Table 2-1
AOC Summaries Addressed in the Feasibility Study
Boeing Auburn Feasibility Study
Auburn, Washington

AOC	Building	Description	Primary Constituents of Concern	Locations Associated with AOC
A-01	17-06	Former USTs (TAU-01 and TAU-02)	GRO, ORO, DRO, BTEX	• Monitoring Wells: AGW009 – AGW017 • Borings: B-1 – B-5, ASB0264 – ASB0270, ASB0280, and ASB0281
A-09	17-07	Acid Scrubber Drain Line Leak	Metals (cadmium, nickel, copper), Cyanide	• Monitoring Wells: AGW037, AGW046 to AGW050, AGW278-1 • Soil Samples: AGR07-HA Series, AGR07-SC series, AGW046, AGW048, AGW049, AGW050, CB2 and CS2 Series, P2-AU and PAU/17-07 Series, S2-AU, and VS2-AU Series
A-13	17-06	Petroleum contamination in soil and groundwater on east side of Building 17-06	DRO, ORO	• Monitoring Wells: AGW041, AGW043, AGW044, AGW115 – AGW118, AGW127 – AGW130, AGW277, AGW279 – AGW282 • Borings: ASB0159, ASB0160R, ASB0167 -- ASB0171, ASB0271 – ASB0275, ASB0286 – ASB0289
A-14	Site-wide	Site-wide TCE and VC contamination in soil and groundwater	TCE, VC	• Monitoring Wells: Interim Site-Wide Groundwater Monitoring Program (Currently Phase 9) VOC monitoring wells • Current Pore Water Sampling Locations: PW-18a-2.5, PW-18a-5, PW-18b-2.5, PW-18b-5, PW-27a-2.5, and PW-27a-5
A-15	Site-wide	Site-wide TCE and VC in stormwater and/or surface water	TCE, VC	• Current stormwater monitoring network: SW-CD4, SW-14, and SW-16 • Current surface water monitoring network: SW-17, SW-18, SW-20, and SW-27

Abbreviations/Acronyms:
AOC = area of concern
BTEX = benzene, toluene, ethylbenzene, and xylenes
DRO = diesel-range organic
GRO = gasoline-range organic
ORO = oil-range organic
TCE = trichloroethene
UST = underground storage tank
VC = vinyl chloride
VOC = volatile organic compounds

Table 3-1
Applicable or Relevant and Appropriate Requirements
Boeing Auburn Feasibility Study
Auburn, Washington

ARARs for Development of Cleanup Levels	Source	Description/Rationale
Model Toxics Control Act	WAC 173-340	Establishes administrative processes and standards in Washington State to identify, investigate, and clean up facilities where hazardous substances have come to be located.
Washington State Surface Water Quality Standards	WAC 173-201A	Establishes water quality standards for surface waters of the state of Washington consistent with public health and public enjoyment of the waters and the propagation and protection of fish, shellfish, and wildlife, pursuant to the provisions of chapter 90.48 RCW.
Federal Clean Water Act Water Quality Standards	40 CFR 131 and 40 CFR 131.45	Establishes the requirements and procedures for developing, reviewing, revising, and approving water quality standards by the States as authorized by section 303(c) of the Clean Water Act. Promulgates human health criteria for priority toxic pollutants in surface waters in Washington.
Washington State Maximum Contaminant Levels in Drinking Water	WAC 246-290-320	Establishes maximum contaminant levels allowed in public drinking water systems in Washington State.
National Primary Drinking Water Regulations	40 CFR 141	Establishes primary drinking water regulations pursuant to section 1412 of the Public Health Service Act, as amended by the Safe Drinking Water Act (Pub. L. 93-523); and related regulations applicable to public water systems.
Potential Action Specific ARARs	**Source**	**Description/Rationale**
Washington Hazardous Waste Management Act and implementing regulations: Dangerous Waste Regulations	RCW 70.105; WAC 173-303	These regulations establish a comprehensive statewide framework for the planning, regulation, control, and management of dangerous waste. The regulations designate those solid wastes that are dangerous or extremely hazardous to human health and the environment. The management of excavated contaminated soil from the Site would be conducted in accordance with these regulations to the extent that any dangerous wastes are discovered or generated during the cleanup action.
Washington Solid Waste Management Act and its implementing regulation: Criteria for Municipal Solid Waste Landfills	RCW 70.95; WAC 173-351	These regulations establish a comprehensive statewide program for solid waste management including proper handling and disposal. The management of any contaminated soil removed from the Site would be conducted in accordance with these regulations to the extent that this soil could be managed as solid waste instead of dangerous waste.
Hazardous Waste Operations	WAC 296-843	Establishes safety requirements for workers conducting investigation and cleanup operations at sites containing hazardous materials. These requirements would be applicable to onsite cleanup activities and would be addressed in a Site health and safety plan prepared specifically for these activities.
Federal NPDES Permit and State Construction Stormwater General Permit	WAC 173-220	Construction activities that disturb one or more acres of land typically need to obtain an NPDES Construction Stormwater General Permit from Ecology. A substantive requirement would be to prepare a SWPPP prior to earthwork activities. The SWPPP would document planned procedures designed to prevent stormwater pollution by controlling erosion of exposed soil and by containing soil stockpiles and other materials that could contribute pollutants to stormwater.
Clean Water Act, Section 401, Waster Quality Certification	33 USC 1340; WAC 173-225-010	Section 401 of the Federal Water Pollution Control Act provides that applicants for a license or permit from the federal government relating to any activity that may result in any discharge into the navigable waters shall obtain a certification from the state that the water quality standards will be met. Ecology's Water Quality Section would review any Nationwide Permit No. 38 issued by the US Army Corps of Engineers. Ecology would also review any associated draft and final design of the chosen cleanup action alternative to document substantive compliance with the Washington State Water Pollution Control Act requirements.
State Environmental Policy Act	RCW 43.21.036; WAC 173-11-250 through 268	Under the SEPA rules, MTCA and SEPA processes are to be combined to reduce duplication and improve public participation (WAC 97-11-250). Ecology is the lead agency for implementing the substantive requirements of SEPA as described in WAC 197-11-253. Ecology is likely to determine that it will act as the lead agency for implementing the requirements of SEPA for cleanup actions at the Site. A SEPA checklist will be completed and attached to the draft Cleanup Action Plan. It is expected that a determination of non-significance will be issued, as the alternatives evaluated in this FS are unlikely to have a significant adverse environmental impact.
Washington Minimum Standards for Construction and Decommissioning	WAC 173-160-381	Ecology or its delegated authority establishes requirements for the installation and decommissioning of monitoring wells.
Electrical Equipment Installations	RCW 19.28	Electrical wiring and equipment may be needed to power active controls and blower motors for SVE and DGR treatments.
Underground Injection Control Program	WAC 173-218	UIC registration would be required for the injection of any materials below ground surface for the purposes of groundwater cleanup. This would include injection of reducing agents such as zero valent iron, electron donor substrates for bioremediation, oxidants for chemical oxidation, or other chemical activation agents or catalysts; or reinjection of treated groundwater.
Uniform Environmental Covenants Act	RCW 64.70	Regulation that addresses recording environmental covenants on the Boeing Auburn facility. Institutional controls; an environmental covenant will be a required element of the final remedy selected.
Right-of-Way Use and Construction	AubMC Chapter 12.60 and 12.66; AlgMC Chapter 14.04	Requires a written permit for any proposed activities that use ROW, including construction activities and movement of equipment. It may be necessary to install additional wells in ROWs.
Fire Hydrant Access	AubMC Chapter 13.16; AlgMC Chapter 13.02	Specifies an application and approval process for connecting to the City of Auburn water supply system. Fire hydrant access is possibly needed for injections.
Environmentally Critical Areas	AubMC Chapter 16.10; AlgMC Chapter 16.18	Specifies development standards for actions affecting environmentally critical areas, including wellhead protection areas, streams and riparian zones, wetlands, geological hazard areas, landslide areas, and erosion or seismic hazard areas.

Abbreviations and Acronyms:

AlgMC = Algona Municipal Code
AubMC = Auburn Municipal Code
ARARs = Applicable or relevant and appropriate requirements
CFR = Code of Federal Regulations
DGR = dynamic groundwater recirculation
Ecology = Washington State Department of Ecology
MTCA = Model Toxics Control Act Cleanup Regulation
NPDES = National Pollutant Discharge Elimination System
Pub = publication
RCW = Revised Code of Washington
ROW = right-of-way
SEPA = State Environmental Policy Act
Site = Boeing Auburn Plant
SVE = soil vapor extraction
SWPPP = stormwater pollution prevention plan
WAC = Washington Administrative Code
UIC = underground injection control
USC = United States Code

Table 3-2
Soil Proposed Cleanup Levels
Boeing Auburn Feasibility Study
Auburn, Washington

Analyte	RI Soil SL (mg/kg)	Method A	Method B		Constituent Exceeds pCUL in Groundwater	Soil Protective of Groundwater Vadose at 13°C	Method C		Background Soil Metals Concentration (d)	Soil pCUL (mg/kg)	Basis for pCUL
		Method A Industrial Properties	Method B Non-Cancer Direct Contact	Method B Cancer Direct Contact			Method C Non-Cancer Direct Contact	Method C Cancer Direct Contact			
VOLATILES											
Trichloroethene	0.00357	N/A	40	12	X	0.025	1,800	2,800	N/A	0.025/1,800	Soil protective of groundwater. Once groundwater pCUL is met, cleanup level will be adjusted to Method C non-cancer direct contact.
TOTAL PETROLEUM HYDROCARBONS AND ASSOCIATED VOLATILES											
AOC A-01											
Benzene	0.00448	N/A	320	18			14,000	2,400	N/A	2,400	Method C cancer direct contact.
Ethylbenzene	6.05	N/A	8,000	--	X	5.9	350,000	--	N/A	5.9/350,000	Soil protective of groundwater. Once groundwater pCUL is met, cleanup level will be adjusted to Method C non-cancer direct contact.
Toluene	0.00465	N/A	6,400	--			280,000	--	N/A	280,000	Method C non-cancer direct contact.
Total Xylenes	14.6	NA	16,000	--	X	14	700,000	--	N/A	14/350,000	Soil protective of groundwater. Once groundwater pCUL is met, cleanup level will be adjusted to Method C non-cancer direct contact.
Diesel-Range Organics	2,000	2,000	(a)	--			(a)	--	N/A	2,000	Method A
Oil-Range Organics	2,000	2,000	(a)	--			(a)	--	N/A	2,000	Method A
Gasoline-Range Organics (b)	30/100	30/100	(a)	--	X	(a)	(a)	--	N/A	30/100	Method A
AOC A-13											
Total Petroleum Hydrocarbons	2,000	N/A	16,000	--		71,000	190,000	--	N/A	71,000	100% NAPL based on ASB0160R Hydrocarbon workbook as documented in *Guidance for Remediation of Petroleum Contaminated Sites, Ecology 2016.*
METALS AND CYANIDE											
Antimony	5.4	N/A	32	--			1,400	--	N/A	1,400	Method C non-cancer based on direct contact. Eliminated as a COC (no detections above the pCUL and not associated with an AOC evaluated as part of the FS).
Cadmium	1.0	N/A	80	--	X	0.69	3,500	--	1.0	1.0/3,500	Protection of groundwater adjusted for natural background. Once groundwater pCUL is met, cleanup level will be adjusted to Method C non-cancer direct contact.
Copper	284	N/A	3,200	--	X	280	140,000	--	36	280/140,000	Soil protective of groundwater. Once groundwater pCUL is met, cleanup level will be adjusted to Method C non-cancer direct contact.
Nickel	130	N/A	1,600	--			70,000	--	48	70,000	Method C non-cancer direct contact.
Cyanide (c)	48	N/A	50	--	X	--	2,200	--	N/A	2,200	Method C non-cancer direct contact.

Abbreviations and Acronyms:

-- = not listed
% = percent
°C = degrees Celsius
CLARC = Cleanup Levels and Risk Calculation
COC = constituent of concern
FS = feasibility study
mg/kg = milligrams per kilogram
N/A = not applicable
NAPL = non-aqueous-phase liquid
pCUL = proposed cleanup level
RI = remedial investigation
SL = screening level

Notes:

A cleanup level for vinyl chloride in soil is not provided because it has never been detected in soil at the site.
Grey Shading = contaminant eliminated as a COC in media identified

(a) Method B/Method C values were not calculated.
(b) 30 mg/kg is used if benzene is detected; 100 mg/kg is used if benzene is not detected.
(c) CLARC calculations are evaluated based on free cyanide.
(d) Puget Sound Region 90th percentile value (Ecology. 1994. Natural Background Soil Metals Concentrations in Washington State. Publication #94-115.)

