
Trichlorofluoromethane	--	--	--	--	--	--	--	--	--		--	**--**	--
Vinyl acetate	--	--	--	--	--	--	--	--	--		--	**--**	--
Vinyl chloride	6,480	3.70	--	--	--	--	--	--	0.025	2.0	0.02	**0.02**	--
Xylene;m-	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Xylene;o-	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Xylene;p-	--	--	--	--	--	--	--	--	--	--	--	**--**	--
Xylenes	--	--	1,000.00	--	--	--	--	--	--	--	--	**1,000**	--

Notes:
Bolded value represents lowest Method B criteria and basis for site screening level.
[1] Final Industrial Stormwater General Permit – January 2, 2015
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TPH = total petroleum hydrocarbon
VOC = volatile organic compound
All units in microgram per liter (µg/L)

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Table 14
Summary Soil Results
Remedial Investigation
Boeing Kent Space Center

Sample Date	Area	Sample Location ID	Sample Depth BGS (feet)	TPH-Diesel	TPH-Oil	Metals						
						Arsenic	Chromium	Silver	Copper	Lead	Nickel	Zinc
			RI Screening Levels	**460**	**2000**	**7.3**	**48**	**13.6**	**100**	**220**	**100**	**270**
1/24/2017	SWMU 88/89	SB-1	11.5-12.5	--	--	**7.57**	24.2	<0.232	37.6	6.78	21.7	80.3
1/24/2017	SWMU 88/89	SB-2	11.5-12.5	--	--	**8.59**	25.5	<0.252	42.7	7.3	24.3	54.4
1/27/2017	AOC-1/3	SB-3	8.5-9.5	<9.7	<42	6.71 J	--	--	--	--	--	--
1/27/2017	AOC-1/3	SB-4	8-9	<8.3	<36	--	--	--	--	--	--	--
1/27/2017	AOC-1/3	SB-5	11-12	<7.8	<33	--	--	--	--	--	--	--
4/12/2017	north	MW1	2.5	--	--	1.31 J	--	--	--	--	--	--
4/11/2017	northeast	MW2	2.5	--	--	4.78 J	--	--	--	--	--	--
4/11/2017	east	MW3	2.5	--	--	3.26 J	--	--	--	--	--	--
4/11/2017	southeast	MW4	2.5	--	--	5.76 J	--	--	--	--	--	--
4/11/2017	southwest	MW5	2.5	--	--	3.44 J	--	--	--	--	--	--
4/13/2017	west	MW6	2.5	--	--	4.64 J	--	--	--	--	--	--
4/11/2017	northwest	MW7	2.5	--	--	2.93 J	--	--	--	--	--	--
Historical Striker Data												
7/29/2010	--	KSC-DP-3	7-8	2000	87	2.2	28	--	20.1	4	--	42
7/29/2010	--	KSC-DP-7	3.5-4	<5.6	<11	3	29	--	22.1	4	--	42
7/29/2010	--	KSC-DP-8	4.5-5	<5.6	<11	1.5	29	--	18.1	3	--	37
7/29/2010	--	KSC-DP-9	5.5-6	<5.5	51	1.8	21	--	15.4	2	--	28
7/30/2010	--	KSC-DP-11	5-5.5	<5.9	<12	3.2	10.9	--	16.4	3	--	25
7/30/2010	--	KSC-DP-13	4.5-5	<5.9	<12	3.5	14.3	--	20.3	5	--	29
7/30/2010	--	KSC-DP-16	7.5-8	--	--	7.6	--	--	--	--	--	--
1/27/2011	--	KSC-DP-17	4-5	--	--	2.6	--	--	--	--	--	--
1/27/2011	--	KSC-DP-18	4-5	--	--	1.9	--	--	--	--	--	--
1/27/2011	--	KSC-DP-19	3.5-4.5	--	--	2.3	--	--	--	--	--	--
1/27/2011	--	KSC-DP-20	4.5-5.5	--	--	2.6	--	--	--	--	--	--
1/25/2011	--	KSC-DP-26	1-1.5	--	--	3.1	--	--	--	--	--	--
1/25/2011	--	KSC-DP-27	1-2	--	--	3.5	--	--	--	--	--	--
1/25/2011	--	KSC-DP-28	2.5-3.5	--	--	3.8	--	--	--	--	--	--
1/25/2011	--	KSC-DP-29	7-8	--	--	4.1	--	--	--	--	--	--
1/25/2011	--	KSC-DP-30	2.5-3.5	--	--	4.7	--	--	--	--	--	--
1/26/2011	--	KSC-DP-31	5-6	--	--	4.3	--	--	--	--	--	--
1/26/2011	--	KSC-DP-32	3.5-4.5	--	--	7.7	--	--	--	--	--	--
1/26/2011	--	KSC-DP-33	1.5-2.5	--	--	8.6	--	--	--	--	--	--

Notes and Abbreviations

Bolded values are above Remedial Investigation Screening Level

BGS = below ground surface

TPH = Total petroleum hydrocarbons

All units in milligrams per kilogram

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Table 15
Summary Groundwater Results
Remedial Investigation
Boeing Kent Space Center

Sample Date	Area	Location	Sample Location ID	VOCs (µg/L)				TPH-Gasoline (µg/L)	TPH-Diesel (mg/L)	TPH-Oil (mg/L)	Mineral Oil (mg/L)	Dissolved Metals (µg/L)									
				cis- 1,2-DCE	VC	benzene	toluene					Arsenic	Cadmium	Chromium	Silver	Copper	Lead	Mercury	Nickel	Selenium	Zinc
			RI Screening Level	16	0.02	0.6	57	800	0.500	0.500	0.500	0.02	0.25	10	0.3	3.5	0.5	0.012	49	5	32
1/24/2017	SWMU 88/89	Building 18-43	SB-1	--	--	--	--	--	--	--	--	**193**	--	<2	<0.5	2.7	<1	--	5.4	--	<15
1/24/2017	SWMU 88/89	Building 18-43	SB-2	--	--	--	--	--	--	--	--	**133**	--	<2	<0.5	<2	<1	--	18.8	--	<15
1/27/2017	AOC-1/3	Building 18-54	SB-3	--	--	--	--	--	<0.099	<0.25	--	**51.1**	--	--	--	--	--	--	--	--	--
1/27/2017	AOC-1/3	Building 18-54	SB-4	--	--	--	--	--	<0.099	<0.25	--	--	--	--	--	--	--	--	--	--	--
1/27/2017	AOC-1/3	Building 18-54	SB-5	--	--	--	--	--	<0.097	<0.24	--	--	--	--	--	--	--	--	--	--	--
1/24/2017	AOC-2	Building 18-35	SB-6	0.2	**0.19**	0.3	<0.2	--	<0.095	--	--	--	--	--	--	--	--	--	--	--	--
1/24/2017	AOC-2	Building 18-35	SB-7	<0.2	<0.2	<0.2	<0.2	--	<0.095	--	--	--	--	--	--	--	--	--	--	--	--
1/24/2017	AOC-2	Building 18-35	SB-8	0.2	**0.19**	<0.2	<0.2	--	0.13	--	--	**48.3**	--	--	--	--	--	--	--	--	--
1/25/2017	18-62 Milling	Building 18-62	SB-9	--	--	--	--	--	<0.095	--	<0.2	--	--	--	--	--	--	--	--	--	--
1/25/2017	18-62 Milling	Building 18-62	SB-10	--	--	--	--	--	0.13	--	<0.2	--	--	--	--	--	--	--	--	--	--
1/25/2017	18-62 Milling	Building 18-62	SB-11	--	--	--	--	--	0.29 J	--	0.325	--	--	--	--	--	--	--	--	--	--
1/25/2017	18-62 Milling	Building 18-62	SB-12	--	--	--	--	--	0.18	--	0.216	**266**	--	--	--	--	--	--	--	--	--
1/26/2017	18-67 UST	Building 18-67	SB-13	--	--	<0.2	<0.2	<250	<0.097	--	--	**16.7**	--	--	--	--	--	--	--	--	--
1/26/2017	KS-1	Building 18-42	SB-14	--	--	--	--	--	0.25	--	--	**105**	--	--	--	--	--	--	--	--	--
1/26/2017	KS-1	Building 18-42	SB-15	--	--	--	--	--	0.28	--	--	--	--	--	--	--	--	--	--	--	--
1/26/2017	KS-1	Building 18-42	SB-16	--	--	--	--	--	0.42	--	--	--	--	--	--	--	--	--	--	--	--
1/26/2017	KS-3	Building 18-41	SB-17	--	--	<0.2	<0.2	<250	--	--	--	<2	--	--	--	--	--	--	--	--	--
1/27/2017	KS-3	Building 18-41	SB-18	--	--	<0.2	<0.2	<250	--	--	--	--	--	--	--	--	--	--	--	--	--
1/25/2017	KS-3	Building 18-41	SB-19	--	--	<0.2	0.9	<250	--	--	--	--	--	--	--	--	--	--	--	--	--
1/27/2017	KS-3	Building 18-41	SB-20	--	--	<0.2	<0.2	<250	--	--	--	--	--	--	--	--	--	--	--	--	--
5/4/2017	north	MW1	MW1	--	--	--	--	--	<0.103	<0.257	--	**85.2**	<0.5	3.5	<0.5	**39.8 J**	**1.4**	<0.2	5.3	<2	**35.6 J**
5/3/2017	northeast	MW2	MW2	--	--	--	--	--	<0.0976	<0.244	--	**28.2**	<0.5	<2	<0.5	<2	<1	<0.2	7.9	<2	<15
5/3/2017	east	MW3	MW3	--	--	--	--	--	<0.0964	<0.241	--	**25.6**	<0.5	<2	<0.5	2.1	<1	<0.2	<2	<2	<15
5/3/2017	southeast	MW4	MW4	--	--	--	--	--	<0.1 J	<0.25	--	**18.9**	<0.5	<2	<0.5	2.1	<1	<0.2	<2	<2	<15
		MW4 Duplicate	MW4 Duplicate	--	--	--	--	--	0.216 J	0.4	--	**18.4**	<0.5	<2	<0.5	<2	<1	<0.2	<2	<2	<15
5/3/2017	southwest	MW5	MW5	--	--	--	--	--	<0.103	<0.257	--	**3.3**	<0.5	<2	<0.5	2.9	<1	<0.2	<2	<2	<15
5/4/2017	west	MW6	MW6	--	--	--	--	--	<0.1	<0.251	--	**27.9**	<0.5	<2	<0.5	<2	<1	<0.2	3.8	<2	<15 J
5/4/2017	northwest	MW7	MW7	--	--	--	--	--	<0.099	<0.248	--	**27.1**	<0.5	<2	<0.5	2.4 J	<1	<0.2	2.5	<2	<15 J
Historical Groundwater Sample Results																					
12/17/2001	Clearwater	Building 18-21	18-21-1	1.6	1.1	<1	<1	--	<0.25	<0.5	--	--	<0.2	3	--	1.4	<1	--	1.5	--	5
10/8/2003		Building 18-21	18-21-2	0.5	0.2	<0.2	0.4	--	0.26	<0.5	--	--	0.3	30	--	21.3	7	--	45.6	--	61
12/17/2001		Building 18-23	18-23-1	6.1	3.3	<1	<1	--	<0.25	<0.5	--	--	<0.2	2	--	<0.5	<1	--	0.8	--	<4
12/18/2001		Building 18-23	18-23-2	<10	<10	<10	<10	--	1.4	0.95	--	--	--	--	--	--	--	--	--	--	--
10/8/2003		Building 18-23	18-23-3	<0.2	<0.2	<0.2	<0.2	--	<0.25	<0.5	--	--	<0.2	13	--	10.4	2	--	25.3	--	33
10/8/2003		Building 18-23	18-23-4	0.4	<0.2	<0.2	<0.2	--	<0.25	<0.5	--	--	0.2	21	--	15.1	6	--	35	--	44
10/8/2003		Building 18-23	18-23-5	0.4	<0.2	<0.2	<0.2	--	<0.25	<0.5	--	--	0.3	42	--	30.3	6	--	67.5	--	122
12/17/2001		Building 18-35	18-35-2	--	--	--	--	--	0.29	<0.5	--	--	--	--	--	--	--	--	--	--	--
10/9/2003		Building 18-35	18-35-3	0.8	<0.2	1.8	<0.2	--	<0.25	<0.5	--	--	<0.2	3.1	--	6.4	<1	--	4.0	--	9
10/9/2003		Building 18-35	18-35-4	8.7	2.2	<0.2	<0.2	--	<0.25	<0.5	--	--	<0.2	<0.5	--	0.8	<1	--	1.5	--	<4
12/17/2001		Building 18-62	18-62-7	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	2	--	0.7	<1	--	2.6	--	<4
10/9/2003		Building 18-62	18-62-8	<0.2	<0.2	<0.2	<0.2	--	<0.25	<0.5	--	--	<0.2	0.6	--	1.1	<1	--	1.5	--	<4
12/26/2001		Building 18-22	BSC-18-22-01	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<0.5	--	1.6	<1	--	10.1	--	<4
12/26/2001		Building 18-22	BSC-18-22-02	8	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	0.8	<1	--	3.6	--	4
12/26/2001		Building 18-22	BSC-18-22-03	<1.0	<1.0	1.4	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	0.9	<1	--	3.8	--	<4
12/26/2001		Building 18-23	BSC-18-23-01	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	0.6	<1	--	3.7	--	<4
12/26/2001		Building 18-23	BSC-18-23-02	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	3	--	0.8	<1	--	5.7	--	8
12/27/2001		Building 18-62	BSC-18-62-03	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	<0.5	<1	--	1	--	<4
12/26/2001		Building 18-62	BSC-18-62-04	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<0.5	--	<0.5	<1	--	1	--	<4