Table 3-3
Groundwater Proposed Cleanup Levels
Boeing Auburn Feasibility Study
Auburn, Washington

Analyte	RI GW SL	Cleanup Levels Protective of Drinking Water									Surface Water Quality Standards in Groundwater (µg/L)
		ARAR Federal MCL	ARAR WA State MCL	Method A	Method B (Non-Cancer)	Method B (Cancer)	Adjusted 10-5	Background (g)	Groundwater pCUL (µg/L)	Basis	
VOLATILES											
Trichloroethene	0.54	5.0	5.0	N/A	4.0	0.54	5.4	N/A	4	Method B Non-Cancer	0.3 (e)
Vinyl Chloride	0.029	2.0	2.0	N/A	24	0.029	0.29	N/A	0.29	Method B Cancer, adjusted to cancer risk 10^{-5} based on MCL rule.	0.02 (f)
TOTAL PETROLEUM HYDROCARBONS AND ASSOCIATED VOLATILES											
AOC A-01											
Benzene	0.795	5.0	5.0	N/A	32	0.8	8.0	N/A	5.0	Federal/State MCL	N/A
Ethylbenzene	700	700	700	N/A	800	--	N/A	N/A	700	Federal/State MCL	N/A
Toluene	640	1,000	1,000	N/A	640	--	N/A	N/A	640	Method B Non-Cancer	N/A
Total Xylenes	1,600	10,000	10,000	N/A	1,600	--	N/A	N/A	1,600	Method B Non-Cancer	N/A
Diesel-Range Organics	500	--	--	500	(a)	(a)	N/A	N/A	500	Method A	N/A
Oil-Range Organics	500	--	--	500	(a)	(a)	N/A	N/A	500	Method A	N/A
Gasoline-Range Organics (d)	800	--	--	800/1,000	(a)	(a)	N/A	N/A	800/1,000	Method A	N/A
AOC A-13											
Total Petroleum Hydrocarbons	N/A	--	--	N/A	20,000 (b)	--	N/A	N/A	20,000	Method B cleanup level (calculated at AGW128 and AGW281 and used median value as indicated in G*uidance for Remediation of Petroleum Contaminated Sites, Ecology 2016*).	N/A
METALS AND CYANIDE											
Arsenic	8.0	10	10	N/A	4.8	0.058	0.58	8.0	8.0	Background; Eliminated as a COC (no history of use, no history of release, natural occurrence).	N/A
Cadmium	5.0	5.0	5.0	NA	8.0	--	--	N/A	5.0	Federal/State MCL	N/A
Copper	640	1,300	1,300	NA	640	--	--	N/A	640	Method B non-cancer	N/A
Nickel	100	--	100	N/A	320	--	--	N/A	100	Federal/State MCL.	N/A
Cyanide	9.6	200	200	N/A	10	--	--	N/A	10 (c)	Method B non-cancer	N/A

Abbreviations and Acronyms:

-- = not Listed
µg/L = micrograms per liter
ARARs = applicable or relevant and appropriate requirements
CFR = Code of Federal Regulations
CLARC = Cleanup Levels and Risk Calculation
COC = constituent of concern
GW = groundwater
MCL = Maximum Contaminant Level
N/A = not applicable
pCUL = proposed cleanup level
RI = remedial investigation
SL = screening level
SWQS = surface water quality standards
TPH = total petroleum hydrocarbon
WA = Washington
WAC = Washington Administrative Code

Notes:

(a) Method B values were not calculated.
(b) Method B values were calculated for groundwater collected from wells AGW128 (TPH Method B = 7,000 µg/L) and AGW281 (TPH Method B = 32,000 µg/L). The mean value (20,000) is used for the pCUL.
(c) CLARC evaluated based on free cyanide.
(d) 800 µg/L is used if benzene is detected; 1,000 µg/L is used if benzene is not detected.
(e) Human Health Fresh Water 40 CFR 131.45.
(f) Human Health Fresh Water WAC 173-201A.
(g) Draft report Sections 1-7, Background Concentrations of Selected Chemicals in Water, Soil, Sediments, and Air of Washington State (PTI 1989).

Grey shading = Contaminant eliminated as a COC in media identified.

Table 3-4
Surface Water Proposed Cleanup Levels
Boeing Auburn Feasibility Study
Auburn Washington

	RI GW SL (a)	Federal ARAR Human Health - Fresh Water 40 CFR 131.45	Federal ARAR Human Health - Fresh Water CWA 304	WA State ARAR Human Health - Fresh Water WAC 173-201A	Method B Non-cancer	Method B Cancer	Surface Water pCUL	Basis
VOLATILES								
Trichloroethene	0.3	0.3	0.6	0.38	120	13	0.3	Federal ARAR 40 CFR 131.45
Vinyl Chloride	0.02	--	0.022	0.02	6,600	3.7	0.02	WA State ARAR WAC 173-201A

Abbreviations and Acronyms:

-- = not listed
ARAR = applicable or relevant and appropriate requirement
CFR = Code of Federal Regulations
CWA = Clean Water Act
GW = groundwater
pCUL = proposed cleanup level
RI = remedial investigation
SL = screening level
WA = Washington
WAC = Washington Administrative Code

Notes:

(a) SLs were provided for different areas in the RI report. The most conservative SLs are presented here.

Table 4-1
AOC A-01 Aquifer Redox Parameter Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Aquifer Redox Conditions						Baseline Electron Donor Indicator	Notes
		DO (mg/L)	ORP (mV)	Nitrate (mg/L)	Ferrous Iron (mg/L)	Sulfate (mg/L)	Aquifer Redox State	Total Organic Carbon (mg/L)	
AGW009	6/5/2017	1.44	-23.2	0.25	2.0	12	Aerobic to Iron-Reducing	3.6	
AGW010	6/5/2017	0.77	-89.9	< 0.10	4.0	11.9	Iron- to Sulfate-Reducing	5.3	Petroleum Hydrocarbons detected
AGW011	6/5/2017	1.39	-24.7	19.0	4.0	35.5	Aerobic to Iron-Reducing	3.9	
AGW014	6/5/2017	4.20	-18.5	22.1	2.0	24.9	Aerobic to Iron-Reducing	2.9	
AGW016	6/5/2017	1.30	-21.1	0.13	1.0	5.3	Aerobic to Sulfate-Reducing	1.3	

Abbreviations and Acronyms:

DO = dissolved oxygen
mg/L = milligrams per liter
mV = millivolts
ORP = oxidation reduction potential

Table 4-2
AOC A-01 Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Petroleum Hydrocarbons (mg/kg) (a)			BTEX by SW-846 8260C (mg/kg) (a)					
			Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Total Xylenes
		Soil pCUL	30/100 (b)	2,000	2,000	2,400	280,000	5.9	N/A	N/A	14
AGW010	15.5	8/23/1990	--	**240**	--	--	**0.039**	**0.25**	--	--	**1.2**
AGW011	13.0	8/23/1990	--	--	--	--	--	--	--	--	**0.034**
AGW012	6.5	8/23/1990	--	--	--	--	--	--	--	--	**0.048**
AGW013	13.0	7/31/1991	10 U	10 U	--	**0.0014**	**0.011**	**0.0016**	--	--	**0.0098**
AGW014	13.0	7/31/1991	10 U	10 U	--	0.0012 U	**0.0032**	0.0012 U	--	--	**0.0009 J**
AGW015	9.0	8/2/1991	--	--	--	**0.0009 J**	**0.0079**	**0.0006 J**	--	--	**0.0038 J**
AGW016	9.5	8/2/1991	10 U	10 U	--	**0.0019**	**0.014**	**0.0008 J**	--	--	**0.0053**
AGW017	1.0	8/6/1991	10 U	10 U	--	0.0011 U	0.0011 U	0.0011 U	--	--	0.0022 U
	5.0	8/6/1991	10 U	**10**	--	0.0012 U	0.0012 U	0.0012 U	--	--	0.0012 U
	13.0	8/5/1991	--	**10**	--	--	--	--	--	--	--
ASB0264	11.0	6/28/2017	7.6 U	8.6 U	37 U	**0.006**	0.006 U	0.006 U	0.006 U	0.006 U	--
	15.0	6/28/2017	5.1 U	7.9 U	34 U	0.0009 U	0.005 U	0.005 U	0.005 U	0.005 U	--
ASB0265	11.0	6/28/2017	**490**	**100 J**	**42**	0.099 U	0.5 U	**1.4**	**4.2**	**1.3**	**5.5**
	19.0	6/28/2017	**12,000 J**	**820**	76 U	0.21 U	1.1 U	**130**	**600**	**120**	**720**
	22.5	6/28/2017	**970 J**	**50**	33 U	0.072 U	0.36 U	**1.9**	**9**	**0.96**	**9.96**
ASB0266	11.0	6/29/2017	5.4 U	7.9 U	34 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	--
	15.0	6/29/2017	5.8 U	7.8 U	33 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	--
ASB0267	11.0	6/29/2017	5.3 U	7.9 U	34 U	0.0009 U	0.004 U	0.004 U	0.004 U	0.004 U	--
	15.0	6/29/2017	6.4 U	8.3 U	36 U	0.001 U	0.006 U	0.006 U	0.006 U	0.006 U	--
ASB0268	11.0	6/29/2017	5.3 U	8.1 U	35 U	0.001 U	0.005 U	0.005 U	0.005 U	0.005 U	--
	13.0	6/29/2017	**380**	7.6 U	32 U	0.042 U	0.21 U	0.21 U	0.21 U	0.21 U	--
	23.0	6/29/2017	5.3 U	8.1 U	35 U	0.0009 U	0.005 U	0.005 U	0.005 U	0.005 U	--
ASB0269	10.0	6/29/2017	**7.3**	8.5 U	37 U	0.0009 U	0.005 U	0.005 U	0.005 U	0.005 U	--
	11.5	6/29/2017	6.5 U	8.8 U	38 U	**0.001**	0.005 U	0.005 U	0.005 U	0.005 U	--

Table 4-2
AOC A-01 Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Petroleum Hydrocarbons (mg/kg) (a)			BTEX by SW-846 8260C (mg/kg) (a)					
			Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Total Xylenes
		Soil pCUL	30/100 (b)	2,000	2,000	2,400	280,000	5.9	N/A	N/A	14
ASB0270	10.0	6/29/2017	4.4 U	7.4 U	32 U	**0.002**	0.004 U	0.004 U	0.004 U	0.004 U	--
	12.0	6/29/2017	4.4 U	7.6 U	33 U	0.0008 U	0.004 U	0.004 U	0.004 U	0.004 U	--
ASB0280	2.0	8/31/2017	4.2 U	45 U	45 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	0.0017 U	--
	6.0	8/31/2017	4.2 U	53 U	53 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	--
	17.5	8/31/2017	4.3 U	54 U	54 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	0.0019 U	--
	24.0	8/31/2017	5.7 U	59 U	59 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	--
ASB0281	7.8	8/31/2017	**18**	54 U	54 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	0.0020 U	--
	27.5	8/31/2017	**6.3 J**	52 U	52 U	0.0018 UJ	0.0018 UJ	**0.0029 J**	0.0018 UJ	0.0018 UJ	--
	34.0	8/31/2017	**3.4 J**	48 U	48 U	0.0016 UJ	0.0016 UJ	**0.0041 J**	0.0016 UJ	0.0016 UJ	--
B-1	3.0	7/30/1991	10 U	10 U	--	0.0011 U	**0.012**	0.0011 U	--	--	**0.0031**
B-2	10.5	7/30/1991	10 U	10 U	--	0.001 U	0.001 U	0.001 U	--	--	0.0021 U
	15.0	7/30/1991	--	--	--	**0.0025**	**0.0007 J**	**0.0007 J**	--	--	0.0022 U
B-3	5.5	7/30/1991	10 U	10 U	--	0.0011 U	**0.0017**	0.0011 U	--	--	**0.0009 J**
B-4	13.0	8/1/1991	**1,300**	**250**	--	0.63 U	**4.2**	**9.4**	--	--	**64**
B-5	7.0	8/6/1991	**12**	10 U	--	0.011 U	0.011 U	0.011 U	--	--	**0.18**

Notes:

Bold text indicates detected analyte.

Green shading indicates detected analyte exceeds applicable soil pCUL

Soil borings are identified by the ASB prefix.

(a) Petroleum hydrocarbons analyzed by NWTPH-dx, -Gx, and SW-846 8015. VOCs were analyzed by SW-846 8260, 8260 SIM, and 8015. In the event total xylenes were calculated, the sum consists of detections of m,p-xylene and o-xylene.