DOF

Table 15
Summary Groundwater Results
Remedial Investigation
Boeing Kent Space Center

Sample Date	Area	Location	Sample Location ID	VOCs (µg/L)				TPH-Gasoline (µg/L)	TPH-Diesel (mg/L)	TPH-Oil (mg/L)	Mineral Oil (mg/L)	Dissolved Metals (µg/L)									
				cis- 1,2-DCE	VC	benzene	toluene					Arsenic	Cadmium	Chromium	Silver	Copper	Lead	Mercury	Nickel	Selenium	Zinc
			RI Screening Level	16	0.02	0.6	57	800	0.500	0.500	0.500	0.02	0.25	10	0.3	3.5	0.5	0.012	49	5	32
12/27/2001		Building 18-62	BSC-18-62-05	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<0.5	--	3.2	<1	--	4.1	--	<4
12/26/2001		Building 18-62	BSC-18-62-06	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<0.5	--	0.6	<1	--	1.6	--	<4
12/27/2001		Building 18-63	BSC-18-63-01	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	<0.5	<1	--	<0.5	--	<4
12/27/2001		Building 18-63	BSC-18-63-02	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	<0.5	<1	--	1	--	<4
12/27/2001		Building 18-67	BSC-18-67-02	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	0.9	<1	--	1.4	--	<4
12/27/2001		Building 18-67	BSC-18-67-03	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	0.6	<1	--	2.4	--	<4
12/27/2001		Building 18-67	BSC-18-67-04	<1.0	<1.0	<1.0	<1.0	--	<0.25	<0.5	--	--	<0.2	<2	--	0.8	<1	--	1.7	--	<4
1/25/2012	Striker		KSC-DP-34	--	--	--	--	--	--	--	--	12.6	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-35	--	--	--	--	--	--	--	--	15	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-36	--	--	--	--	--	--	--	--	47.1	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-37	--	--	--	--	--	--	--	--	5.2	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-38	--	--	--	--	--	--	--	--	27.9	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-39	--	--	--	--	--	--	--	--	58.4	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-40	--	--	--	--	--	--	--	--	3.3	--	--	--	--	--	--	--	--	--
1/25/2012			KSC-DP-41	--	--	--	--	--	--	--	--	3.3	--	--	--	--	--	--	--	--	--
2/9/2012			KSC-DP-42	--	--	--	--	--	--	--	--	6	--	--	--	--	--	--	--	--	--
2/9/2012			Kent-1	--	--	--	--	--	--	--	--	59.6	--	--	--	--	--	--	--	--	--
2/9/2012			Kent-2	--	--	--	--	--	--	--	--	<2	--	--	--	--	--	--	--	--	--
2/8/2012			Kent-3	--	--	--	--	--	--	--	--	<2	--	--	--	--	--	--	--	--	--
2/8/2012			Kent-4	--	--	--	--	--	--	--	--	<2	--	--	--	--	--	--	--	--	--
2/8/2012			Kent-6	--	--	--	--	--	--	--	--	3.9	--	--	--	--	--	--	--	--	--
2/9/2012			Kent-7	--	--	--	--	--	--	--	--	115	--	--	--	--	--	--	--	--	--
2/9/2012			Kent-8	--	--	--	--	--	--	--	--	14.5	--	--	--	--	--	--	--	--	--
2/9/2012			15M17S	--	--	--	--	--	--	--	--	<2	--	--	--	--	--	--	--	--	--
2/9/2012			15M30A	--	--	--	--	--	--	--	--	10.8	--	--	--	--	--	--	--	--	--
7/28/2010			KSC-DP-1	<0.2	<0.2	<0.2	<0.2	<250	<0.10	<0.20	--	23.8	<0.2	<1	--	<0.5	<1	<0.1	--	--	<4
7/30/2010			KSC-DP-2	23	0.3	<0.2	<0.2	<250	<0.10	0.27	--	8.1	<2	<5	--	<2	<20	<0.1	--	--	<10
7/30/2010			KSC-DP-3	<0.2	0.2	<0.2	<0.2	360	0.11	<0.20	--	40.3	<2	<5	--	<2	<20	<0.1	--	--	<10
7/29/2010			KSC-DP-4	<0.2	<0.2	<0.2	<0.2	<250	<0.10	<0.20	--	9.6	<0.2	<1	--	0.5	<1	<0.1	--	--	<4
7/30/2010			KSC-DP-5	<0.2	<0.2	<0.2	0.2	<250	<0.10	<0.20	--	120	<2	<5	--	<2	<20	<0.1	--	--	<10
7/29/2010			KSC-DP-9	<0.2	<0.2	<0.2	<0.2	<250	<0.10	<0.20	--	0.13.8	<0.2	2	--	0.8	<1	<0.1	--	--	<4
7/30/2010			KSC-DP-11	<0.2	<0.2	<0.2	<0.2	<250	<0.10	<0.20	--	43.8	<2	<5	--	<2	<20	<0.1	--	--	<10
7/30/2010			KSC-DP-15	0.3	<0.2	<0.2	<0.2	<250	<0.10	<0.20	--	9.1	<2	<5	--	<2	<20	<0.1	--	--	<10
7/30/2010			KSC-DP-16	1	1.8	<0.2	<0.2	<250	<0.10	<0.20	--	53.3	<2	<5	--	<2	<20	<0.1	--	--	<10
1/27/2011			KSC-DP-17	0.2	0.8	<0.2	<0.2	--	--	--	--	59.9	--	--	--	--	--	--	--	--	--
1/27/2011			KSC-DP-18	0.4	1.4	<0.2	0.2	--	--	--	--	115	--	--	--	--	--	--	--	--	--
1/27/2011			KSC-DP-19	<0.2	0.2	<0.2	0.6	--	--	--	--	77	--	--	--	--	--	--	--	--	--
1/27/2011			KSC-DP-20	<0.2	<0.2	<0.2	0.2	--	--	--	--	33.7	--	--	--	--	--	--	--	--	--
1/26/2011			KSC-DP-22	--	--	--	--	<100	<0.11	<0.22	--	66	--	--	--	--	--	--	--	--	--
1/26/2011			KSC-DP-23	--	--	--	--	<100	<0.10	<0.21	--	66.7	--	--	--	--	--	--	--	--	--
1/26/2011			KSC-DP-24	--	--	--	--	350	<0.11	<0.21	--	2.7	--	--	--	--	--	--	--	--	--
1/26/2011			KSC-DP-25b	--	--	--	--	380	0.20	<0.21	--	71.6	--	--	--	--	--	--	--	--	--
1/25/2011			KSC-DP-26	--	--	--	--	--	--	--	--	0.8	--	--	--	--	--	--	--	--	--
1/25/2011			KSC-DP-27	--	--	--	--	--	--	--	--	111	--	--	--	--	--	--	--	--	--
1/25/2011			KSC-DP-28	--	--	--	--	--	--	--	--	18	--	--	--	--	--	--	--	--	--
1/25/2011	Striker		KSC-DP-29	--	--	--	--	--	--	--	--	1.1	--	--	--	--	--	--	--	--	--
1/25/2011			KSC-DP-30	--	--	--	--	--	--	--	--	31.9	--	--	--	--	--	--	--	--	--
1/26/2011			KSC-DP-31	--	--	--	--	--	--	--	--	65.4	--	--	--	--	--	--	--	--	--
1/26/2011			KSC-DP-32	--	--	--	--	--	--	--	--	2.8	--	--	--	--	--	--	--	--	--

DOF

Table 15
Summary Groundwater Results
Remedial Investigation
Boeing Kent Space Center

Sample Date	Area	Location	Sample Location ID	VOCs (µg/L)				TPH-Gasoline (µg/L)	TPH-Diesel (mg/L)	TPH-Oil (mg/L)	Mineral Oil (mg/L)	Dissolved Metals (µg/L)									
				cis- 1,2-DCE	VC	benzene	toluene					Arsenic	Cadmium	Chromium	Silver	Copper	Lead	Mercury	Nickel	Selenium	Zinc
			RI Screening Level	16	0.02	0.6	57	800	0.500	0.500	0.500	0.02	0.25	10	0.3	3.5	0.5	0.012	49	5	32
1/26/2011			KSC-DP-33	--	--	--	--	--	--	--	--	0.3	--	--	--	--	--	--	--	--	--
11/21/1994			92MW-01	--	--	--	--	--	--	--	--	19	--	--	--	--	--	--	--	--	--
11/21/1994			92MW-02	--	--	--	--	--	--	--	--	17	--	--	--	--	--	--	--	--	--
11/21/1994			92MW-03	--	--	--	--	--	--	--	--	25	--	--	--	--	--	--	--	--	--
11/21/1994			93MW-04	--	--	--	--	--	--	--	--	17	--	--	--	--	--	--	--	--	--
11/21/1994			93MW-05	--	--	--	--	--	--	--	--	16	--	--	--	--	--	--	--	--	--
4/27/2009			MW-1	--	--	--	--	--	--	--	--	27	--	--	--	--	--	--	--	--	--
4/27/2009			MW-2	--	--	--	--	--	--	--	--	24	--	--	--	--	--	--	--	--	--
4/27/2009			MW-3	--	--	--	--	--	--	--	--	51	--	--	--	--	--	--	--	--	--
10/26/1998			P-1	--	--	--	--	--	--	--	--	42	--	--	--	--	--	--	--	--	--
10/26/1998			P-2	--	--	--	--	--	--	--	--	13	--	--	--	--	--	--	--	--	--
10/26/1998			P-3	--	--	--	--	--	--	--	--	18	--	--	--	--	--	--	--	--	--
10/26/1998			P-4	--	--	--	--	--	--	--	--	21	--	--	--	--	--	--	--	--	--
3/6/2000			KGC-MW-1	--	--	--	--	--	--	--	--	19	--	--	--	--	--	--	--	--	--
3/6/2000			KGC-MW-2	--	--	--	--	--	--	--	--	3	--	--	--	--	--	--	--	--	--
3/6/2000			KGC-MW-3	--	--	--	--	--	--	--	--	12	--	--	--	--	--	--	--	--	--

Notes and Abbreviations
Bolded values are above Remedial Investigation Screening Level
Only detected VOCs shown
Samples collected from screen set across the water table
TPH = Total petroleum hydrocarbons
VOCs = Volatile Organic Compounds
ug/L = micrograms per liter
mg/L = milligrams per liter

Table 16
General Chemistry Results
Remedial Investigation
Boeing Kent Space Center