(b) 30 mg/kg is used if benzene is detected; 100 mg/kg is used if benzene is not detected.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Acronyms/Abbreviations:

-- = not analyzed

BTEX = benzene, toluene, ethylbenzene, and xylenes

ft = feet

mg/kg = milligrams per kilogram

N/A = not applicable

pCUL = proposed cleanup level

VOC = volatile organic compound

Table 4-3
AOC A-01 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Petroleum Hydrocarbons (µg/L) (a)			BTEX (µg/L) (a)					
		Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Total Xylenes
	Groundwater pCUL	800/1,000 (b)	500	500	5	640	700	N/A	N/A	1,600
AGW009	6/20/2016	--	--	--	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
	6/5/2017	250 U	99 U	250 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
AGW010	6/20/2016	**6,100**	**1,200**	240 U	2.0 U	**4.7**	**290**	**96**	**20**	**116**
	11/29/2016	**10,000**	**530**	240 U	2.0 U	**5.9**	**630**	**460**	**66**	**526**
	6/5/2017	**1,500**	**300**	240 U	**0.3**	**0.5**	**42**	**16 J**	**2.0 J**	**18.0 J**
	12/1/2017	**8,700 J**	**330**	250 U	**0.76 J**	**3.9 J**	**570**	**490**	**77**	**567**
	5/31/2018	**2,000 J**	**330**	350 U	**0.85**	**1.4**	**190**	**37**	**7.1**	**44.1**
	12/12/2018	**41,500**	**733**	200 U	**1.35**	**11.4 J**	**1,150**	**2150**	**453**	**2,600**
AGW011	6/5/2017	250 U	100 U	250 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
AGW012	12/5/2004	250 U	250 U	500 U	1 U	1 U	1 U	1 U	1 U	ND
AGW013	12/5/2004	250 U	250 U	500 U	1 U	1 U	1 U	1 U	1 U	ND
AGW014	6/5/2017	250 U	100 U	250 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
AGW015	9/7/2017	250 U	**130 J**	260 U	0.20 U	0.20 U	0.50 U	0.50 U	0.50 U	ND
AGW016	6/5/2017	250 U	100 U	250 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
AGW017	12/5/2004	250 U	250 U	500 U	1 U	1 U	1 U	1 U	1 U	ND
	6/9/2009	--	--	--	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U	ND

Sample Location	Sample Date	Petroleum Hydrocarbons (µg/L) (a)			BTEX (µg/L) (a)					
		Gasoline-Range Organics	Diesel-Range Organics	Oil-Range Organics	Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Total Xylenes
ASB0264-15	6/28/2017	**1,900**	**440**	250 U	**0.7**	**0.6**	**17**	**8.3**	**1.4**	**9.7**
ASB0265-13.5	6/28/2017	**70,000**	**1,900 J**	250 U	**7.0**	**150**	**2,000**	**6,300**	**1,800**	**8,100**
ASB0266-15	6/29/2017	250 U	100 U	250 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
ASB0267-15	6/29/2017	250 U	100 U	250 U	0.2 U	**1.4**	0.5 U	0.5 U	0.5 U	ND
ASB0268-15	6/29/2017	**2,000**	**500**	250 U	**0.2**	0.2 U	**5.0**	0.5 U	0.5 U	ND
ASB0269-14.5	6/29/2017	**3,900**	**840**	250 U	1.0 U	1.0 U	**54**	**4.6**	2.5 U	**4.6**
ASB0270-14	6/29/2017	250 U	100 U	250 U	0.2 U	0.2 U	0.5 U	0.5 U	0.5 U	ND
ASB0280-18	8/31/2017	250 U	100 U	260 U	0.20 U	0.20 U	0.50 U	0.50 U	0.50 U	ND
ASB0281-17	8/31/2017	250 U	100 U	**310**	0.20 U	0.20 U	0.50 U	0.50 U	0.50 U	ND

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable groundwater pCUL (based on drinking water).

Groundwater monitoring locations are identified by the AGW prefix.

Boring sample designations include the location name followed by the depth at which the sample was collected.

Groundwater concentrations from temporary boring grab samples are not considered a reliable estimate of actual groundwater concentrations and are, therefore, not compared to pCULs.

(a) Petroleum hydrocarbons were analyzed by NWTPH-dx, -Gx, and SW-846 8015. VOCs were analyzed by SW-846 8260, 8260 Selected Ion Monitoring (SIM), and 8015. In the event total xylenes were calculated, the sum consists of detections of m,p-xylene and o-xylene.

(b) 800 µg/L is used if benzene is detected; 1,000 µg/L is used if benzene is not detected.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.

Acronyms/Abbreviations:

-- = not analyzed

µg/L = micrograms per liter

BTEX = benzene, toluene, ethylbenzene, and xylenes

N/A = not applicable

ND = not detected

pCUL = proposed cleanup level

VOC = volatile organic compound

Table 4-4
AOC A-09 Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Total Metals (mg/kg) (a)			Cyanide (mg/kg) (a)		
			Cadmium	Copper	Nickel	Cyanide	Cyanide After Chlorination	Cyanide Amenable
		Soil pCUL	1.0	280	70,000	2,200	N/A	N/A
AGR07-HA1	1.0	9/12/1996	0.2 U	**19.2**	**14**	0.21 U	**1.4**	0.21 U
	3.0	9/12/1996	0.2 U	**26.5**	**17**	0.21 U	**0.36**	0.21 U
	6.5	9/12/1996	**248**	**378**	**27**	**62**	**89**	4.7 U
AGR07-HA2	3.8	9/13/1996	**0.3**	**21.9**	**14**	**1.6**	**1.9**	0.23 U
	6.0	9/13/1996	0.2 U	**385**	**31**	**200**	**390**	4.7 U
AGR07-HA3	2.5	9/13/1996	**0.3**	**32.9**	**12**	0.21 U	0.21 U	0.21 U
AGR07-SC4A	0.7	12/22/1997	**0.4**	**21.7**	**14**	**0.34**	--	--
	1.5	12/22/1997	**0.2**	**16.7**	**13**	**0.4**	--	--
AGR07-SC4B	0.5	12/22/1997	**0.4**	**22.4**	**13**	**0.34**	--	--
	1.5	12/22/1997	0.2 U	**19.2**	**12**	**0.34**	--	--
AGR07-SC4C	0.5	12/22/1997	0.2 U	**20.8**	**16**	**0.32**	--	--
	1.5	12/22/1997	0.2 U	**23.4**	**13**	**0.39**	--	--
AGR07-SC4D	0.5	12/22/1997	**0.2**	**21.2**	**13**	**0.33**	--	--
	1.5	12/22/1997	0.2 U	**17.1**	**10**	**0.28**	--	--
AGR07-SC4E	0.5	12/22/1997	0.2 U	**22.6**	**16**	**0.32**	--	--
	1.5	12/22/1997	**0.3**	**18.1**	**12**	**0.43**	--	--
	2.0	12/22/1997	0.2 U	**18**	**13**	**0.29**	--	--
AGW046	5.0	9/13/1996	0.2 U	**12.4**	**9**	0.23 U	**0.86**	0.23 U
	15.0	9/13/1996	0.2 U	**11.6**	**8**	0.24 U	0.23 U	0.24 U
AGW048	5.0	9/13/1996	0.2 U	**20.3**	**11**	0.22 U	**0.33**	0.22 U
	15.0	9/13/1996	**0.3**	**11.8**	**5**	**0.76**	**0.7**	0.25 U
AGW049	2.0	9/13/1996	0.2 U	**19.4**	**19**	0.2 U	0.21 U	0.2 U
	7.5	9/13/1996	**37.8**	**242**	**37**	**350**	**530**	23 U
	10.0	9/13/1996	**0.5**	**619**	**30**	**19**	**21**	0.45 U
	12.5	9/13/1996	0.2 U	**123**	**17**	**0.53**	**1.7**	0.21 U
AGW050	5.0	9/12/1996	**0.3**	**17.2**	**11**	0.22 U	**0.38**	0.22 U
	13.0	9/12/1996	**0.5**	**15.2**	**11**	0.21 U	0.21 U	0.21 U

Table 4-4
AOC A-09 Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Total Metals (mg/kg) (a)			Cyanide (mg/kg) (a)		
			Cadmium	Copper	Nickel	Cyanide	Cyanide After Chlorination	Cyanide Amenable
		Soil pCUL	1.0	280	70,000	2,200	N/A	N/A
CB2-AU-17-07-22	N/A	7/31/1996	**0.3**	**9.6**	**7**	**0.59**	--	--
CS2-AU/17-07-11	N/A	7/30/1996	**0.8**	**28**	**12**	**1**	--	--
CS2-AU/17-07-19	N/A	7/31/1996	**642**	**81.5**	**10**	**200**	--	--
P2-AU/17-07-16	N/A	7/30/1996	**492**	**94.3**	**22**	**73**	--	--
PAU/17-07-24	N/A	8/1/1996	0.2 U	**13.2**	**8**	0.22 U	--	--
PAU/17-07-25	N/A	8/1/1996	**124**	**64**	**18**	**110**	--	--
PAU/17-07-39	N/A	8/1/1996	**163**	**35.4**	**16**	**77**	--	--
PAU/17-07-40	N/A	8/1/1996	**146**	**90.6**	**28**	**28**	--	--
PAU/17-07-41	N/A	8/1/1996	**84**	**80**	**9**	**41**	--	--
PAU/17-07-42	N/A	8/1/1996	**1.5**	**19.8**	**13**	**2.9**	--	--
PAU/17-07-43	N/A	8/1/1996	**0.5**	**36.6**	**15**	**0.44**	--	--
PAU/17-07-44	N/A	8/1/1996	0.2 U	**21.2**	**13**	0.22 U	--	--
PAU/17-07-45	N/A	8/6/1996	**148**	**131**	**32**	**5.3**	--	--
PAU/17-07-46	N/A	8/6/1996	**15**	**102**	**15**	**18**	--	--
PAU/17-07-47	N/A	8/6/1996	**0.4**	**21.4**	**11**	--	--	--
S2-AU/17-07-12	N/A	7/30/1996	**353**	**181**	**17**	**75**	--	--
VS2-AU/17-07-17	N/A	7/31/1996	**1**	**16**	**14**	**2.2**	--	--
VS2-AU/17-07-18	N/A	7/31/1996	**169**	**108**	**36**	**16**	--	--
VS2-AU/17-07-20	N/A	7/31/1996	**77.9**	**22.6**	**21**	**21**	--	--
VS2-AU/17-07-21	N/A	7/31/1996	**224**	**93.5**	**25**	**13**	--	--

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable pCUL for soil.

(a) Total metals were analyzed by SW-846 6010, 6020, and EPA 200.8.
Cyanide was analyzed by EPA 335.1, 335.2, ASTM D6888-09, ASTM D7237-10, and ASTM D7511-12.

Acronyms/Abbreviations:

-- = not analyzed
EPA = US Environmental Protection Agency
ft = feet
mg/kg = milligrams per kilogram
N/A = not applicable
pCUL = proposed cleanup level

Table 4-5
AOC A-09 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Dissolved Metals (µg/L) (a)			Cyanide (µg/L) (a)		
		Cadmium	Copper	Nickel	Total Cyanide	Available Cyanide	Free Cyanide
	Groundwater pCUL	5.0	640	100	10	N/A	10
AGW037	12/10/2004	2 U	2 U	10 U	--	--	--
	11/28/2017	--	--	--	5.00 U	--	--
	3/12/2018	--	--	--	5.00 U	--	--
	6/5/2018	--	--	--	5.00 U	--	--
AGW046	9/26/1996	0.2 U	2 U	10 U	4 U	--	--
	12/10/2004	2 U	2 U	10 U	--	--	--
AGW047	12/10/2004	2 U	**5**	10 U	--	--	--
	6/6/2017	--	--	--	**140**	--	--
	11/29/2017	--	--	--	**23.3**	--	--
	3/12/2018	--	--	--	**97.7**	--	--
	6/5/2018	--	--	--	**62.6**	2.00 U	5.00 U
	12/4/2018	--	--	--	**18.4**	--	--
AGW048	12/10/2004	**5**	10	10 U	**--**	--	--
	6/16/2016	**1.2**	--	**2.1**	--	--	--
	6/6/2017	**3.3**	--	2.0 U	**65**	--	--
	11/28/2017	--	--	--	**74.0**	--	--
	3/12/2018	--	--	--	**79.8**	--	--
	6/5/2018	**3.8**	--	**1.3 J**	**50.3**	2.00 U	5.00 U
	12/4/2018	--	--	--	**147**	--	--
AGW049	6/16/2016	**12.9**	--	**56.4**	--	--	--
	11/29/2016	**12.4**	--	**66.7**	--	--	--
	6/6/2017	**6.2**	**745**	**52.5**	**53**	--	--
	11/28/2017	**8.8**	**760**	**60**	**7.48**	--	--
	3/12/2018	--	--	--	**18.5**	--	--
	6/5/2018	**4.0**	**180**	**14 J**	**15.3 J**	2.00 U	5.00 U
	12/4/2018	**11.5**	**730**	**57.3**	5.00 U	--	--

Table 4-5
AOC A-09 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Dissolved Metals (µg/L) (a)			Cyanide (µg/L) (a)		
		Cadmium	Copper	Nickel	Total Cyanide	Available Cyanide	Free Cyanide
	Groundwater pCUL	5.0	640	100	10	N/A	10
AGW050	12/10/2004	**14**	**21**	**20**	--	--	--
	6/16/2016	**18.5**	--	**38.3**	--	--	--
	11/29/2016	**16.2**	--	**16.4**	--	--	--
	6/6/2017	**51.9**	--	**174**	**2,000**	--	--
	11/28/2017	**12**	--	**12 J**	**296**	--	--
	3/12/2018	--	--	--	**3,620**	--	--
	6/5/2018	**24**	--	**62**	**4,670**	**24.8 J**	**10.9 J**
	9/5/2018	--	--	--	**166**	**2.5**	5 U
	12/4/2018	**10.7**	--	**13.7**	**351**	--	--
AGW278-1	11/28/2017	--	--	--	**15.8**	--	--
	3/12/2018	--	--	--	**8.90 J**	--	--
	6/5/2018	--	--	--	**39.3 J**	2.00 U	**169 J**
	9/5/2018	--	--	--	**48.7 J**	2 UJ	**262 EJ**
	12/4/2018	--	--	--	5.00 U	--	--

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable groundwater pCUL (based on drinking water).

Groundwater monitoring locations are identified by the AGW prefix.

Boring sample designations include the location name followed by the depth at which the sample was collected.

Acronyms/Abbreviations:

-- = not analyzed
µg/L = micrograms per liter
EPA = US Environmental Protection Agency
N/A = not applicable
pCUL = proposed cleanup level

(a) Dissolved metals were analyzed by SW-846 6010, 6020, and EPA 200.8.
Cyanide was analyzed by EPA 335.1, 335.2, ASTM D6888-09, ASTM D7237-10, and ASTM D7511-12.

U = The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.
E = Estimated value; the result is above the calibration range of the instrument.

Table 4-6
AOC A-13 Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Petroleum Hydrocarbons (mg/kg) (a)		
			Total Petroleum Hydrocarbons	Diesel-Range Organics	Oil-Range Organics
		Soil pCUL	71,000	N/A	N/A
AGW127	15.0	9/8/2008	**5.3**	**5.3**	11 U
AGW128	18.5	9/12/2008	**5,280**	**880**	**4,400**
AGW129	12.5	9/11/2008	**12**	5.7 U	**12**
AGW130	14.0	9/11/2008	**5.6**	**5.6**	11 U
AGW277	8.0	8/12/2017	ND	51 U	51 U
	17.0	8/12/2017	**15,200**	**2,200**	**13,000**
	21.0	8/13/2017	**1,500**	500 U	**1,500**
	24.5	8/13/2017	ND	51 U	51 U
	26.0	8/13/2017	**110**	56 U	**110**
	29.5	8/13/2017	ND	69 U	69 U
AGW279	12.5	12/27/2017	ND	54 U	54 U
	22.0	12/27/2017	ND	51 U	51 U
AGW280	13.0	12/28/2017	ND	53 U	53 U
	23.5	12/28/2017	ND	57 U	57 U
AGW281	13.0	12/29/2017	ND	56 U	56 U
	16.0	12/29/2017	**170**	52 U	**170**
	18.5	12/29/2017	**18,100**	**3,100**	**15,000**
	21.0	12/29/2017	**770**	**140**	**630**
	25.5	12/29/2017	**496**	**96**	**400**
	26.5	12/29/2017	**170**	50 U	**170**
	27.5	12/29/2017	ND	59 U	59 U
AGW282	11.5	12/29/2017	**95**	49 U	**95**
	16.0	12/29/2017	ND	53 U	53 U
	17.0	12/29/2017	ND	58 U	58 U
	21.0	12/29/2017	ND	50 U	50 U
	22.5	12/29/2017	ND	60 U	60 U
ASB0159	16.0	8/30/2004	ND	5 U	10 U
ASB0160	17.5	9/7/2004	**36,800**	**4,800**	**32,000**
ASB0167	5.0	9/7/2004	ND	--	--
	20.0	9/7/2004	ND	5 U	10 U
ASB0168	15.0	9/8/2004	**1,570**	**170**	**1,400**
	17.5	9/8/2004	**268**	**28**	**240**
ASB0169	15.0	9/8/2004	**2,420**	**320**	**2,100**
	17.5	9/8/2004	**3,360**	**460**	**2,900**
ASB0170	15.0	9/9/2004	**23,900**	**3,900**	**20,000**
	17.5	9/9/2004	**15,200**	**2,200**	**13,000**
ASB0171	15.0	9/9/2004	**11,100**	**1,600**	**9,500**
	17.5	9/9/2004	**8,200**	**1,200**	**7,000**
ASB0271	11.0	8/12/2017	ND	51 U	51 U
	18.0	8/12/2017	**9,100**	**1,600**	**7,500**
	24.0	8/12/2017	**1,290**	**290**	**1,000**
ASB0272	11.0	8/12/2017	ND	50 U	50 U
	17.0	8/12/2017	**13,300**	**2,300**	**11,000**
	19.0	8/12/2017	**18,500**	**3,500**	**15,000**

Table 4-6
AOC A-13 Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Petroleum Hydrocarbons (mg/kg) (a)		
			Total Petroleum Hydrocarbons	Diesel-Range Organics	Oil-Range Organics
		Soil pCUL	71,000	N/A	N/A
ASB0274	10.0	8/12/2017	**92**	49 U	**92**
	16.0	8/12/2017	ND	55 U	55 U
	19.0	8/12/2017	ND	49 U	49 U
ASB0275	8.0	8/13/2017	ND	50 U	50 U
	10.0	8/13/2017	**62**	51 U	**62**
	20.0	8/13/2017	ND	68 U	68 U
	23.0	8/13/2017	ND	50 U	50 U
ASB0286	11.0	12/27/2017	ND	51 U	51 U
	16.0	12/27/2017	**326**	**56**	**270**
	18.0	12/27/2017	**13,600**	**2,600**	**11,000**
	22.0	12/27/2017	ND	51 U	51 U
ASB0287	12.0	12/28/2017	ND	50 U	50 U
	22.0	12/28/2017	ND	56 U	56 U
ASB0288	10.5	12/28/2017	**120**	50 U	**120**
	12.0	12/28/2017	**5,630**	**930**	**4,700**
	13.5	12/28/2017	**3,960**	**660**	**3,300**
	18.0	12/28/2017	**19,500**	**3,500**	**16,000**
	22.5	12/28/2017	**2,090**	**390**	**1,700**
	25.0	12/28/2017	ND	52 U	52 U
	29.0	12/28/2017	ND	60 U	60 U
ASB0289	12.0	12/29/2017	ND	52 U	52 U
	17.0	12/29/2017	**120**	53 U	**120**
	20.5	12/29/2017	**423**	**93**	**330**
	22.0	12/29/2017	**100**	56 U	**100**
	25.0	12/29/2017	ND	52 U	52 U
	27.0	12/29/2017	ND	58 U	58 U

Notes:

Bold text indicates detected analyte

(a) Petroleum hydrocarbons analyzed by NWTPH-dx, -Gx, and SW-846 8015. Total petroleum hydrocarbons were calculated by summing detections of diesel range and oil range organics.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Abbreviations and Acronyms:

-- = not analyzed
ft = feet
mg/kg = milligrams per kilogram
N/A = not applicable
ND = not detected
pCUL = proposed cleanup level

Table 4-7
AOC A-13 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Petroleum Hydrocarbons (µg/L) (a)		
		Total Petroleum Hydrocarbons	Diesel-Range Organics	Oil-Range Organics
	Groundwater pCUL	20,000	N/A	N/A
AGW041	6/13/2013	ND	95 U	240 U
AGW043	1/15/2009	ND	250 U	500 U
AGW044	6/20/2016	**2,530**	**1,800**	**730**
	5/31/2017	**180**	**180**	240 U
	6/8/2018	**1,300**	**1,300**	350 U
AGW115	12/11/2013	ND	94 U	230 U
AGW116	12/11/2013	ND	95 U	240 U
AGW117	12/10/2013	ND	94 U	240 U
AGW118	12/11/2013	ND	94 U	230 U
AGW127	12/10/2013	ND	95 U	240 U
AGW128	6/17/2016	**1,450**	**1,100**	**350**
	12/1/2016	**3,400 J**	**2,200 J**	**1,200**
	5/31/2017	**2,400**	**1,100**	**1,300**
	12/5/2017	**7,600**	**1,800**	**5,800**
	6/7/2018	**3,400 J**	**1,500 J**	**1,900 J**
	12/11/2018	**2,885**	**455**	**2,430**
AGW129	12/11/2013	ND	95 U	240 U
AGW130	6/20/2016	ND	94 U	230 U
	12/1/2016	ND	95 U	240 U
	5/31/2017	ND	98 U	240 U
	12/5/2017	**290**	100 U	**290**
	6/8/2018	ND	110 U	350 U
	12/12/2018	ND	100 U	200 U
AGW277	9/6/2017	**1,430 J**	**450 J**	**980 J**
	12/5/2017	**1,810**	**310**	**1,500**
	3/14/2018	**140**	**140**	350 U
	6/7/2018	**230**	**230**	350 U
	9/4/2018	**200**	**200**	350 U
	12/11/2018	ND	100 U	200 U
AGW279	3/14/2018	ND	110 U	350 U
	6/7/2018	ND	110 U	350 U
	9/4/2018	ND	110 U	350 U
	12/11/2018	ND	100 U	200 U
AGW280	3/14/2018	ND	110 U	350 U
	6/7/2018	ND	110 U	350 U
	9/5/2018	ND	110 U	350 U
	12/12/2018	ND	100 U	200 U
AGW281	3/13/2018	**690**	**150**	**540**
	6/7/2018	**190**	**190**	350 U
	9/5/2018	**890**	**190**	**700**
	12/12/2018	**250**	100 U	**250**
AGW282	3/13/2018	**4,260**	**660**	3,600
	6/7/2018	**490**	**490**	350 U
	9/5/2018	ND	110 U	350 U
	12/12/2018	ND	100 U	200 U

Table 4-7
AOC A-13 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Petroleum Hydrocarbons (µg/L) (a)		
		Total Petroleum Hydrocarbons	Diesel-Range Organics	Oil-Range Organics
	Groundwater pCUL	20,000	N/A	N/A
AGW277-20	8/12/2017	**891,000 J**	**21,000 J**	**870,000**
ASB0159-19	8/30/2004	ND	250 U	500 U
ASB0160R-18	9/7/2004	**11,500**	**1,500**	**10,000**
ASB0167-18	9/7/2004	ND	250 U	500 U
ASB0168-18	9/8/2004	**2,120**	**320**	**1,800**
ASB0169-18	9/8/2004	**3,160**	**460**	**2,700**
ASB0170-18	9/9/2004	**4,390**	**690**	**3,700**
ASB0171-18	9/9/2004	**4,010**	**610**	**3,400**
ASB0271-20	8/12/2017	**248,000**	**38,000**	**210,000**
ASB0272-20	8/12/2017	**352,000**	**62,000**	**290,000**
ASB0274-18	8/12/2017	**520**	**110**	**410**
ASB0275-19	8/13/2017	ND	100 U	250 U
ASB0286-16	12/27/2017	**25,600 J**	**4,600 J**	**21,000**
ASB0287-17.5	12/28/2017	ND	100 U	250 U
ASB0288-16	12/28/2017	**49,900 J**	**9,900 J**	**40,000 J**
ASB0289-16	12/29/2017	**3,900**	**1,100**	**2,800**

Notes:

Bold text indicates detected analyte

Groundwater monitoring locations are identified by the AGW prefix.

Boring sample designations include the location name followed by the depth at which the sample was collected. Groundwater concentrations from temporary boring grab samples are not considered a reliable estimate of actual groundwater concentrations and are, therefore, not compared to pCULs.

(a) Petroleum hydrocarbons were analyzed by NWTPH-dx, -Gx, and SW-846 8015.

Total petroleum hydrocarbons were calculated by summing detections of diesel range and oil range organics.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

U = The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.