Location	Date	pH	Conductivity (uS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Ferrous Iron (mg/L)	Nitrate (mg/L)	Sulfate (mg/L)
MW-1	5/4/2017	6.35	1092	0.46	-18.6	11.5	4.5	<0.1 J	1.4 J
MW-2	5/3/2017	6.58	608	0.29	7.5	9.6	6.5	<0.1 J	<0.1 J
MW-3	5/3/2017	6.77	149	0.12	-8.1	2.6	4.5	<0.1 J	<0.1 J
MW-4	5/3/2017	6.81	310	1.52	-9.5	15.8	4.8	<0.1 J	3.1 J
MW-5	5/3/2017	6.46	407	1.8	4	11.4	1.5	1.6	36.7
MW-6	5/4/2017	6.2	397	0.6	-6.3	14.3	6	<0.1 J	14.6 J
MW-7	5/4/2017	6.5	483	1.28	-5.1	9.8	4.3	<0.1 J	1.2 J
SB-1	1/24/2017	6.6	347	--	--	178	--	--	--
SB-2	1/24/2017	6.6	292	--	--	37.3	--	--	--
SB-3	1/27/2017	6.91	92.5	--	--	234	--	--	--
SB-4	1/27/2017	6.46	105	--	--	21	--	--	--
SB-5	1/27/2017	6.93	77.5	--	--	74	--	--	--
SB-6	1/24/2017	6.6	386	--	--	468	--	--	--
SB-7	1/24/2017	6.44	389	--	--	455	--	--	--
SB-8	1/24/2017	6.23	458	--	--	290	--	--	--
SB-9	1/25/2017	6.73	137	--	--	27	--	--	--
SB-10	1/25/2017	6.7	286	--	--	20.8	--	--	--
SB-11	1/25/2017	6.7	312	--	--	87	--	--	--
SB-12	1/25/2017	6.62	315	--	--	280	--	--	--
SB-13	1/26/2017	6.9	126	--	--	136	--	--	--
SB-14	1/26/2017	6.5	142	--	--	1.6	--	--	--
SB-15	1/26/2017	6.6	135	--	--	482	--	--	--
SB-16	1/26/2017	6.38	148	--	--	38.4	--	--	--
SB-17	1/26/2017	7.21	93.6	--	--	578	--	--	--
SB-18	1/27/2017	6.48	125	--	--	37.1	--	--	--
SB-19	1/25/2017	6.96	219	--	--	151	--	--	--
SB-20	1/27/2017	6.68	121	--	--	291	--	--	--
Stormwater									
N. Detention Pond	1/18/2017	7.16	77.2	--	--	10.56	--	--	--
Manhole 20.235	1/18/2017	6.68	39.2	--	--	1.12	--	--	--
Manhole 20.237	1/18/2017	6.48	66.5	--	--	3.09	--	--	--
Manhole 15.10	1/18/2017	6.47	77.5	--	--	6.25	--	--	--
Manhole 16.12	1/18/2017	6.71	29.2	--	--	0.24	--	--	--
Oufall 16	1/18/2017	6.78	22.2	--	--	2.93	--	--	--
Historical Groundwater Sample Results									
KGW001	10/3/1997	6.61	1120	--	--	--	--	--	--
KGW002	10/3/1997	6.54	748	--	--	--	--	--	--
KGW003	10/3/1997	6.4	1095	--	--	--	--	--	--
KGW004	10/3/1997	6.37	1155	--	--	--	--	--	--
KGW001	8/5/1998	6.77	1232	--	--	--	--	--	--
KGW002	8/5/1998	6.82	942	--	--	--	--	--	--
KGW003	8/5/1998	6.61	828	--	--	--	--	--	--
KGW004	8/5/1998	6.59	598	--	--	--	--	--	--
KGW001	1/14/1999	6.67	882	--	--	--	--	--	--
KGW002	1/14/1999	6.76	961	--	--	--	--	--	--
KGW003	1/14/1999	6.47	864	--	--	--	--	--	--
KGW004	1/14/1999	6.5	824	--	--	--	--	--	--

Notes:
uS/cm = microSiemens per centimeter
mg/L = milligrams per liter
mV = millivolts
ORP = oxidation-reduction potential
NTU = nephelometric turbidity unit
J = The result value is qualified as estimated

DOF

Table 17
Storm Sewer System Solids Results
Remedial Investigation
Boeing Kent Space Center

Sample Date	Location	Sample Location ID	TPH		PAHs																	PCBs	Metals										
			Diesel	Oil	2-Methylnaphthalene	Acenaphthylene	Acenaphthene	Anthracene	Dibenzofuran	Naphthalene	Phenanthrene	Pyrene	Fluorene	Fluoranthene	Benzo(g,h,i)perylene	Benzo(a)anthracene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Dibenzo(a,h)anthracene	Chrysene	Total Benzofluoranthenes	Total PCBs	Arsenic	Chromium	Silver	Copper	Lead	Nickel	Zinc	Cadmium	Selenium	Mercury	cPAH TEQ using TEF under WAC 173-340-708e
RI Screening Level			**340**	**3600**	**17000**																	**110**	**14**	**72**	**0.57**	**400**	**360**	**26**	**3200**	**2.1**	**11**	**0.66**	
Units			**mg/kg**		**ug/kg**																		**mg/kg**										
2017 RI Results																																	
6/29/2017	Outfall-Mill Creek 20/20B	OF-20	9.72	20.8	<4.87	<4.87	2.46 J	<4.87	<4.87	3.42 J	10.6	14.6	3.37 J	13.8	5.53	5.5	5.11	4.06 J	<4.87	9.01	9.95	<18.3	3.8	13.2	0.05 J	21.9	9.85	11.4	44.1	0.13	0.71 J	0.04481	6.6
5/4/2017	Outfall- East Drainage Ditch 16	KSC-OF-16-0.3	19.7	89	2.38 J	<4.72	<4.72	6.04	<4.72	<4.72	33.6	101	3.14 J	113	87.9	47.6	62.3	70.5	16.8	97.3	158	<17.6	3.01	18.7	0.08 J	29.2	9.02	15.7	109	0.31	0.94	<0.02258	76.8
5/4/2017	Outfall-North Detention Pond	OF-DP-0.3	20.8	103	4.99	5.01	<4.94	3.92 J	3.43 J	9.02	23	41.7	3.57 J	38.1	61	13.8	21	29.4	8.47	42.6	66.6	**189.5**	**38.4**	45.1	0.29 J	195	50.5	**35.2**	415	1.41	1.59	0.1721	26.6
Historical Storm System Sample Results																																	
9/17/2002	Catch basin	CB 14.12C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**1400**	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 14.7C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<130	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 16.5C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**180**	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 20.156C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<6	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 16.21C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	ND	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 16.19C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	<14	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 17.6C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**320**	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 20.169C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**180**	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 17.9C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	66	--	--	--	--	--	--	--	--	--	--	--
9/17/2002		CB 18.13C	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**970**	--	--	--	--	--	--	--	--	--	--	--
Feb 2014	Off-Site	DT318	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	74.4	--	--	--	--	--	--	--	--	--	--	5117
Feb 2014		FS318	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	51.8	--	--	--	--	--	--	--	--	--	--	2878
Feb 2014		CS318	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**128**	--	--	--	--	--	--	--	--	--	--	8396
11/1/2011	North Detention Pond	NDP-1(0-0.5)	<89	<180	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**21**	49	--	295	132	--	400	1.7	--	0.33	--
11/1/2011		NDP-2(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.1	21.3	--	63.4	27.8	--	147	0.7	--	0.06	--
11/1/2011		NDP-2(1-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.2 J	--	--	--	--	--	--	--	--	--	--
11/1/2011		NDP-3(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.7	17.9	--	62.7	36.6	--	122	0.6	--	0.07	--
11/1/2011		NDP-4(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13.2	20.5	--	51.6	27.1	--	144	0.5	--	0.07	--
11/1/2011		NDP-4(1-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.2	--	--	--	--	--	--	--	--	--	--
11/1/2011		NDP-5(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.6	19.5	--	40.4	15.8	--	67	0.2	--	0.07	--
11/1/2011		NDP-5(1-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.8	--	--	--	--	--	--	--	--	--	--
11/1/2011		NDP-6(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10.8	17	--	50.3	26.7	--	87	0.2	--	0.05	--
11/1/2011		NDP-6(1-2)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4	--	--	--	--	--	--	--	--	--	--
11/1/2011		NDP-7(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.6	17.4	--	45.7	14.2	--	65	0.3	--	0.09	--
11/1/2011		NDP-8(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.4	20.3	--	42.3	12	--	57	<0.1	--	0.05	--
11/1/2011		NDP-9(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.9	15.7	--	30.6	66.8 J	--	62	0.2	--	0.04	--
11/1/2011		NDP-10(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7	17	--	30.7	9.8	--	54	<0.2	--	0.05	--
11/1/2011		NDP-11(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	6.7	16.7	--	29.4	88.3	--	50	0.2	--	0.05	--
11/1/2011		NDP-12(0-1)	<50	<100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5.7	22.4	--	20.5	7.3	--	40	<0.1	--	<0.02	

Notes and Abbreviations

Bolded values are above Remedial Investigation Screening Level
Only detected PAHs shown
TPH = Total petroleum hydrocarbons
PAHs = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
ug/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
< = compound was not detected greater than the reporting limit shown
J = The result value is qualified as estimated
Draft results - data are unvalidated

DOF

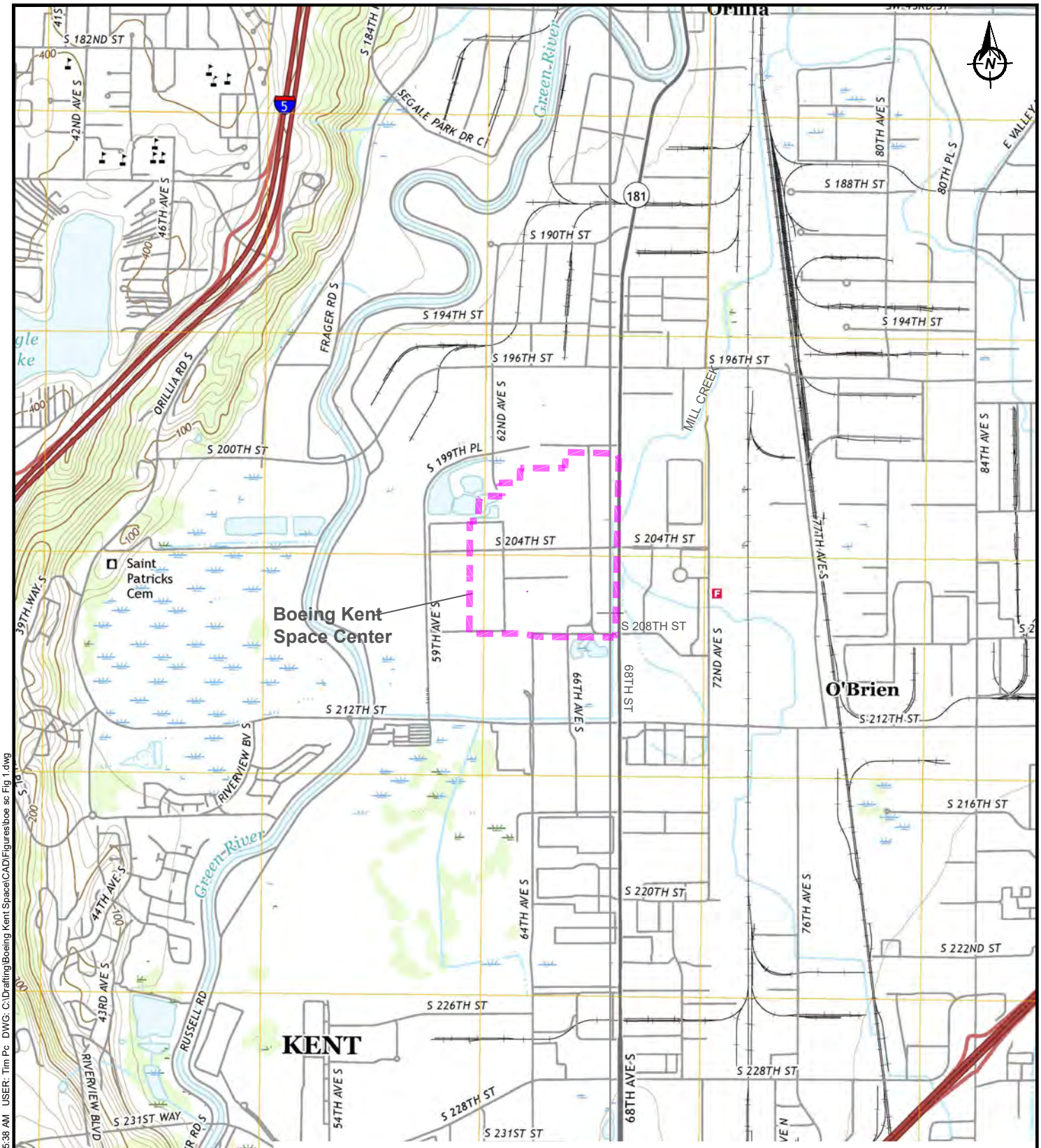
Table 18
Stormwater Results
Remedial Investigation
Boeing Kent Space Center