Abbreviations and Acronyms:

-- = not analyzed
µg/L = micrograms per liter
N/A = not applicable
ND = not detected
pCUL = proposed cleanup level

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW001R	12/5/2018	**1.51**	0.0200 U
AGW002R	12/5/2018	0.200 U	**0.0416**
AGW006R	12/6/2018	**0.560**	**0.0335**
AGW009	6/8/2018	**0.23**	0.020 U
AGW010	12/12/2018	0.200 U	0.0200 U
AGW024	12/10/2018	0.200 U	**1.09 J**
AGW025	12/10/2018	0.200 U	**1.98 J**
AGW026	12/10/2018	**0.737**	**0.0328 J**
AGW027	12/7/2018	0.200 U	**0.447**
AGW029	6/1/2018	0.20 U	0.020 U
AGW030	6/1/2018	0.20 U	0.020 U
AGW031R	12/6/2018	**0.839**	**0.0252**
AGW032	12/10/2018	0.200 U	**0.0796 J**
AGW033	12/6/2018	0.200 U	**0.0229**
AGW034	6/11/2018	**1.4**	0.020 U
AGW035	6/1/2018	**1.8**	0.020 U
AGW037	12/7/2018	**2.12**	**0.134**
AGW039	5/31/2018	**0.41**	0.020 U
AGW040	5/31/2018	**0.65**	0.020 U
AGW041	6/8/2018	**0.23**	0.020 U
AGW044	6/8/2018	0.20 U	0.020 U
AGW053R	12/5/2018	**1.11**	**0.118**
AGW055R	12/6/2018	**0.516**	**0.0284**
AGW057R	12/5/2018	**0.838**	0.0200 U
AGW058R	6/6/2018	0.20 U	0.020 U
AGW059R	6/6/2018	0.20 U	0.020 U
AGW060R	12/5/2018	**0.827**	**0.0544**
AGW064	12/6/2018	**0.790**	0.0200 U
AGW065	6/1/2018	0.20 U	0.020 U
AGW066	12/5/2018	**3.56**	0.0200 U
AGW067	12/6/2018	**3.91**	0.0200 U
AGW068	6/5/2018	0.20 U	0.020 U
AGW069	12/6/2018	0.200 U	0.0200 U
AGW072	12/5/2018	**1.11**	0.0200 U
AGW073	12/5/2018	**0.206**	0.0200 U
AGW074	12/7/2018	0.200 U	0.0200 U
AGW078	6/8/2018	0.20 U	0.020 U
AGW079	12/10/2018	0.200 U	**0.321 J**
AGW081	6/11/2018	0.20 U	0.020 U
AGW085	12/10/2018	**0.503**	0.0200 UJ
AGW087	12/7/2018	0.200 U	0.0200 U
AGW088	12/7/2018	0.200 U	0.0200 U
AGW089	12/7/2018	0.200 U	0.0200 U
AGW090	12/7/2018	0.200 U	0.0200 U
AGW091	12/7/2018	0.200 U	0.0200 U

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW095R	12/6/2018	**0.746**	0.0200 U
AGW098R	12/6/2018	**0.385**	0.0200 U
AGW104	6/12/2018	0.20 U	0.020 U
AGW105R	12/6/2018	**0.761**	**0.532**
AGW106R	12/5/2018	0.200 U	0.0200 U
AGW110R	12/5/2018	0.200 U	**0.102**
AGW112R	12/5/2018	**1.81**	**0.353**
AGW115	12/10/2018	0.200 U	**0.268 J**
AGW116	12/10/2018	0.200 U	0.0200 UJ
AGW117	12/10/2018	0.200 U	0.0200 UJ
AGW118	12/10/2018	**0.292**	0.0200 UJ
AGW119	12/7/2018	0.200 U	0.0200 U
AGW120	12/7/2018	0.200 U	0.0200 U
AGW125	12/6/2018	**7.08**	**0.0337**
AGW126	12/6/2018	**6.75**	**0.0938**
AGW127	6/11/2018	0.20 U	0.020 U
AGW128	12/11/2018	0.200 U	0.0200 U
AGW129	12/10/2018	**0.458**	0.0200 UJ
AGW130	12/12/2018	**0.244**	**0.0270**
AGW131	12/12/2018	0.200 U	**2.89**
AGW133	6/12/2018	0.20 U	0.020 U
AGW134	12/6/2018	0.200 U	0.0200 U
AGW135	12/6/2018	**1.15**	**0.0289**
AGW136	12/6/2018	**2.25**	0.0200 U
AGW137	12/6/2018	**3.07**	0.0200 U
AGW138	12/6/2018	**0.465**	0.0200 U
AGW139	12/13/2018	**1.78**	0.0200 U
AGW140	12/6/2018	**3.10**	**0.146**
AGW141	12/6/2018	**1.68**	0.0200 U
AGW142	12/6/2018	0.200 U	0.0200 U
AGW143	12/7/2018	0.200 U	0.0200 U
AGW144	12/7/2018	**0.408**	**0.400**
AGW145	12/7/2018	**11.1**	**0.832**
AGW146	12/7/2018	**3.76**	**0.0938**
AGW147	12/7/2018	0.200 U	0.0200 UJ
AGW148	12/7/2018	**3.08**	**0.0307**
AGW149	12/7/2018	**3.33**	0.0200 U
AGW150	12/11/2018	**1.14**	0.0200 U
AGW151	12/6/2018	**0.449**	0.0200 U
AGW152	12/10/2018	0.200 U	**2.07 J**
AGW153	6/12/2018	0.20 U	0.020 U
AGW154	12/7/2018	**0.270**	0.0200 U
AGW155	12/10/2018	0.200 U	**4.23 J**
AGW156	12/7/2018	**0.261**	**1.17**
AGW157	12/7/2018	**0.383**	**0.430**

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW158	12/13/2018	**1.74**	**0.0263**
AGW159	12/13/2018	**3.50**	**0.0540**
AGW160	12/4/2018	**6.72**	**0.0266**
AGW161	12/3/2018	**1.27**	0.0200 U
AGW162	12/11/2018	**0.572**	0.0200 U
AGW163	12/10/2018	**3.76**	**0.0407 J**
AGW164	12/7/2018	**1.42**	**0.0551**
AGW165	12/7/2018	**2.07**	**0.169**
AGW166	12/13/2018	0.200 U	**0.286**
AGW167	12/13/2018	**5.16**	**0.130**
AGW168	12/13/2018	**3.87**	**0.0348**
AGW169	12/13/2018	**4.58**	**0.0373**
AGW170	12/13/2018	**2.01**	**0.0276**
AGW171	12/13/2018	**1.79**	0.0200 U
AGW172	12/4/2018	**3.79**	0.0200 U
AGW173	12/4/2018	0.200 U	0.0200 U
AGW174	12/3/2018	**1.51**	0.0200 U
AGW175	12/3/2018	**1.78**	0.0200 U
AGW176	12/4/2018	**3.52**	0.0200 U
AGW177	12/4/2018	**3.97**	0.0200 U
AGW178	12/4/2018	**4.06**	0.0200 U
AGW179	12/4/2018	**0.255**	**0.104**
AGW180	12/4/2018	**3.05**	0.0200 U
AGW181	12/6/2018	**4.01**	**0.0399**
AGW182	12/13/2018	**1.46**	**0.161**
AGW183	12/13/2018	0.200 U	0.0200 U
AGW184	12/12/2018	**0.386**	0.0200 U
AGW185	12/3/2018	**2.36**	0.0200 U
AGW186	12/12/2018	**0.539**	0.0200 U
AGW187	12/3/2018	**1.70**	0.0200 U
AGW188	12/6/2018	**4.56**	**0.0315**
AGW189	12/12/2018	**0.513**	0.0200 U
AGW190	12/10/2018	**1.18**	0.0200 U
AGW191	12/7/2018	0.200 U	0.0200 U
AGW192	12/7/2018	0.200 U	0.0200 U
AGW193	12/13/2018	**2.98**	**0.157**
AGW194	12/13/2018	**1.58**	0.0200 U
AGW195	12/4/2018	**7.19**	0.0200 U
AGW196	12/4/2018	0.200 U	**2.63**
AGW197	12/4/2018	**8.66**	0.0200 U
AGW198	12/4/2018	**5.80**	0.0200 U
AGW199	12/4/2018	**6.34**	**0.0263**
AGW200-2	12/12/2018	**0.314**	**1.47**
AGW200-5	12/12/2018	**0.933**	**1.40**
AGW200-6	12/12/2018	**0.904**	**0.738**

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW201-2	12/13/2018	**0.344**	**1.81**
AGW201-5	12/13/2018	**2.90**	**0.549**
AGW201-6	12/13/2018	**5.26**	**0.278**
AGW202-2	12/13/2018	**0.871**	**1.14**
AGW202-4	12/13/2018	**1.46**	**0.210**
AGW202-6	12/13/2018	**0.773**	**0.0293**
AGW203-2	12/13/2018	**0.625**	0.0200 U
AGW203-4	12/13/2018	**2.27**	0.0200 U
AGW203-6	12/13/2018	0.200 U	0.0200 U
AGW204	6/12/2018	0.20 U	0.020 U
AGW205	6/11/2018	0.20 U	0.020 U
AGW206	12/10/2018	**0.976**	0.0200 UJ
AGW207-2	12/12/2018	**4.28**	**0.131**
AGW207-4	12/12/2018	**4.79**	**0.0869**
AGW207-7	12/12/2018	**4.72**	**0.0213**
AGW208-2	12/5/2018	**1.26**	**0.634**
AGW208-4	12/5/2018	**0.342**	**0.345**
AGW208-6	12/5/2018	**4.74**	0.0200 U
AGW209-2	12/5/2018	0.200 U	**1.60**
AGW209-5	12/5/2018	**1.79**	**1.39**
AGW209-6	12/5/2018	**4.48**	**0.0314**
AGW210-2	6/4/2018	0.20 U	0.020 U
AGW210-5	12/5/2018	**0.666**	**0.0490**
AGW210-6	12/5/2018	**3.77**	**0.0298**
AGW211-2	6/4/2018	0.20 U	0.020 U
AGW211-5	12/5/2018	**2.33**	0.0200 U
AGW211-6	12/5/2018	**1.42**	0.0200 U
AGW212-2	6/1/2018	0.20 U	0.020 U
AGW212-5	12/10/2018	**1.54**	0.0200 U
AGW212-7	12/10/2018	**3.82**	0.0200 U
AGW213	12/6/2018	0.200 U	**0.0225**
AGW214	12/3/2018	**2.40**	**0.0228 J**
AGW215	12/6/2018	0.200 U	0.0200 U
AGW216	12/3/2018	**0.630**	0.0200 U
AGW217	12/3/2018	**1.63**	**0.0244 J**
AGW218	12/6/2018	**2.98**	**0.0269**
AGW219	12/3/2018	0.200 U	0.0200 U
AGW220	12/10/2018	**0.213**	0.0200 U
AGW221	12/3/2018	0.200 U	0.0200 U
AGW222	12/10/2018	**0.458**	0.0200 UJ
AGW223	6/8/2018	0.20 U	0.020 U
AGW224	6/5/2018	0.20 U	0.020 U
AGW225	12/7/2018	**2.17**	**0.316**
AGW226	12/3/2018	0.200 U	**0.295**
AGW227	12/6/2018	**1.52**	**0.237**