Sample Date	Location	Sample Location ID	TPH-Gasoline (ug/L)	TPH-Diesel (mg/L)	TPH-Oil (mg/L)	Detected VOCs (ug/L)	PAHs (ug/L)						PCBs (ug/L)	Total Metals (ug/L)										Dissolved Metals (ug/L)									
						Acetone	Naphthalene	Phenanthrene	Pyrene	Fluoranthene	Chrysene	Total Benzofluoranthenes	Total	Arsenic	Chromium	Silver	Copper	Lead	Nickel	Zinc	Cadmium	Selenium	Mercury	Arsenic	Chromium	Silver	Copper	Lead	Nickel	Zinc	Cadmium	Selenium	Mercury
WA Industrial Stormwater Benchmarks			--	**10**		--	--	--	--	--	--	--	--	**150**	--	**3.8**	**14**	**81.6**	--	**117**	**2.1**	**5**	**1.4**	**150**	--	**3.8**	**14**	**81.6**	--	**117**	**2.1**	**5**	**1.4**
RI Screening Level			**800/1000**	**0.5**	**0.5**	--	**4700**	--	**20**	**20**	**0.003**	--	**0.00006**	**0.02**	**57**	**0.32**	**3.5**	**0.54**	**49**	**32**	**0.25**	**3.1**	**0.01**	**0.02**	**57**	**0.32**	**3.5**	**0.54**	**49**	**32**	**0.25**	**3.1**	**0.01**
1/18/2017	Manhole	MH-20.237-W	<100	<0.1	<0.2	5.22	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.373**	<0.5	<0.2	2.92	0.503	0.608	25.1	<0.1	<2.0	<0.1	**0.257**	<0.5	<0.2	2	<0.1	<0.5	19	<0.1	<0.5	<0.1
1/18/2017	Manhole	MH-20.235-W	<100	<0.1	<0.2	6.27	0.011	0.013	<0.01	<0.01	<0.01	<0.01	**0.012**	**0.562**	0.571	<0.2	3.47	**0.591**	0.501	**47.8**	<0.1	<2.0	<0.1	**0.462**	<0.5	<0.2	2.25	0.11	<0.5	**37.2**	<0.1	<0.5	<0.1
1/18/2017	Manhole	MH-16.12-W	<100	<0.1	<0.2	8.18	0.012	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.2	<0.5	<0.2	2.46	0.229	<0.5	**59.8**	<0.1	<2.0	<0.1	<0.2	<0.5	<0.2	1.77	0.182	<0.5	**50.5**	<0.1	<0.5	<0.1
1/18/2017	Manhole	MH-15.10-W	<100	<0.1	<0.2	5.67	<0.01	0.013	0.013	<0.01	<0.01	<0.01	<0.01	**0.381**	0.844	<0.2	2.85	**2.18**	<0.5	21.4	<0.1	<2.0	<0.1	**0.272**	0.601	<0.2	1.6	0.155	<0.5	8.46	<0.1	<0.5	<0.1
1/20/2017	Outfall-Mill Creek 20/20B	OF-20-W	<100	<0.1	<0.2	5.33	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.481**	<0.5	<0.2	2.29	0.329	0.59	12.4	<0.1	<2	<0.1	**0.33**	<0.5	<0.2	1.61	0.117	<0.5	9.41	<0.1	<0.5	<0.1
1/18/2017	Outfall- East Drainage Ditch 16	OF-16-W	<100	<0.1	0.219	20.2	0.017	0.034	0.020	0.018	**0.010**	0.011	<0.01	<0.2	0.632	<0.2	3.21	**1.42**	0.555	**57.5**	<0.1	<2	<0.1	<0.2	<0.5	<0.2	0.945	<0.1	<0.5	**37.7**	<0.1	<0.5	<0.1
1/18/2017	Outfall- North Detention Pond	OF-NDP-W	<100	<0.1	<0.2	5.72	0.014	ND	ND	ND	ND	ND	<0.01	**0.506**	0.606	<0.2	**5.03**	0.358	0.713	15.9	<0.1	<2	<0.1	**0.356**	<0.5	<0.2	2.02	<0.1	<0.5	9.88	<0.1	<0.5	<0.1
Historical Storm System Sample Results																																	
11/7/2002	Mill Creek Offsite	B317	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	52			
1/21/2003		B317	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35.3			
1/22/2003		B317	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	34.6			
11/17/2003		B317	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29.6			
Aug 2005			--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.94-13.6	--	--	5-105	--	--	--	--	--	--	0.75-10.8	--	--	4-100			
Sept 2005			--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.89-14.1	--	--	6-88.7	--	--	--	--	--	--	0.67-10.4	--	--	5.7-79.3			
Dec 2005			--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.23-6.01	--	--	19-75.9	--	--	--	--	--	--	0.74-3.14	--	--	18.3-58.4			

Notes and Abbreviations
Bolded values are above Remedial Investigation Screening Level
Only detected VOCs and PAHs shown
TPH = Total petroleum hydrocarbons
VOCs = Volatile Organic Compounds
PAHs = Polynuclear Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls

DOF

Figures



Boeing Kent Space Center
Kent, Washington

Remedial Investigation

Site Location Map

DALTON OLMSTED FUGLEVAND

FIGURE
1

December 27, 2017

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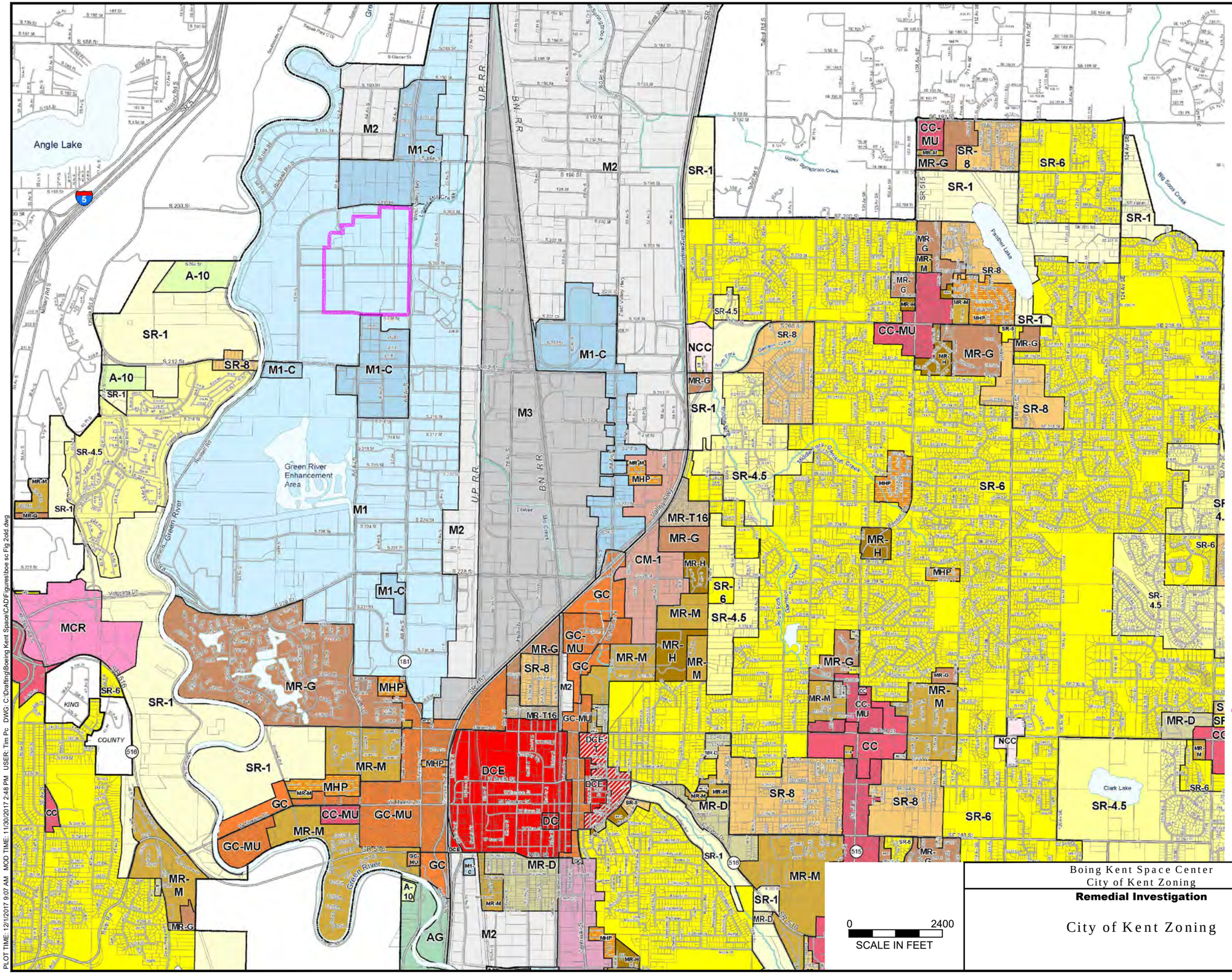

Zoning Districts

- Kent City Limits
- Agricultural (A-10)
- Agricultural / General (AG)
- Single Family (SR-1)
- Single Family (SR-3)
- Single Family (SR-4.5)
- Single Family (SR-6)
- Single Family (SR-8)
- Duplex Multifamily (MR-D)
- Townhouse / Condo (MR-T12)
- Townhouse / Condo (MR-T16)
- Low Density Multifamily (MR-G)
- Medium Density Multifamily (MR-M)
- High Density Multifamily (MR-H)
- Mobile Home Park (MHP)
- Neighborhood Convenience Commercial (NCC)
- Downtown Commercial (DC)
- Downtown Commercial Enterprise (DCE)
- Downtown Commercial Enterprise - Transitional Overlay (DC
- Community Commercial (CC)
- Community Commercial / Mixed Use (CC-MU)
- General Commercial (GC)
- General Commercial / Mixed Use (GC-MU)
- Midway Commercial Residential (MCR)
- Midway Transit Community I (MTC-1)
- Midway Transit Community II (MTC-2)
- Commercial Manufacturing I (CM-1)
- Commercial Manufacturing II (CM-2)
- Industrial Park (M1)
- Industrial Park / Commercial (M1-C)
- Limited Industrial (M2)
- General Industrial (M3)

Legend

Site Boundary

Reference:
Base map provided by City of Kent
(Surface Drainage Facilities, Date printed April 2016)

0 2400
SCALE IN FEET

Boing Kent Space Center
City of Kent Zoning
Remedial Investigation

City of Kent Zoning

DALTON OLMSTED FUGLEVAND

FIGURE
2
December 27, 2017

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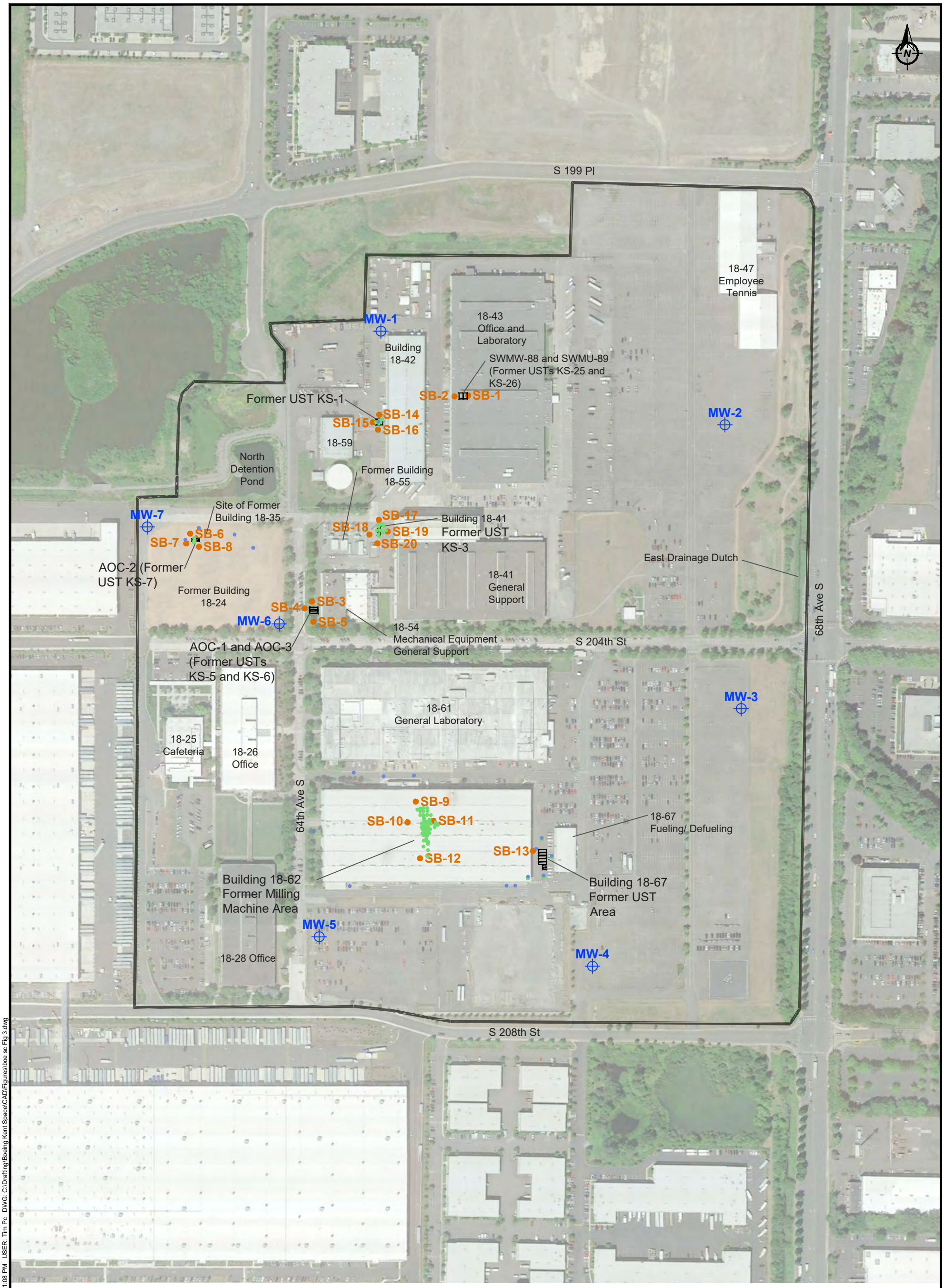