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW228	12/6/2018	**3.34**	**0.214**
AGW229	12/13/2018	**1.63**	**0.0391**
AGW230	12/12/2018	**0.924**	0.0200 U
AGW231	12/4/2018	0.200 U	**2.51**
AGW232	12/4/2018	0.200 U	**5.43**
AGW233	12/3/2018	0.200 U	0.0200 U
AGW234	12/10/2018	**8.00**	**0.0704**
AGW235-2	12/11/2018	0.200 U	**3.64**
AGW235-4	12/11/2018	**1.44**	**0.168**
AGW235-7	12/11/2018	0.200 U	0.0200 U
AGW236	12/6/2018	**2.27**	**0.451**
AGW237	12/6/2018	**2.25**	**0.0394**
AGW238	12/6/2018	0.200 U	0.0200 U
AGW239	12/6/2018	0.200 UJ	**1.16**
AGW240-1	12/7/2018	0.200 U	**0.0531**
AGW240-5	12/7/2018	0.200 U	**0.0237**
AGW241-1	12/12/2018	0.200 U	0.0200 U
AGW241-5	12/12/2018	0.200 U	0.0200 U
AGW242-1	12/12/2018	0.200 U	**0.217**
AGW242-2	12/12/2018	0.200 U	0.0200 U
AGW242-5	12/12/2018	0.200 U	0.0200 U
AGW243-1	12/5/2018	0.200 U	**0.382 J**
AGW243-3	12/5/2018	0.200 U	0.0200 U
AGW243-5	12/6/2018	0.200 U	0.0200 U
AGW244	12/3/2018	0.200 U	0.0200 U
AGW245	12/3/2018	0.200 U	0.0200 U
AGW246	12/3/2018	0.200 U	0.0200 U
AGW247-1	12/3/2018	0.200 U	**0.369**
AGW247-5	12/3/2018	0.200 U	**1.72**
AGW248-1	12/7/2018	0.200 U	0.0200 U
AGW248-5	12/7/2018	**3.93**	**0.103**
AGW249-1	12/12/2018	0.200 U	**0.461**
AGW249-5	12/12/2018	**5.69**	**0.0722**
AGW250-1	12/6/2018	0.200 U	0.0200 U
AGW250-2	12/6/2018	0.200 U	**0.0317**
AGW250-3	12/6/2018	**0.466**	**0.0510**
AGW250-6	12/6/2018	0.200 U	0.0200 U
AGW251-1	12/13/2018	0.200 U	**0.105**
AGW251-2	12/13/2018	0.200 U	**0.714**
AGW251-3	12/13/2018	0.200 U	**4.99**
AGW251-6	12/13/2018	0.200 U	**0.250**
AGW252	12/10/2018	0.200 U	0.0200 U
AGW253	5/31/2018	0.20 U	0.020 U
AGW254-1	12/10/2018	0.200 U	0.0200 U
AGW254-2	12/10/2018	0.200 U	**0.0442**

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW254-5	12/10/2018	0.200 U	0.0200 U
AGW255-1	12/12/2018	**0.510**	**0.189**
AGW255-3	12/12/2018	0.200 U	**0.142**
AGW255-5	12/12/2018	0.200 U	**0.161**
AGW256	12/4/2018	**0.818**	0.0200 U
AGW257	12/4/2018	0.200 U	0.0200 U
AGW258	12/4/2018	0.200 U	0.0200 U
AGW259	12/10/2018	0.200 U	0.0200 U
AGW260	12/12/2018	0.200 U	0.0200 U
AGW261	12/12/2018	**2.59**	**0.145**
AGW262	12/12/2018	0.200 U	**0.0940**
AGW263	12/7/2018	**0.561**	**0.0256**
AGW264	12/7/2018	0.200 U	0.0200 U
AGW265	12/7/2018	0.200 U	0.0200 U
AGW266	12/6/2018	0.200 U	**0.0217**
AGW267	12/5/2018	0.200 U	0.0200 U
AGW268	12/5/2018	0.200 U	0.0200 U
AGW269	12/4/2018	0.200 U	**0.159**
AGW270	12/4/2018	0.200 U	**1.26 J**
AGW271	12/4/2018	0.200 U	**0.214**
AGW272	12/4/2018	**0.261**	**1.76**
AGW273	12/5/2018	0.200 U	**3.09**
AGW274	12/5/2018	0.200 U	**0.116**
AGW275	12/5/2018	0.200 U	**0.0295**
AGW276-2	12/6/2018	**0.320**	**1.27**
AGW276-5	12/6/2018	0.200 U	**2.40**
AGW276-6	12/6/2018	**2.82**	**0.0992**
AGW278-1	12/4/2018	**0.571**	**0.831 J**
AGW278-2	12/7/2018	**0.852**	**0.278**
AGW278-4	12/7/2018	0.200 U	**2.47**
AGW278-6	12/7/2018	0.200 U	0.0200 U
APP-057	12/10/2018	0.200 U	0.0200 U
IW34	12/4/2018	0.200 U	**0.670**
IW36	12/4/2018	0.200 U	**2.65**
IW37	12/5/2018	0.200 U	**0.309**
PW-18A-2.5	10/15/2018	0.20 U	0.020 U
PW-18A-5	10/15/2018	0.20 U	**0.061**
PW-18B-2.5	10/15/2018	0.20 U	0.020 U
PW-18B-5	10/15/2018	0.20 U	0.020 U
PW-23	9/24/2015	0.2 U	0.020 U
PW-24	9/24/2015	0.2 U	0.020 U
PW-25	9/24/2015	0.2 U	0.020 U

Table 4-8
AOC A-14 Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (a) (µg/L)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
PW-26	9/24/2015	0.2 U	0.020 U
PW-27A-2.5	9/19/2018	0.20 U	0.020 UJ
PW-27A-5	9/19/2018	0.20 U	0.020 UJ

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable groundwater pCUL (based on drinking water).

Blue shading indicates concentrations above SWQS in groundwater.

(a) VOCs were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring (SIM).

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Abbreviations and Acronyms:

µg/L = micrograms per liter
pCUL = proposed cleanup level
SWQS = surface water quality standards
VOC = volatile organic compound

Table 4-9
AOC A-14 Building 17-07 Release Area Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Volatile Organic Compounds (mg/kg) (a)	
			Trichloroethene	Vinyl Chloride
		Soil pCUL	0.025	N/A
AGW037	10	1/8/1996	0.05 U	0.05 U
AGW278	7.5	8/18/2017	**0.0019**	0.0015 U
	11	8/18/2017	0.0016 U	0.0016 U
	15	8/18/2017	0.0015 U	0.0015 U
B1	9	1/8/1996	0.05 U	0.05 U
	11	1/8/1996	0.05 U	0.05 U
B2	8	1/8/1996	0.05 U	0.05 U
	10	1/8/1996	0.05 U	0.05 U
B3	8	1/8/1996	0.05 U	0.05 U
	10	1/8/1996	0.05 U	0.05 U

Notes:

Bold text indicates detected analyte.

(a) VOCs were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Abbreviations and Acronyms:

ft = feet
mg/kg = milligrams per kilogram
N/A = not applicable
pCUL = proposed cleanup level
VOC = volatile organic compound

Table 4-10
AOC A-14 Building 17-07 Release Area Soil Gas Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds ($\mu g/m^3$) (a)	
		Trichloroethene	Vinyl Chloride
SSV23	10/6/2011	2.1 U	**3.8**
SSV24	4/22/2011	**24.2**	1 U
SSV26	4/22/2011	2.2 U	1 U
SSV27	10/6/2011	**72**	**190**
SSV28	10/6/2011	**190**	0.51 U
SSV29	4/22/2011	**1,010**	0.97 U
SSV30	4/22/2011	**32.7**	0.81 U
SSV31	4/22/2011	**36.5**	0.5 U
SSV32	4/22/2011	**168**	0.45 U
SSV076	6/28/2017	**2.3**	1.0 U
SSV077	6/28/2017	21 U	9.8 U
SSV078	6/28/2017	3.8 U	1.8 U
SSV079	6/28/2017	2.1 U	1.0 U
SSV080	6/28/2017	**3.7**	1.0 U
SSV081	6/28/2017	2.1 U	1.0 U
SSV082	6/28/2017	**1,800**	1.0 U
SSV083	6/28/2017	**110**	**41**
SSV084	6/28/2017	**16**	**1.5**
SSV085	6/28/2017	**84**	1.0 U
SSV086	6/28/2017	2.1 U	1.0 U

Notes:

Bold text indicates detected analyte

No soil gas pCUL developed because vapor intrusion is an incomplete exposure pathway at the Site.

(a) Volatile organic compounds analyzed by TO-15.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Abbreviations and Acronyms:

$\mu g/m^3$ = micrograms per cubic meter

pCUL = proposed cleanup level

Table 4-11
AOC A-14 Building 17-07 Release Area Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (µg/L) (a)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGR07-C9	6/21/2017	**1.1**	**0.18**
AGW037	6/16/2016	**2.6**	**0.3**
	11/29/2016	**2.6**	**0.18**
	5/30/2017	**1.8**	**0.19**
	11/28/2017	**2.1**	**0.21**
	6/5/2018	**1.5**	**0.17**
	12/7/2018	**2.12**	**0.134**
AGW047	9/29/2010	**1**	0.02 U
AGW048	9/29/2010	**1.1**	0.02 U
AGW049	9/29/2010	**1.6**	0.02 U
AGW050	9/29/2010	**1.1**	0.02 U
AGW165	6/16/2016	**2.3**	**0.3**
	11/29/2016	**2.6**	**0.18**
	5/30/2017	**2.4**	**0.80**
	12/4/2017	**2.1**	**0.18**
	6/11/2018	**2.1**	**0.40**
	12/7/2018	**2.07**	**0.169**
AGW278-1	9/6/2017	**0.55**	**0.35 J**
	10/9/2017	**0.52**	**0.50**
	11/28/2017	**0.43**	**0.63**
	3/12/2018	**0.74**	**0.64**
	6/5/2018	**0.66**	**0.51**
	9/5/2018	**0.61**	**0.83**
	12/4/2018	**0.571**	**0.831 J**
AGW278-2	9/6/2017	**0.72**	0.020 UJ
	10/9/2017	**0.80**	**0.29**
	12/4/2017	**0.91**	**0.27**
	3/12/2018	**1.0**	**0.29**
	6/11/2018	**0.67**	0.020 U
	9/5/2018	**0.96**	**0.22**
	12/7/2018	**0.852**	**0.278**
AGW278-4	9/6/2017	0.20 U	**2.7 J**
	10/9/2017	0.20 U	**2.2**
	12/4/2017	0.20 U	**2.0**
	3/12/2018	0.20 U	**3.2**
	6/11/2018	0.20 U	**2.5**
	9/6/2018	0.20 U	**3.1**
	12/7/2018	0.200 U	**2.47**

Table 4-11
AOC A-14 Building 17-07 Release Area Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (µg/L) (a)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW278-6	9/6/2017	0.20 U	0.020 UJ
	10/9/2017	0.20 U	0.020 U
	12/5/2017	0.20 U	0.020 U
	3/12/2018	0.20 U	0.020 U
	6/11/2018	0.20 U	0.020 U
	9/6/2018	0.20 U	0.020 U
	12/7/2018	0.200 U	0.0200 U
ASB0157-17	8/24/2004	0.2 U	**0.94**

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable groundwater pCUL (based on drinking water).

Blue shading indicates concentrations above SWQS in groundwater.

Groundwater monitoring locations are identified by the AGW prefix.
Boring sample designations include the location name followed by the depth at which the sample was collected.

(a) VOCs were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Abbreviations and Acronyms:

µg/L = micrograms per liter
pCUL = proposed cleanup level
SWQS = Surface Water Quality Standards
VOC = volatile organic compound

Table 4-12
AOC A-14 Former Building 17-03 Release Area Soil Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Depth (ft)	Sample Date	Volatile Organic Compounds (mg/kg) (a)	
			Trichloroethene	Vinyl Chloride
		Soil pCUL	0.025	N/A
AGW097	16	12/3/2003	ND	ND
AGW099	16	12/9/2003	ND	ND
ASB0290	12	12/17/2018	**0.0445**	0.00092 U
	16	12/17/2018	**0.0653**	0.00092 U
ASB0291	12	12/18/2018	0.00117 U	0.00117 U
	17.5	12/18/2018	0.00118 U	0.00118 U
ASB0293	11	12/20/2018	0.00113 U	0.00113 U
	15	12/20/2018	0.00105 U	0.00105 U
ASB0276	7.5	8/28/2017	0.0020 UJ	0.0020 UJ
	9.5	8/28/2017	0.0023 UJ	0.0023 UJ
	17.9	8/28/2017	0.0019 UJ	0.0019 UJ
ASB0277	6.2	8/28/2017	0.0024 U	0.0024 U
	11	8/28/2017	**0.0038**	0.0019 U
ASB0278	7.5	8/28/2017	0.0020 U	0.0020 U
	9	8/28/2017	0.0020 U	0.0020 U
ASB0282	9	9/1/2017	0.0018 U	0.0018 U
	16.5	9/1/2017	**0.0080**	0.0016 U
ASB0283	16.5	9/8/2017	0.0016 U	0.0016 U
ASB0284	6.5	9/8/2017	0.0017 U	0.0017 U
	8.5	9/8/2017	0.0023 U	0.0023 U
ASB0285	2.5	9/11/2017	0.0018 U	0.0018 U
	9.7	9/11/2017	0.0020 U	0.0020 U
ASB0279	6.5	8/30/2017	0.0019 U	0.0019 U
	12.5	8/30/2017	**0.0017**	0.0016 U
	18.5	8/30/2017	0.0015 U	0.0015 U
SS-26	8.5	10/28/1992	ND	ND
SS-27	8.5	10/28/1992	ND	ND
SS-28	8.5	10/28/1992	ND	ND
SS-29	8.5	10/28/1992	ND	ND

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable soil pCUL

(a) VOCs were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

UJ = The analyte was analyzed for but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

Abbreviations and Acronyms:

ft = feet
mg/kg = milligrams per kilogram
N/A = not applicable
ND = not detected
pCUL = proposed cleanup level
VOC = volatile organic compound

Table 4-13
AOC A-14 Former Building 17-03 Release Area Soil Gas Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds ($\mu g/m^3$) (a)	
		Trichloroethene	Vinyl Chloride
ASG001	6/26/2017	**1,000**	2.4 U
ASG002	6/26/2017	**1,400**	3.2 U
ASG003	6/26/2017	**1,700**	5.9 U
ASG004	6/26/2017	**420**	1.0 U
ASG005	6/26/2017	**700**	3.2 U
ASG006	6/26/2017	**77**	1.0 U

Notes:

Bold text indicates detected analyte.