Legend

- MW-1 — RI Groundwater Monitoring Well
- SB-10 — RI Soil/Groundwater Sample Boring
- Site Boundary
- Historic Water Sample
- Historic Soil Sample

0 300

SCALE IN FEET

Boeing Kent Space Center
Kent, Washington

Remedial Investigation

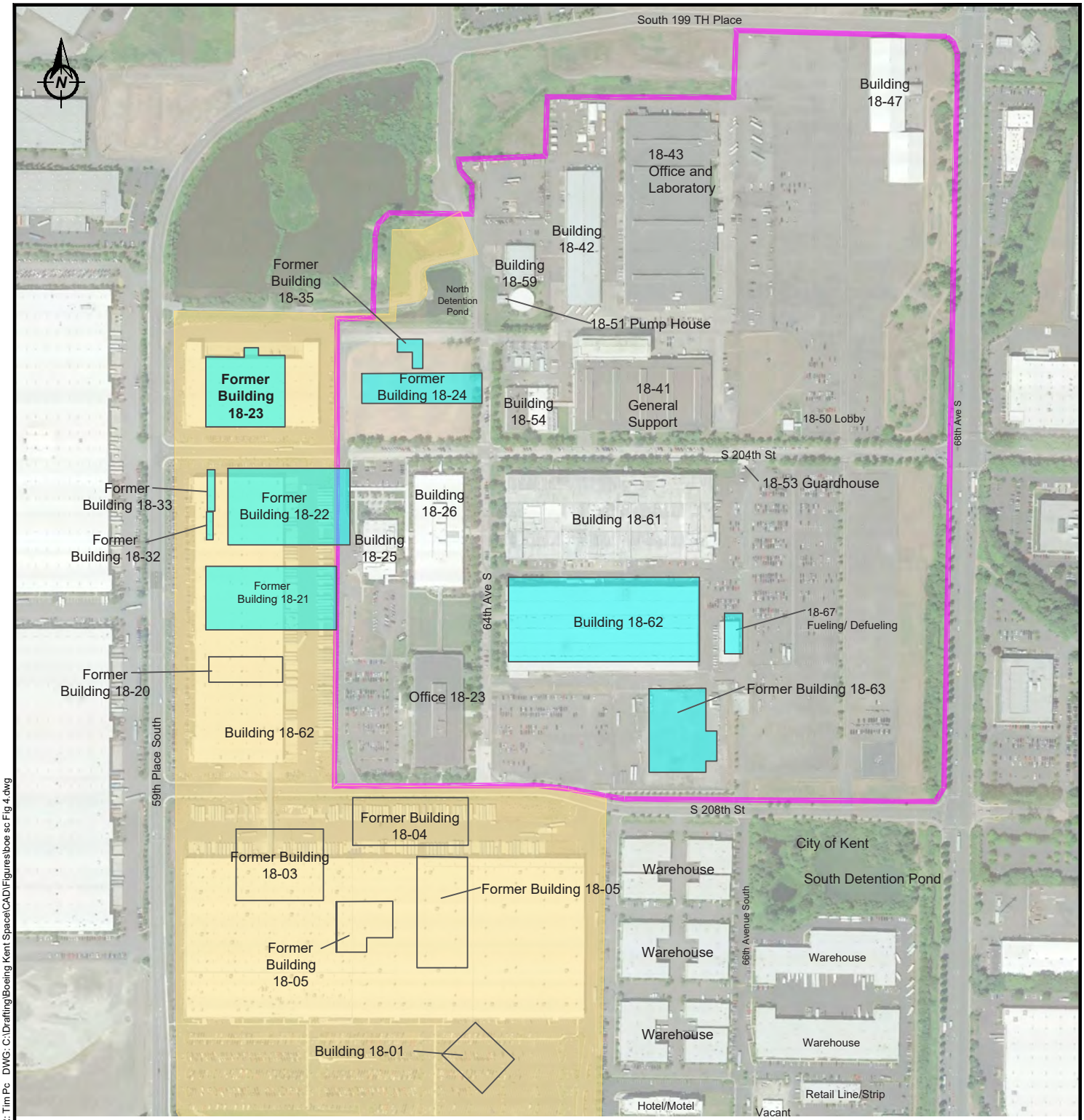
Sample Locations

DOF DALTON OLMSTED FUGLEVAND

FIGURE
3

December 27, 2017

PLOT TIME: 12/20/2017 1:09 PM MOD TIME: 12/20/2017 1:08 PM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig 3.dwg



Legend

- Striker Property-Sold and Removed From RCRA Facility
- Investigation During Clearwater Assessment - No Further Action Determination and Approval for Removal From RCRA Facility Received
- Site Boundary

0 500

SCALE IN FEET

Boeing Kent Space Center
Kent, Washington

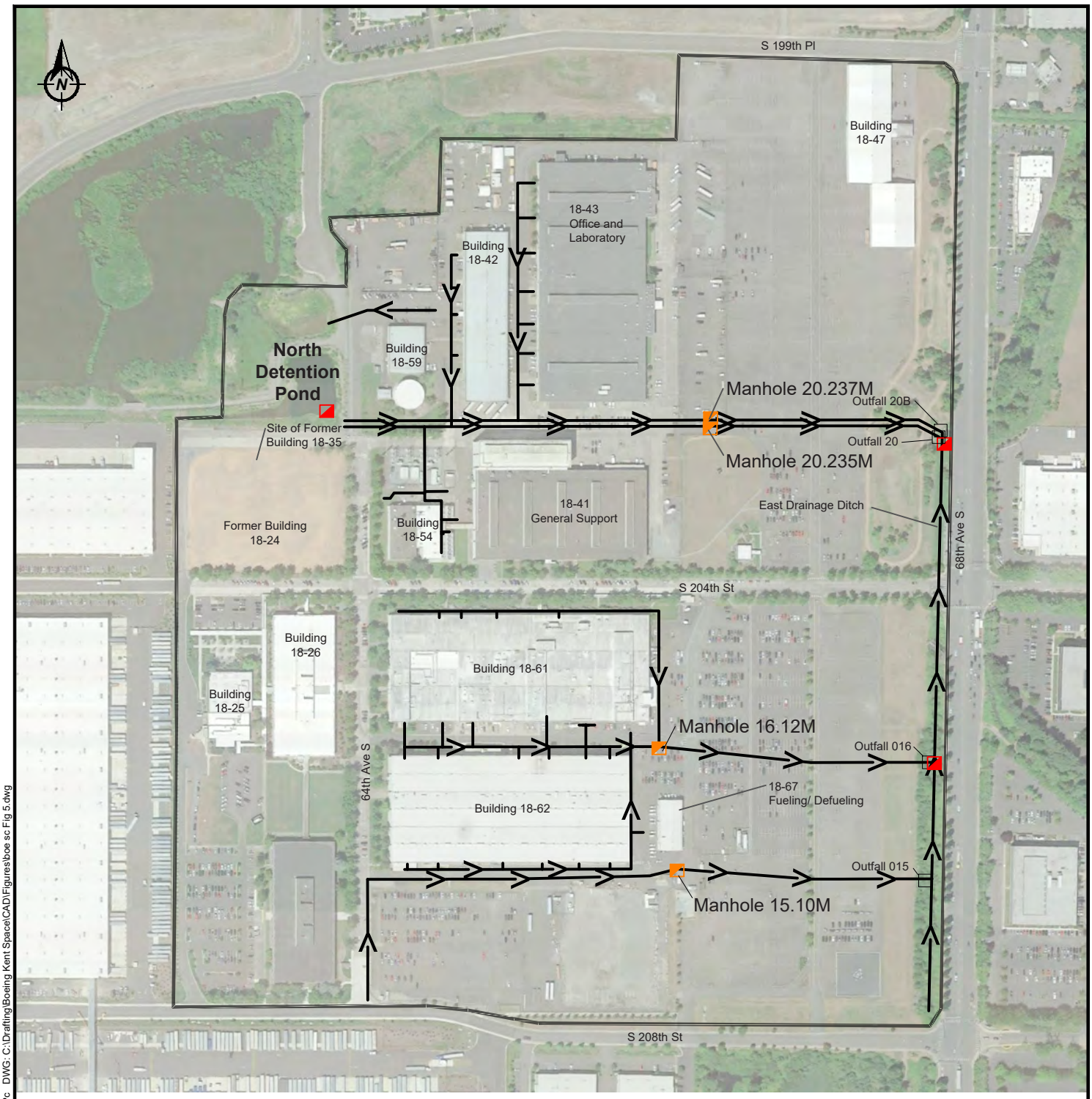
Remedial Investigation

Area of Previous Investigation

DALTON OLMSTED FUGLEVAND

FIGURE 4

December 27, 2017



Legend

- Stormwater Conveyance System Solid and Stormwater Sample Location
- Stormwater Conveyance System Sediment and Stormwater Sampling location
- Outfall and Number
- Selected Storm Sewer Lines and Flow Direction Associated with the SWMUs and AOCs
- Site

0 400
SCALE IN FEET

Boeing Kent Space Center
Kent, Washington

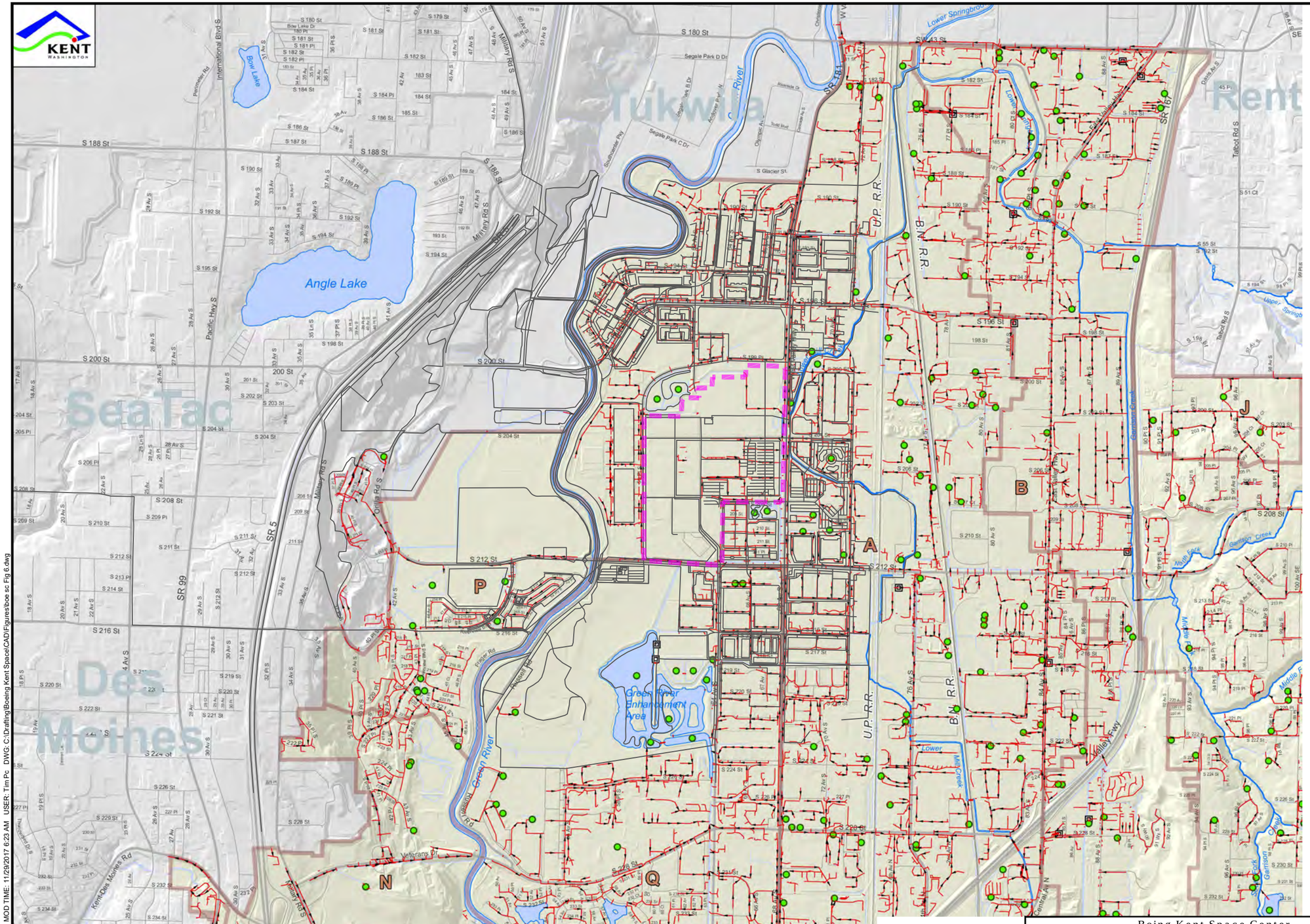
Remedial Investigation

SWMU-86 Stormwater Conveyance System Investigation

DALTON OLMSTED FUGLEVAND

FIGURE
5

December 27, 2017



Legend

- Site Boundary
- Storm Sewer
- Detention Facility
- Pump Station
- Drainage Utility Basin Boundary
- Kent City Limits

BASIN CODE	DESCRIPTION
A	LOWER MILL CREEK
B	LOWER GARRISON CREEK
C	DIRECT INTO GREEN RIVER
D, E, F	MULLEN SLOUGH, MILL CREEK (AUBURN)
G	UPPER MILL CREEK
H	SOOS CREEK
I	UPPER GARRISON CREEK
J	PANTHER CREEK
K, L , M, N, O, P	WESTSIDE
Q	VALLEY DETENTION
R	PANTHER CREEK

Reference:
Base map provided by City of Kent
(Surface Drainage Facilities, Date printed April 2016)

0 2000
SCALE IN FEET

Boing Kent Space Center
Kent Washington
Remedial Investigation

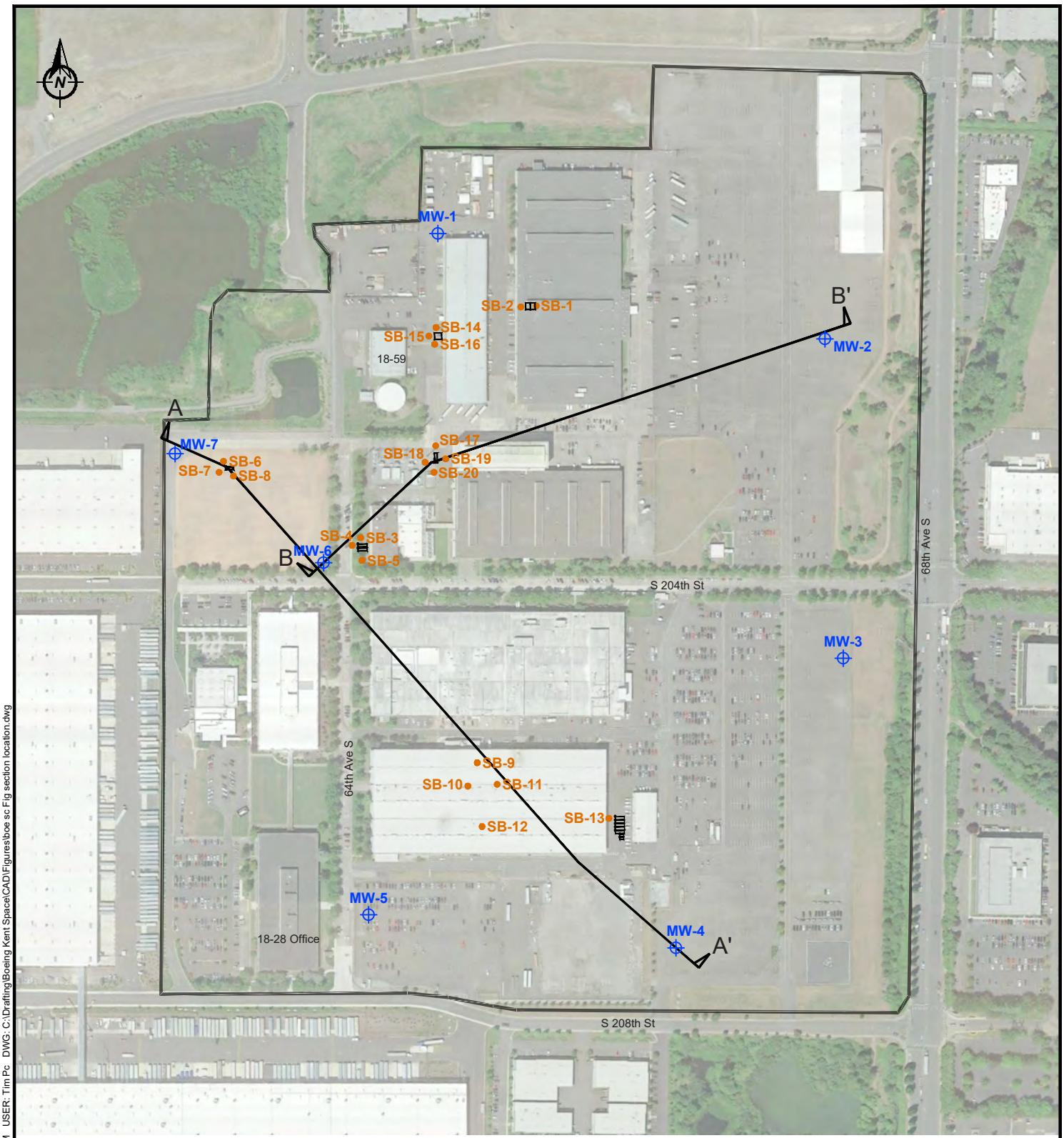
City of Kent Drainage

DALTON OLMSTED FUGLEVAND

FIGURE
6

December 27, 2017

PLOT TIME: 11/29/2017 6:25 AM MOD TIME: 11/29/2017 6:23 AM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig 6.dwg



Legend

A A' Cross Section Location

Site

MW-1 Groundwater Monitoring Well

SB-10 Soil/Groundwater Sample Boring

0 400

SCALE IN FEET

Boeing Kent Space Center
Kent, Washington

Remedial Investigation

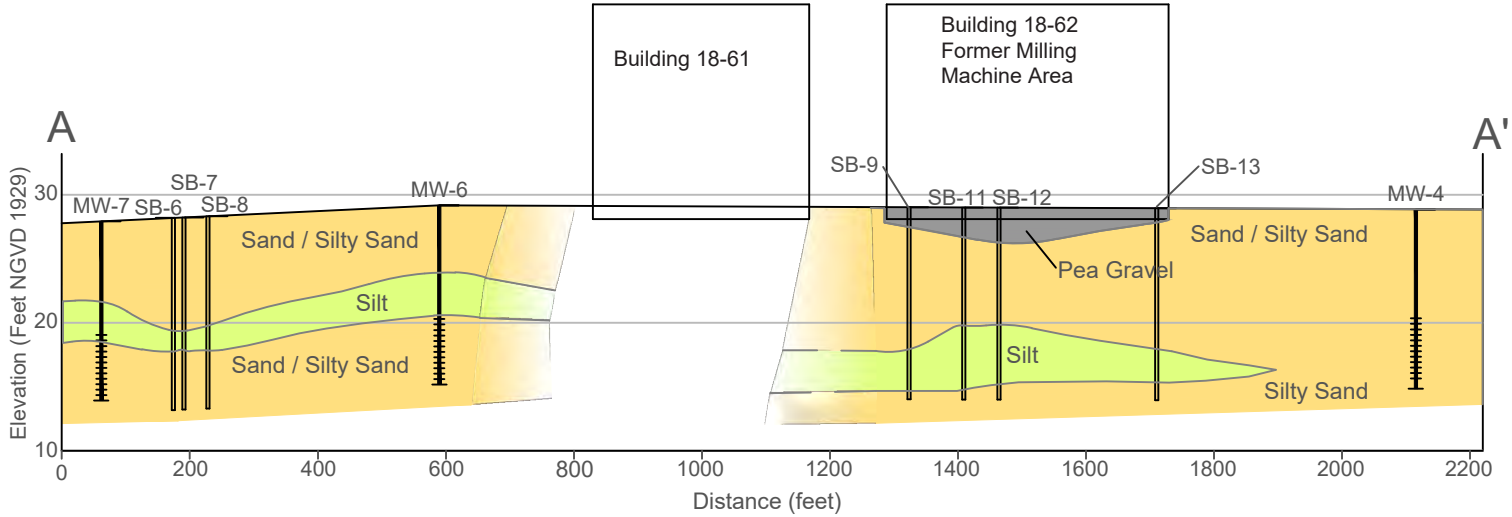
Cross Section Location Map

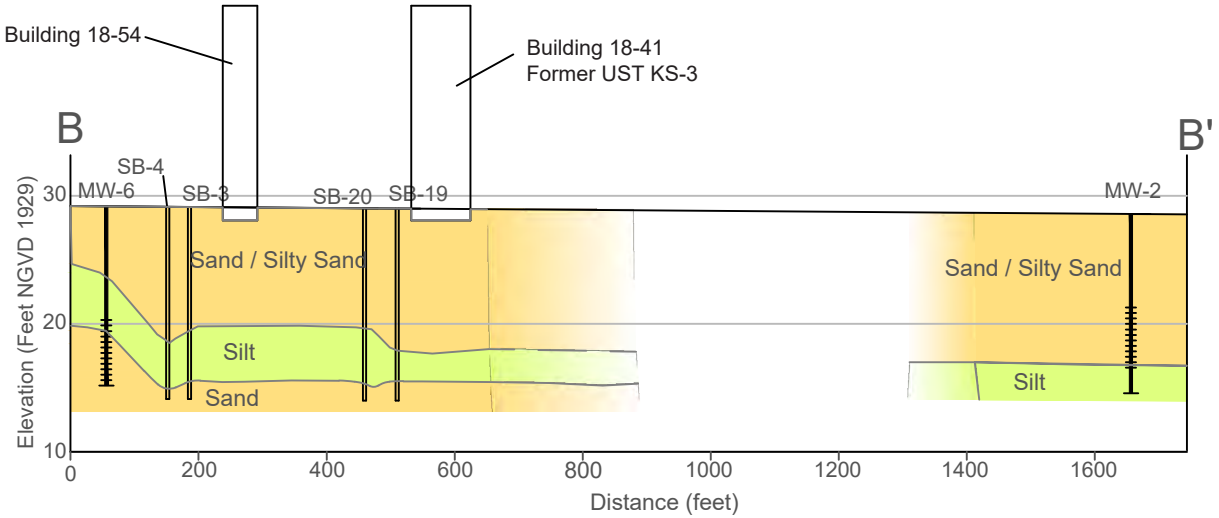
DALTON OLMSTED FUGLEVAND

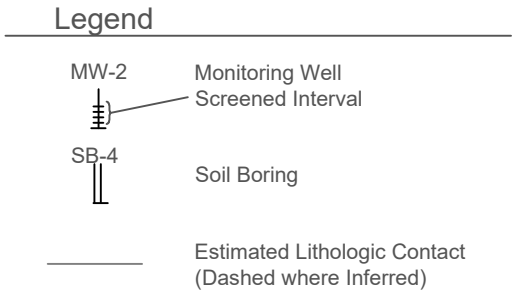
FIGURE
7

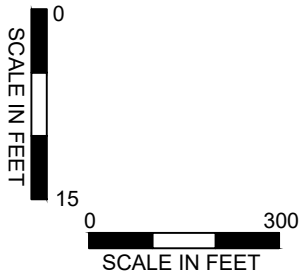
December 27, 2017

PLOT TIME: 12/20/2017 1:11 PM MOD TIME: 11/30/2017 3:29 PM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig section location.dwg