No soil gas pCUL developed because vapor intrusion is an incomplete exposure pathway at the Site.

(a) Volatile organic compounds analyzed by TO-15.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Abbreviations and Acronyms:

$\mu g/m^3$ = micrograms per cubic meter

pCUL = proposed cleanup level

Table 4-14
AOC A-14 Former Building 17-03 Release Area Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (µg/L) (a)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
AGW001R	6/22/2016	**1.9**	0.020 U
	11/30/2016	**2.2**	0.2 U
	6/7/2017	**1.2**	0.020 U
	11/29/2017	**1.6**	0.020 U
	6/6/2018	**1.1**	0.020 U
	12/5/2018	**1.51**	0.0200 U
AGW097	12/7/2004	0.2 U	0.02 U
AGW099	12/7/2004	0.2 U	0.02 U
ASB0276-20	8/28/2017	**4.44**	0.0200 U
ASB0276-30	8/28/2017	**1.43**	0.0200 U
ASB0276-40	8/29/2017	**0.39 J**	0.0200 U
ASB0277-20	8/28/2017	**9.21**	0.0200 U
ASB0277-30	8/29/2017	**1.48**	0.0200 U
ASB0277-40	8/29/2017	**11.0**	0.0200 U
ASB0278-20	8/30/2017	**7.19**	0.0200 U
ASB0278-30	8/30/2017	**3.46**	0.0200 U
ASB0278-40	8/30/2017	**2.17**	0.0200 U
ASB0278-50	8/30/2017	**0.46**	0.0200 U
ASB0279-20	8/30/2017	**0.40**	0.0200 U
ASB0279-30	8/31/2017	0.20 U	0.0200 U
ASB0279-40	8/31/2017	0.20 U	0.0200 U
ASB0279-50	8/31/2017	0.20 U	0.0200 U
ASB0282-20	9/1/2017	**3.85 J**	0.0200 U
ASB0282-30	9/1/2017	**3.75 J**	0.0200 U
ASB0282-40	9/1/2017	**3.68 J**	0.0200 U
ASB0282-50	9/1/2017	**0.78**	0.020 UJ
ASB0283-21	9/8/2017	**1.2**	0.020 U
ASB0283-30	9/8/2017	**1.4**	0.020 U
ASB0283-40	9/8/2017	**0.56**	0.020 U
ASB0283-50	9/8/2017	**0.45**	0.020 U
ASB0284-20	9/8/2017	**1.9**	0.020 U
ASB0284-30	9/11/2017	**2.8**	0.020 U
ASB0284-40	9/11/2017	**0.69**	0.020 U
ASB0284-50	9/11/2017	**2.3**	0.020 U
ASB0285-20	9/11/2017	**0.45**	0.020 U
ASB0285-30	9/11/2017	**1.6**	0.020 U
ASB0285-40	9/11/2017	**1.0**	0.020 U
ASB0290-20	12/17/2018	**5.61**	0.0200 U
ASB0290-30	12/17/2018	**1.40**	0.0200 U
ASB0290-40	12/18/2018	**0.879**	0.0200 U
ASB0291-20	12/18/2018	**1.17**	0.0200 U
ASB0291-30	12/18/2018	**0.950**	0.0200 U
ASB0291-40	12/19/2018	**0.689 J**	0.0200 UJ
ASB0292-20	12/19/2018	**1.96**	0.0200 U
ASB0292-29.5	12/19/2018	**3.24 J**	0.0200 UJ

Table 4-14
AOC A-14 Former Building 17-03 Release Area Groundwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (µg/L) (a)	
		Trichloroethene	Vinyl Chloride
	Groundwater pCUL	4.0	0.29
	SWQS in Groundwater	0.3	0.02
ASB0292-40	12/20/2018	**1.30 J**	0.0200 UJ
ASB0293-20	12/20/2018	**0.370**	0.0200 U
ASB0293-30	12/20/2018	**0.471**	0.0200 U
ASB0293-40	12/20/2018	0.646 UJ	0.0200 UJ

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds applicable groundwater pCUL (based on drinking water).

Blue shading indicates concentrations above SWQS in groundwater.

Groundwater monitoring locations are identified by the AGW prefix.

Boring sample designations include the location name followed by the depth at which the sample was collected.

(a) VOCs were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring.

U = The analyte was analyzed for but was not detected above the level of the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

J = The result is an estimated quantity. The associated numerical value is the approximate concentration of the analyte in the sample.

Abbreviations and Acronyms:

µg/L = micrograms per liter
pCUL = proposed cleanup level
SWQS = surface water quality standards
VOC = volatile organic compound

Table 4-15
AOC A-15 Stormwater Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (µg/L) (a)	
		Trichloroethene	Vinyl Chloride
SW-3	3/24/2014	0.2 U	0.02 U
SW-5	6/20/2012	0.2 U	0.02 U
SW-6	6/20/2012	0.2 U	0.02 U
SW-10	3/24/2014	0.2 U	0.02 U
SW-11	6/19/2012	0.2 U	**0.087**
SW-12	4/2/2014	0.2 U	0.02 U
SW-14	8/30/2016	**1.0**	**0.2**
	9/15/2017	**0.76**	0.020 U
	9/27/2018	**0.47**	**0.31**
SW-15	9/5/2014	0.2 U	0.02 U
SW-16	8/30/2016	0.2 U	**0.026**
	9/15/2017	**0.31**	0.020 U
	9/27/2018	**0.33**	**0.22**
SW-19	9/5/2014	0.2 U	**0.13**
SW-CD1	9/17/2012	**1.3**	**0.059**
SW-CD2	9/5/2014	0.2 U	**0.10**
SW-CD3	9/17/2012	0.2 U	0.02 U
SW-CD4 (formerly SW-4)	3/18/2016	**0.5**	**0.28**
	8/30/2016	**2.4**	**0.11**
	3/20/2017	**0.5**	**0.2**
	9/15/2017	**1.7**	0.020 U
	3/6/2018	**0.47**	**0.23**
	9/27/2018	**1.8**	**0.14**
SW-CD13	12/2/2014	0.2 U	**0.54**

Notes:

Bold text indicates detected analyte

(a) Volatile organic compounds were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

Abbreviations and Acronyms:

µg/L = micrograms per liter

Table 4-16
AOC A-15 Surface Water Results
Boeing Auburn Feasibility Study
Auburn, Washington

Sample Location	Sample Date	Volatile Organic Compounds (µg/L) (a)	
		Trichloroethene	Vinyl Chloride
	Surface Water pCUL	0.3	0.02
SW-1 (c)	6/19/2012	0.2 U	0.02 U
SW-2	6/19/2012	0.2 U	0.02 U
SW-7 (c)	6/19/2012	0.2 U	0.04 U
SW-8 (c)	6/19/2012	0.2 U	0.02 U
SW-9 (c)	6/19/2012	0.2 U	0.04 U
SW-17 (b)	8/30/2016	0.2 U	**0.050**
	9/15/2017	0.20 U	0.020 U
	9/27/2018	0.20 U	0.020 UJ
SW-18	8/30/2016	0.2 U	**0.027**
	9/21/2016	0.2 U	**0.022**
	3/20/2017	0.2 U	0.020 U
	9/15/2017	0.20 U	0.020 U
	9/19/2018	0.20 U	0.020 UJ
	10/15/2018	0.20 U	0.020 U
SW-20 (c)	8/30/2016	0.2 U	0.020 U
	9/15/2017	0.20 U	0.020 U
	9/27/2018	0.20 U	0.020 UJ
SW-21	9/5/2014	0.2 U	0.02 U
SW-22 (c)	3/24/2014	0.2 U	0.02 U
SW-23	9/24/2015	0.2 U	0.020 U
SW-24	9/24/2015	0.2 U	0.020 U
SW-25 (c)	9/24/2015	0.2 U	0.020 U
SW-26 (c)	9/24/2015	0.2 U	0.020 U
SW-27	9/15/2017	0.20 U	0.020 U
	9/27/2018	0.20 U	0.020 UJ

Notes:

Bold text indicates detected analyte

Green shading indicates detected analyte exceeds the surface water pCUL.

(a) Volatile organic compounds were analyzed by SW-846 8260 and 8260 Selected Ion Monitoring.

(b) SW-17 is collected from the Auburn 400 north retention basin discharge to the wetland and is not necessarily representative of surface water conditions in the wetland.

(c) Human health surface water quality standards based on fish consumption that apply to Mill Creek do not apply to these wetlands.

U = The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.

UJ = The analyte was analyzed for, but was not detected. The reported quantitation limit is approximate and may be inaccurate or imprecise.

Abbreviations and Acronyms:

µg/L = micrograms per liter

pCUL = proposed cleanup level

Table 5-1
Summary of Retained Technologies
Boeing Auburn Feasibility Study
Auburn, Washington

Treatment Category	Treatment Technologies							
	Area of Concern A-01		Area of Concern A-09 (Metals and Cyanide near Building 17-07)		Area of Concern A-13 (Building 17-06 Hydrocarbon Release)		Area of Concern A-14 TCE and VC Contamination (Soil and Groundwater)	
	Retained	Screened Out	Retained	Screened Out	Retained	Screened Out	Retained	Screened Out
Containment (Physical/Hydraulic)	• Cap (contain in place)	• Vertical barrier (slurry walls, low-permeability barrier walls, or sheet pile walls)	• Cap (contain in place)	• Vertical barrier (slurry walls, low-permeability barrier walls, or sheet pile walls)	• Cap (contain in place)	• Vertical barrier (slurry walls, low-permeability barrier walls, or sheet pile walls)	None	• Slurry walls, low-permeability barrier walls, or sheet pile walls • Interceptor trench or extraction wells
Ex Situ Physical/Chemical Treatment	None	• Pump and treat (various *ex situ* treatment options)	None	• Pump and treat (various *ex situ* treatment options)	• Pump and treat (various *ex situ* treatment options)	None	None	• Pump and treat (various *ex situ* treatment options)
Enhanced Groundwater Flushing	N/A	N/A	N/A	N/A	N/A	N/A	• DGR	None
In Situ Biological Treatment	• Enhanced bioremediation (reductive) • Enhanced bioremediation (oxidative) • MNA	None	None	• Enhanced bioremediation	• MNA	• Enhanced bioremediation (reductive) • Enhanced bioremediation (oxidative)	• Enhanced bioremediation (reductive) • MNA	None
In Situ Chemical/Physical Treatment	• Air/ozone sparge • Chemical oxidation	• Thermal treatment	• Chemical treatment (e.g., zero valent iron) • MNA	• Chemical oxidation • Air/ozone sparging; biosparging	• Surfactant	• Air sparge • Chemical oxidation • Thermal treatment	• SVE (soil only) • Chemical treatment (reductive; e.g., zero valent iron)	• Air sparge • Chemical treatment (oxidative) • Thermal treatment
Physical Removal (Soil)	• Excavation	None	• Excavation	None	• Excavation	None	None	• Excavation
Product Recovery	N/A	N/A	N/A	N/A	• Passive (sorbent sock)	• Dual-phase extraction • Active (belt skimmer)	N/A	N/A
Institutional Controls	• Restrictive environmental covenant, fencing, signage	None	• Restrictive environmental covenant, fencing, signage	None	• Restrictive environmental covenant, fencing, signage	None	• Restrictive environmental covenant, fencing, signage	None

Abbreviations and Acronyms:

DGR = dynamic groundwater recirculation
MNA = monitored natural attenuation
N/A = not applicable
SVE = soil vapor extraction
TCE = trichloroethene
VC = vinyl chloride