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Kent, Washington

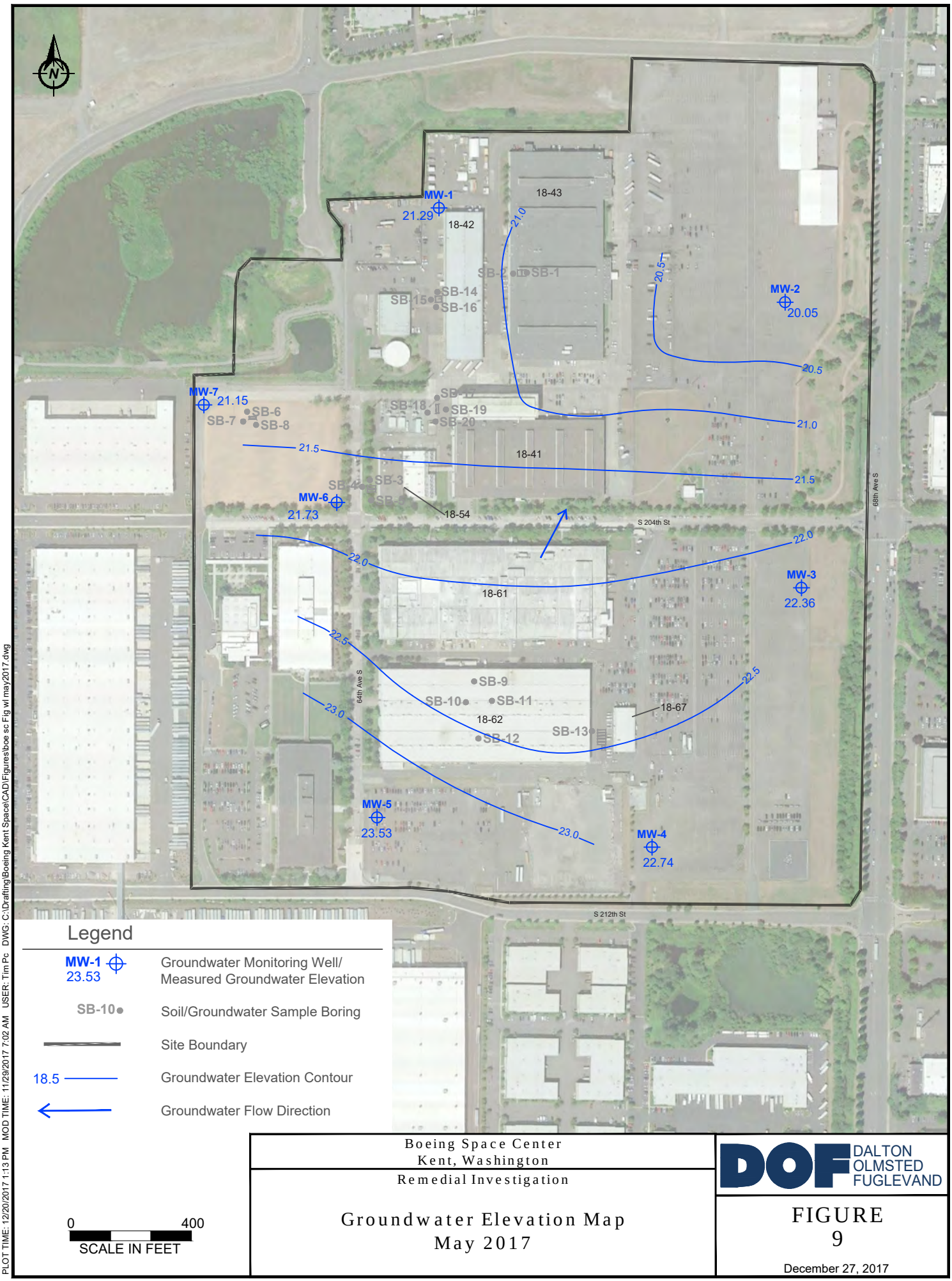
Remedial Investigation

Cross Section A-A' and Cross Section B-B'

DALTON OLMSTED FUGLEVAND

FIGURE
8

December 27, 2017



Legend

MW-1 23.53	Groundwater Monitoring Well/ Measured Groundwater Elevation
SB-10	Soil/Groundwater Sample Boring
	Site Boundary
18.5	Groundwater Elevation Contour
	Groundwater Flow Direction

0 400
SCALE IN FEET

Boeing Space Center
Kent, Washington

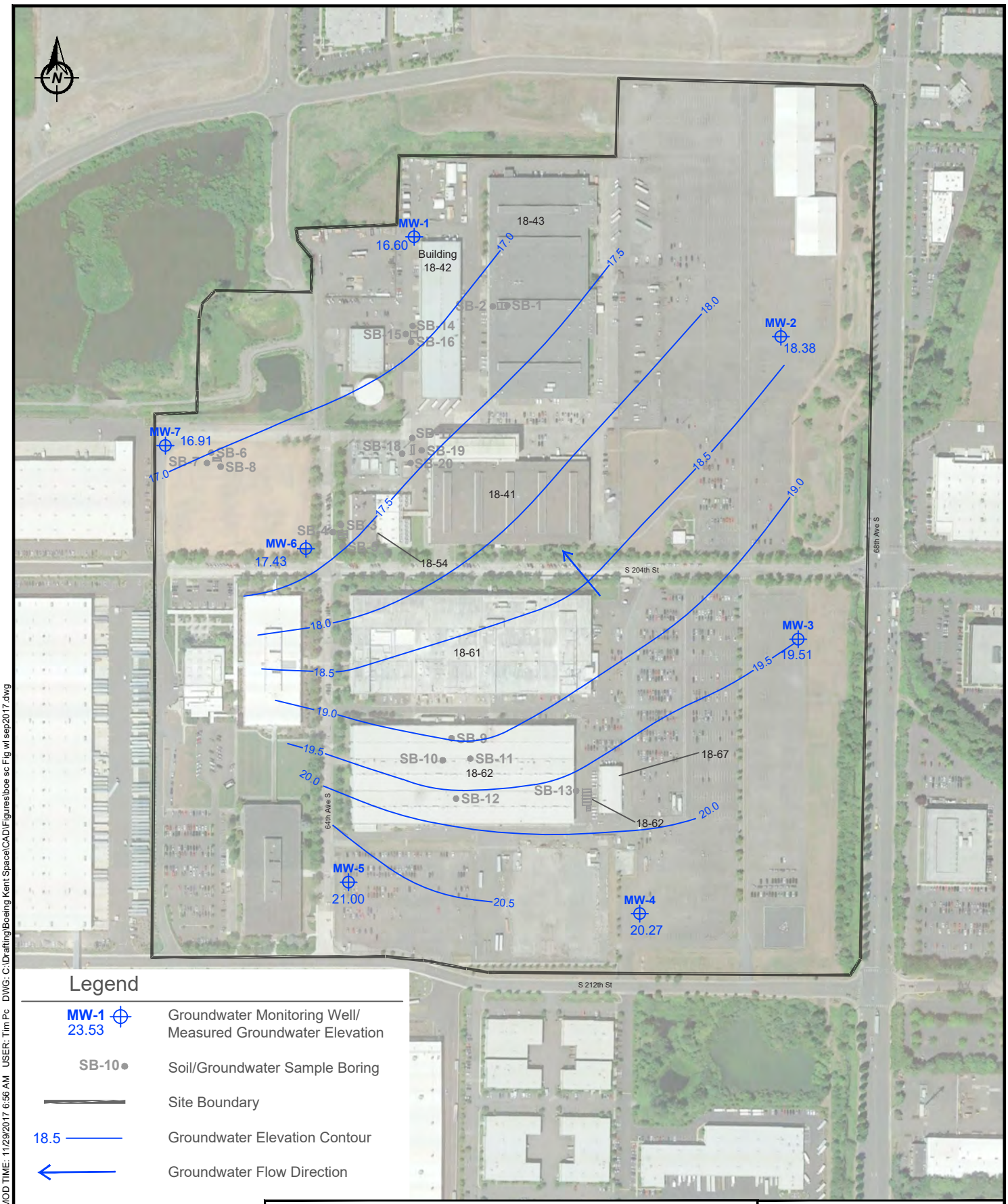
Remedial Investigation

Groundwater Elevation Map
May 2017

DALTON OLMSTED FUGLEVAND

FIGURE
9

December 27, 2017



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Kent, Washington

Remedial Investigation

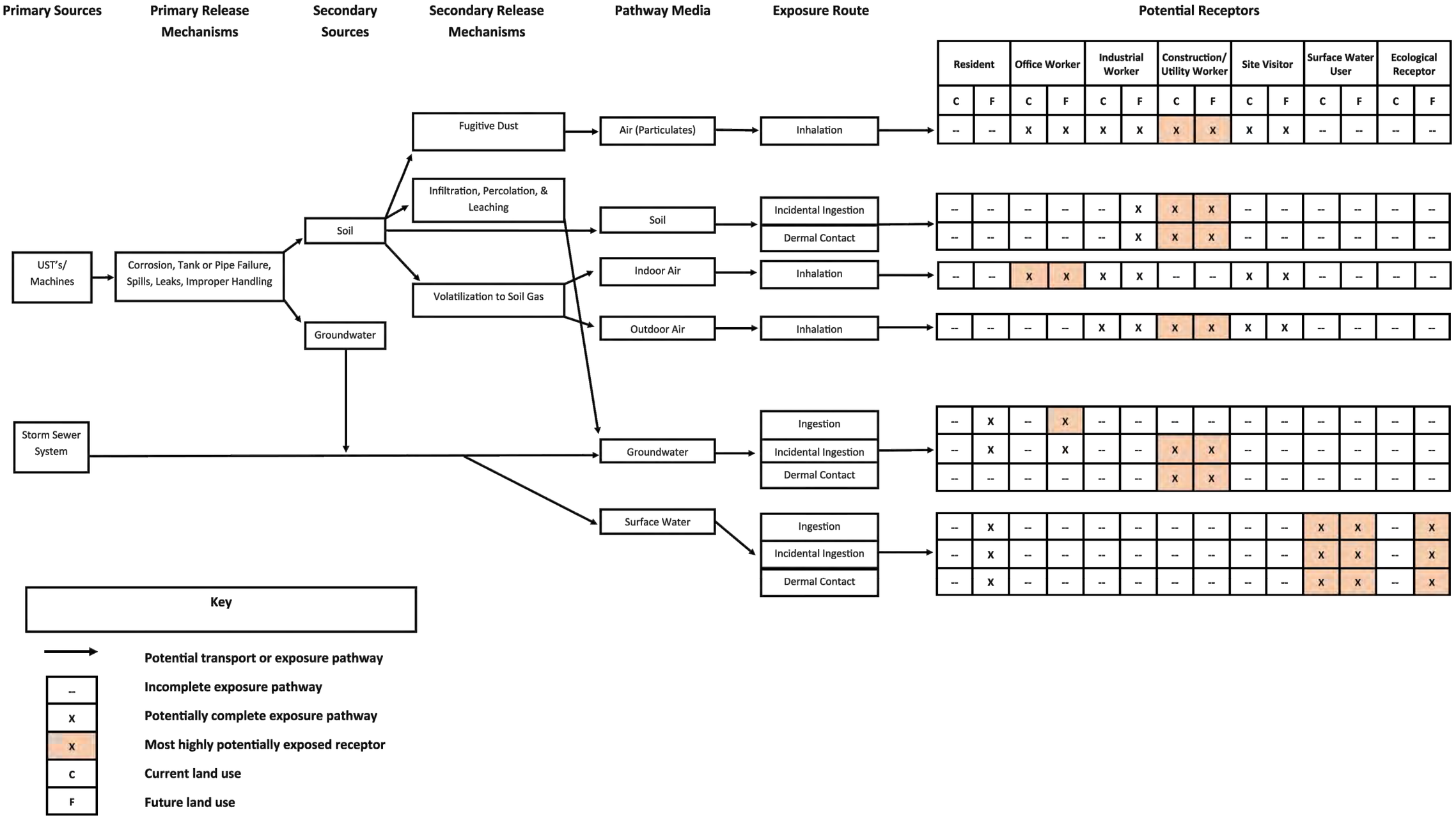
Groundwater Elevation Map September 2017

DALTON OLMSTED FUGLEVAND

FIGURE 10

December 27, 2017

PLOT TIME: 12/20/2017 1:14 PM MOD TIME: 11/29/2017 6:56 AM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig wl sep2017.dwg



PLOT TIME: 11/30/2017 3:30 PM MOD TIME: 11/29/2017 5:00 PM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig 11.dwg

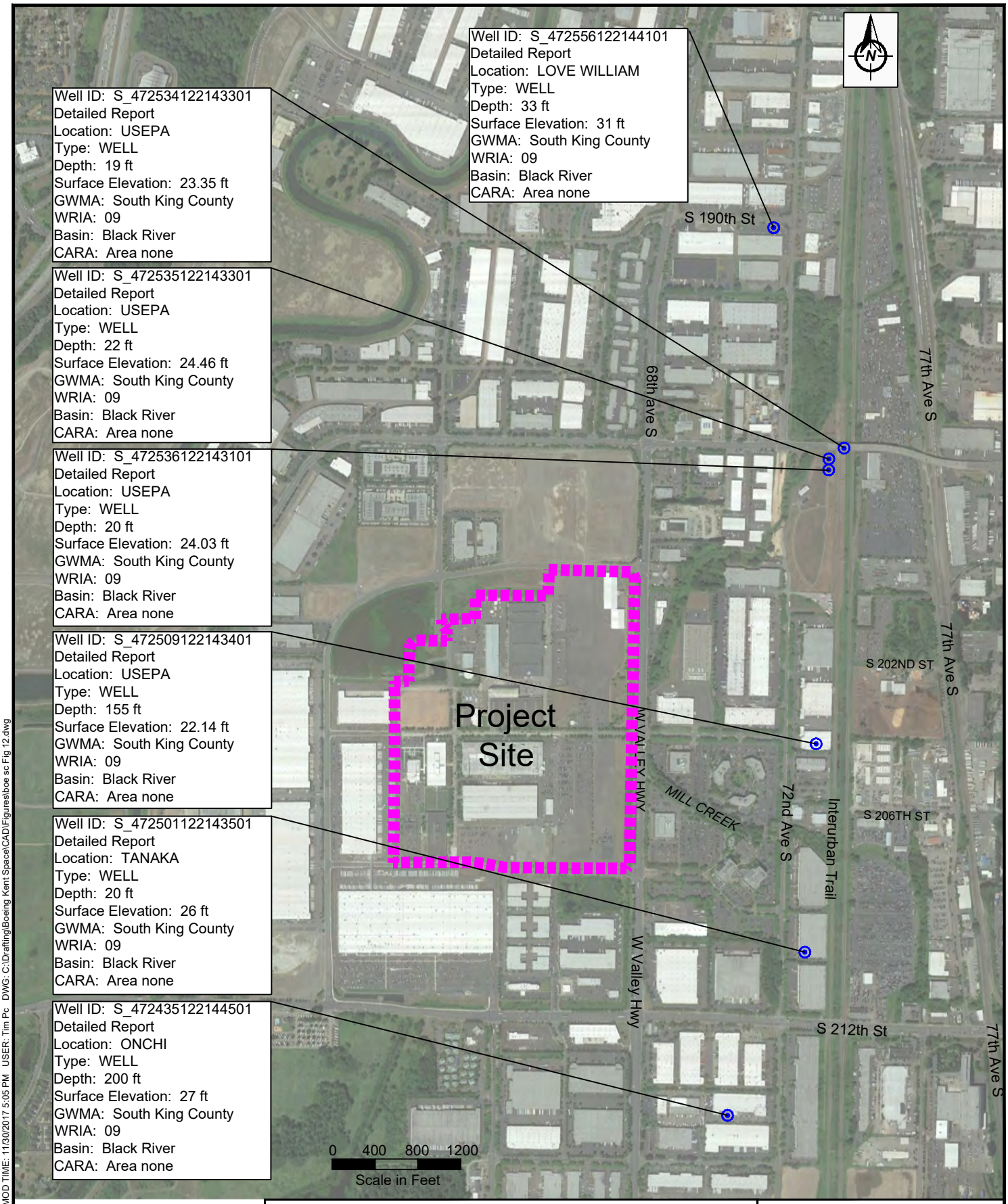
Boing Kent Space Center
Kent Washington
Remedial Investigation

Conceptual Site Model

DALTON OLMSTED FUGLEVAND

FIGURE
11

December 27, 2017



Legend

- Well Location

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Kent, Washington

Remedial Investigation

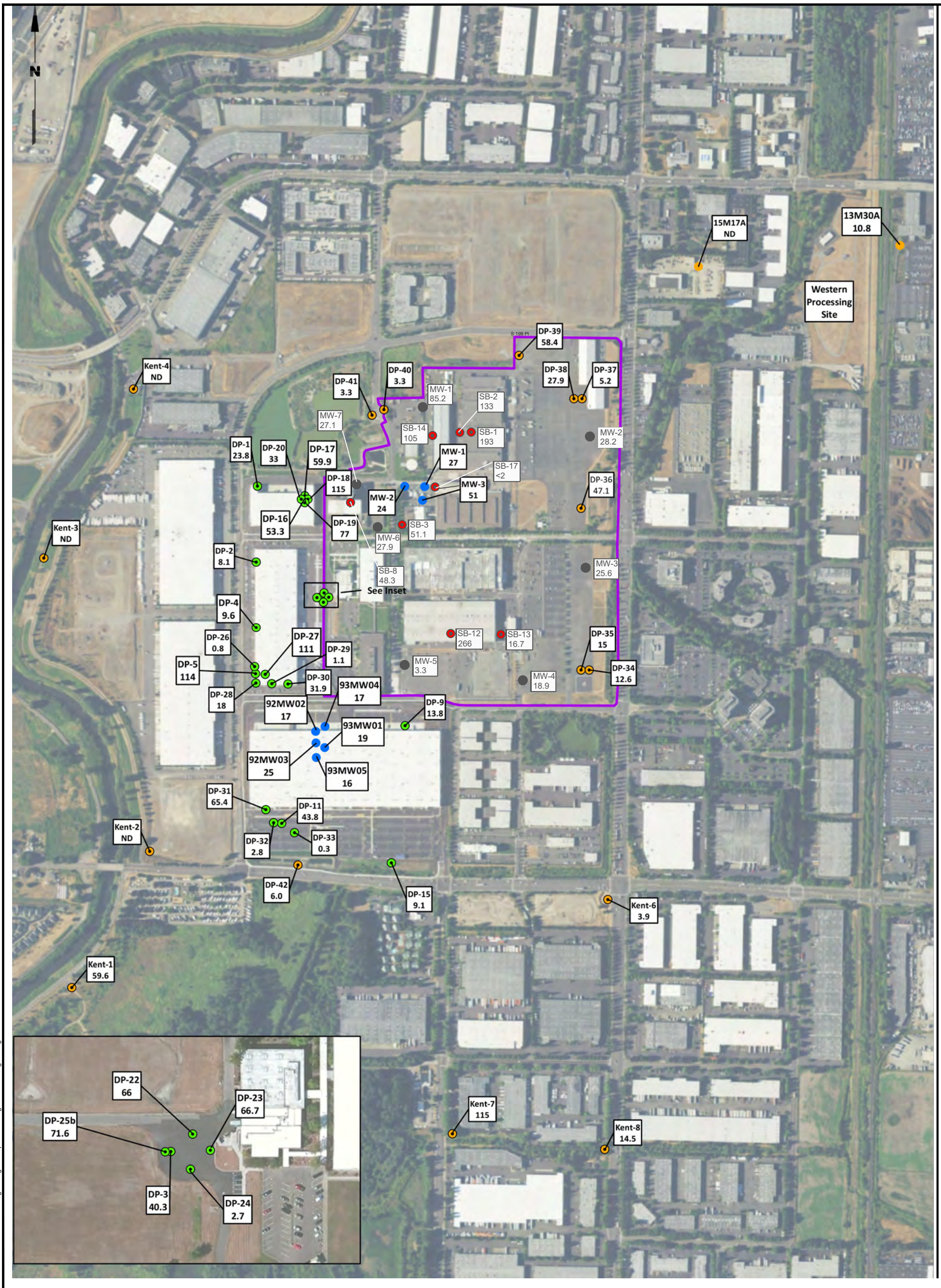
Nearby Groundwater Wells

DALTON OLMSTED FUGLEVAND

FIGURE
12

December 27, 2017

PLOT TIME: 11/30/2017 5:06 PM MOD TIME: 11/30/2017 5:05 PM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig 12.dwg



Legend

- Direct-Push Sample Location
- Monitoring Well Location
- Site Boundary
- Sampled Prior to 2010
- Sampled 2010 - 2011
- Sampled 2012
- Sampled 2017

0 700
SCALE IN FEET

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Kent, Washington

Remedial Investigation

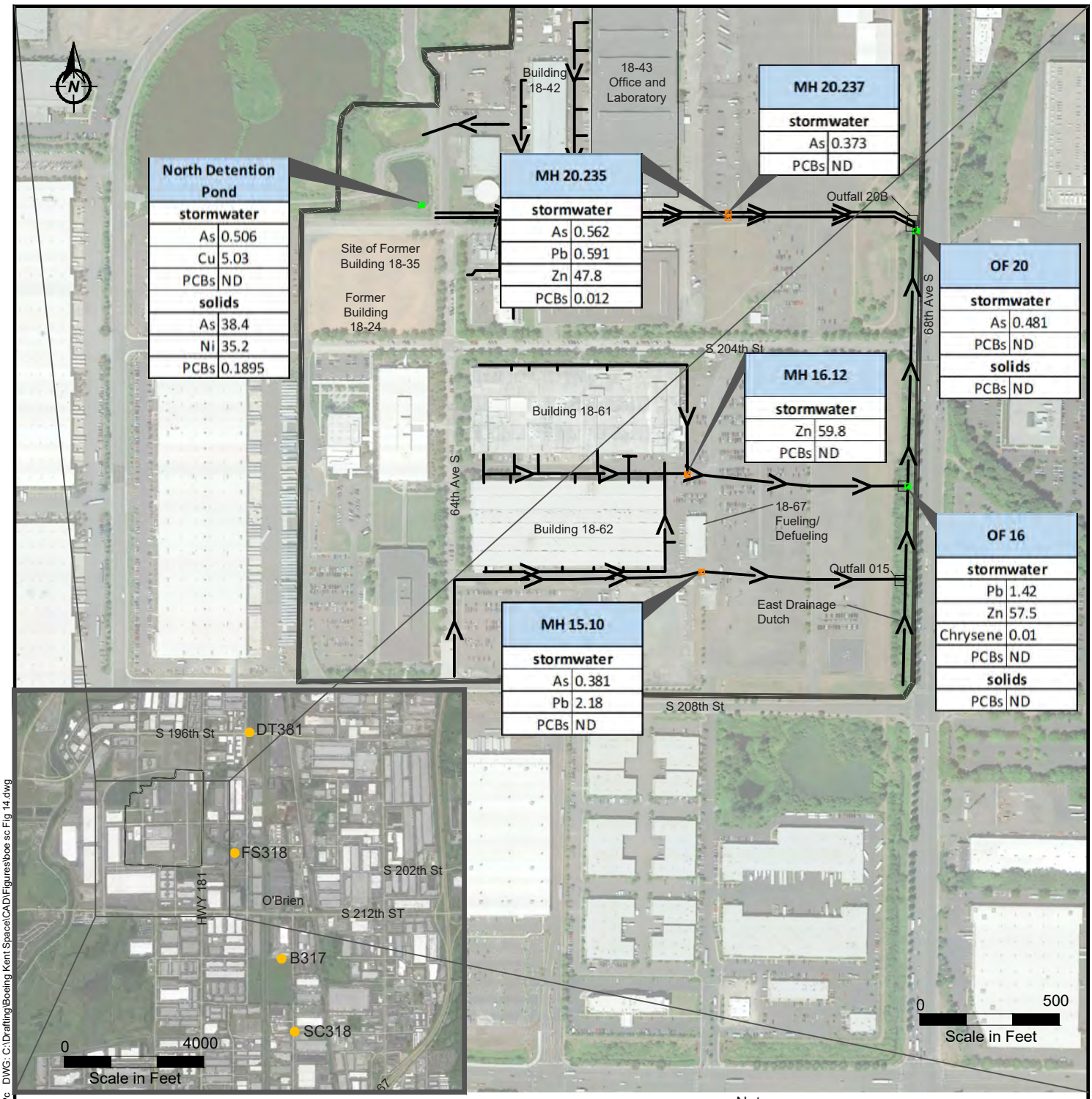
Area-Wide Arsenic Groundwater Sample Results

DALTON OLMSTED FUGLEVAND

FIGURE
13

December 27, 2017

PLOT TIME: 12/1/2017 9:55 AM MOD TIME: 12/1/2017 9:54 AM USER: Tim Pc DWG: C:\Drafting\Boeing Kent Space\CAD\Figures\boe sc Fig 13.dwg



Legend

- Stormsewer System Solid and Stormwater Sample Location
- Stormsewer System Sediment and Stormwater Sampling location
- SC318 — Off Site Historical Sample Location
- Selected Storm Sewer Lines and Flow Direction Associated with the SWMUs and AOCs
- Site
- Outfall and Number

Notes

- Solids concentrations in mg/Kg
- Stormwater concentrations in µg/L
- ND = not detected
- Results shown for constituents detected above screening levels and all results for PCBs shown

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Remedial Investigation

SWMU-86 Stormwater Conveyance System Results

DALTON OLMSTED FUGLEVAND

FIGURE 14

December 27, 2017