Table 5-2
AOC A-09 Remedial Action Alternatives
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	**Alternative B1**	**Alternative B2**	**Alternative B3**
Alternative Name:	**Monitored Containment and MNA**	***In Situ* Groundwater Treatment**	**Future Excavation (and Monitored Containment)**
Alternative Description:	Containment of soil and groundwater including: • Containment of contaminated soil by maintaining the asphalt/concrete. Routine inspection and reporting of containment. • Routine groundwater sampling of existing monitoring wells and monitoring of geochemistry for MNA of metals. • Institutional controls consisting of an environmental covenant to limit activities that could result in exposure to soil and groundwater, and which outlines the required continued maintenance for the cap over soil concentrations exceeding CULs protective of groundwater.	*In situ* groundwater treatment including: • *In situ* groundwater treatment in areas with metals and cyanide contamination above pCULs (*conceptual design: sulfidated colloidal ZVI injection; two injection rows with wells on 12-foot centers targeting the shallow zone; one row 24 feet long [three injection wells] upgradient of contamination; and one row 60 feet long [six injection wells] located at wells exceeding groundwater pCULs, will consist of 4 injection events performed every 2 years*). • This alternative assumes that saturated soils will be treated by the groundwater remediation. In addition, soil concentrations protective of groundwater will be empirically demonstrated, and only direct contact CULs will be needed.	Future excavation of soil contamination: • Excavation of contaminated soils when Building 17-07 is demolished. • Routine groundwater sampling after soil is removed until groundwater concentrations are below pCULs. • Until excavation can occur, containment of contaminated soil and groundwater will continue by maintaining the asphalt/concrete, routine inspection and reporting of containment, and routine groundwater sampling of existing monitoring wells.
Point of Compliance - Soil:	Standard; Site-Wide (with institutional controls for residual soil contamination)	Standard; Site-Wide	Standard; Site-Wide
Point of Compliance - Groundwater:	Standard; Site-Wide	Standard; Site-Wide	Standard; Site-Wide

Abbreviations and Acronyms:
CUL = cleanup level (specifically referencing general MTCA cleanup levels rather than proposed cleanup levels developed as part of the feasibility study)
MNA = monitored natural attenuation
MTCA = Model Toxics Control Act
pCUL = proposed cleanup level
ZVI = zero valent iron

Table 5-3
AOC A-14 Remedial Action Alternatives
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	Alternative D1	Alternative D2	Alternative D3
Alternative Name:	**Site-Wide MNA**	**SVE and EISB at Release Areas and MNA**	**SVE and DGR at Release Areas and MNA**
Alternative Description:	Containment of soil and MNA for the entire plume: • Continue containment of contaminated soil site-wide with pavement and buildings acting as a cap. • Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continued monitoring with routine groundwater sampling. • Institutional controls consisting of an environmental covenant to limit activities that could result in exposure to soil, and which outlines the required continued maintenance for the cap to soil concentrations exceeding protection of groundwater.	Soil vapor extraction system, EISB injection at release areas, and MNA: • Soil and soil gas contamination is cleaned up by SVE in the vadose zone at the Former Building 17-03 release area (*conceptual design: 12 SVE wells installed to a depth of 10 feet operating for 5 years)* . • Soil and soil gas contamination is cleaned up by SVE in the vadose zone at the Building 17-07 release area (*conceptual design: 7 SVE wells installed to a depth of 10 feet operating for 5 years).* • *In situ* groundwater treatment using EISB in the Building 17-07 release area (*conceptual design: 2 injection rows [60-foot line with 5 well clusters and 75-foot line with 6 well clusters] targeting all groundwater zones [SZ, IZ, DZ], will consist of 3 injection events over a span of 10 years).* • *In situ* groundwater treatment using EISB in the former Building 17-03 release area (*conceptual design: 2 injection rows [75-foot lines with 6 wells each] targeting the SZ [20 to 40 feet bgs], will consist of 3 injection events over a span of 10 years).* • Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continued monitoring with routine groundwater sampling.	Soil vapor extraction system, DGR, and MNA: • Soil and soil gas contamination is cleaned up by SVE in the vadose zone at the Building 17-07 release area (*conceptual design: 7 soil vapor extraction wells installed to a depth of 10 feet operating for 5 years).* • Soil and soil gas contamination is cleaned up by SVE in the vadose zone at the Former Building 17-03 release area (*conceptual design: 12 soil vapor extraction wells installed to a depth of 10 feet operating for 5 years).* • DGR targeting the Building 17-07 release area (*conceptual design: installation of 6 extraction well clusters [SZ, IZ, DZ] and 5 injection well clusters [SZ and DZ] with 1 treatment system operating for 17 years).* • DGR around the Former Building 17-03 release area *(conceptual design: installation of 7 extraction well clusters [SZ, IZ, DZ] and 12 injection well clusters [SZ and DZ] with 1 treatment system operating for 29 years).* • Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continued monitoring with routine groundwater sampling.
Point of Compliance - Soil:	Standard; Site-Wide (with institutional controls for residual soil contamination)	Standard; Site-Wide	Standard; Site-Wide
Point of Compliance - Groundwater:	Standard; Site-Wide	Standard; Site-Wide	Standard; Site-Wide

Table 5-3
AOC A-14 Remedial Action Alternatives
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	Alternative D4A	Alternative D4B	Alternative D5
Alternative Name:	**EISB PRB at Facility Boundary and MNA**	**ZVI PRB at Facility Boundary and MNA**	**SVE and EISB at Release Areas, EISB Downgradient Focus Areas, and MNA**
Alternative Description:	Containment of soil and *in situ* groundwater treatment by creating a PRB at the Facility boundary, and MNA including: • Continue containment of contaminated soil site-wide with pavement and buildings acting as a cap. • *In situ* groundwater treatment along the Building 17-07 Facility boundary using an EISB PRB installed via injection *(conceptual design: 1,120-foot long injection row with 33 injection well clusters [35-foot centers] targeting all groundwater zones [SZ, IZ, DZ], will consist of 5 injection events performed every 2 years over a span of 10 years of active treatment followed by 10 years of sustained treatment due to endogenous decay and donor back diffusion).* • *In situ* groundwater treatment along the Prologis property boundary using an EISB PRB installed via injection *(conceptual design: 1,120-foot long injection row with 33 injection well clusters [35-foot centers] targeting all groundwater zones [SZ, IZ, DZ], will consist of 5 injection events performed every 2 years over a span of 10 years of active treatment followed by 10 years of sustained treatment due to endogenous decay and donor back diffusion).* • Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continued monitoring with routine groundwater sampling. • Institutional controls consisting of an environmental covenant to limit activities that could result in exposure to soil, and which outlines the required continued maintenance for the cap to soil concentrations exceeding protection of groundwater pCULs.	Containment of soil and *in situ* groundwater treatment by creating a PRB at the Facility boundary, and MNA including: • Continue containment of contaminated soil site-wide with pavement and buildings acting as a cap. • *In situ* groundwater treatment along the Building 17-07 Facility boundary using a sulfidated colloidal ZVI PRB installed via injection *(conceptual design: 1,116-foot long injection row with 94 injection well clusters [12-foot centers] targeting all groundwater zones [SZ, IZ, DZ], will consist of 5 injection events performed every 4 years for a span of 20 years of active treatment).* • *In situ* groundwater treatment along the Prologis property boundary using a sulfidated micro-scale ZVI PRB installed via injection *(conceptual design: 1,116-foot long injection row with 94 injection well clusters [12-foot centers] targeting all groundwater zones [SZ, IZ, DZ], will consist of 5 injection events performed every 4 years for a span of 20 years of active treatment).* • Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continued monitoring with routine groundwater sampling. • Institutional controls consisting of an environmental covenant to limit activities that could result in exposure to soil, and which outlines the required continued maintenance for the cap to soil concentrations exceeding protection of groundwater pCULs.	SVE system, enhanced *in situ* bioremediation injection at release areas, and MNA: All of the treatments in Alternative D2 plus: • *In situ* groundwater treatment using EISB at the Focus Area of the Building 17-07 property boundary *(conceptual design is same as PRB at Building 17-07 property boundary in Alternative D4A: 1,120-foot long injection row with 33 injection well clusters [35-foot centers] targeting all groundwater zones [SZ, IZ, DZ], will consist of 5 injection events performed every 2 years over a span of 10 years of active treatment followed by 10 years of sustained treatment due to endogenous decay and donor back diffusion).* • *In situ* groundwater treatment using EISB in the Algona Focus Area *(conceptual design: 980-foot long injection row adding on to the pilot test injection row [5 wells] for a total of 29 wells targeting the shallow groundwater zone 3, will consist of 3 injection events over a span of 10 years).* • *In situ* groundwater treatment using EISB in The Outlet Collection Focus Area *(conceptual design: 6 injection rows surrounding the building; one 385-foot long injection row on the west side of the building including 12 injection well clusters [35-foot centers] targeting all groundwater zones [SZ, IZ, DZ]; three 980-foot long injection rows located on the south side of the building including 29 injection well clusters for each row [35-foot centers] targeting all groundwater zones [SZ, IZ, DZ]; two 700-foot long rows on the north side of the building including 21 injection well clusters for each row [35-foot centers] targeting all groundwater zones [SZ, IZ, DZ]; will consist of 5 injection events performed every 2 years for 10 years of active treatment followed by 10 years of sustained treatment due to endogenous decay and donor back diffusion).* • Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continued monitoring with routine groundwater sampling.
Point of Compliance - Soil:	Standard; Site-Wide (with institutional controls for residual soil contamination)	Standard; Site-Wide (with institutional controls for residual soil contamination)	Standard; Site-Wide
Point of Compliance - Groundwater:	Standard; Site-Wide	Standard; Site-Wide	Standard; Site-Wide

Abbreviations and Acronyms:

AOC = area of concern
bgs = below ground surface
DGR = dynamic groundwater recirculation
DZ = deep zone
EISB = enhanced *in situ* bioremediation
IZ = intermediate zone
MNA = monitored natural attenuation
pCUL = proposed cleanup level
PRB = permeable reactive barrier
SVE = soil vapor extraction
SZ = shallow zone
ZVI = zero valent iron

Table 6-1
AOC A-09 Summary of Remedial Alternatives Compliance with MTCA Threshold Requirements
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	Alternative B1	Alternative B2	Alternative B3
Description:	Monitored Containment and MNA	*In Situ* Groundwater Treatment	Future Excavation (and Monitored Containment)
Compliance with MTCA Threshold Criteria (WAC 173-340-360[2][a])			
Protect human health and the environment.	**Yes** - Alternative will protect human health and the environment through containment of contaminated soil and groundwater.	**Yes** - Alternative will protect human health and the environment through treatment of contaminated groundwater that will allow for empirical demonstration of protection of groundwater and use of direct contact soil CULs.	**Yes** - Alternative will protect human health and the environment through excavation of contaminated soil, which will lead to remediation of contaminated groundwater.
Comply with cleanup standards (WAC 173-360-700 through 760).	**Yes** - Containment and ICs used for soil not complying with pCULs; groundwater complies with pCULs after cleanup remedy is completed.	**Yes** - Soil and groundwater complies with pCULs after cleanup remedy is completed.	**Yes** - Soil and groundwater complies with pCULs after cleanup remedy is completed.
Comply with applicable state/federal laws (WAC 173-360-710).	**Yes** - Alternative complies with applicable laws (see FS report Section 3.0).		
Provide for compliance monitoring (WAC 173-360-410).	**Yes** - Alternative includes provisions for compliance monitoring (soil cap monitoring for ICs, long-term routine groundwater monitoring).	**Yes** - Alternative includes provisions for compliance monitoring (H&S monitoring during construction/O&M, groundwater confirmation monitoring).	**Yes** - Alternative includes provisions for compliance monitoring (H&S monitoring during excavation, and soil and groundwater confirmation monitoring).
Compliance with other requirements (WAC 173-340-360[2][b])			
Permanent Solutions to the Maximum Extent Practicable (WAC 173-340-360[3])			
Permanent to the maximum extent practicable.	**Yes** - See Disproportionate Cost Analysis (Table 6-2 of this FS report).	**No** - See Disproportionate Cost Analysis (Table 6-2 of this FS report).	**No** - See Disproportionate Cost Analysis (Table 6-2 of this FS report).
Reasonable Restoration Time Frame (WAC 173-340-360[4][b])			
Provide for a reasonable restoration time frame.	**Yes** - Estimated restoration time frame for cadmium and copper in groundwater is approximately **8 years.** Additional data collection will be required to determine the cyanide in groundwater restoration time frame. For purposes of cost estimation, **30 years** is assumed. See factors below.	**Yes** - Estimated restoration time frame is approximately **10 years** for design, construction, implementation, and monitoring. See factors below.	**Yes** - Estimated restoration time frame is **2 years,** from after excavation occurs, to demonstrate that groundwater pCULs are met. Containment including long-term routine monitoring of groundwater to ensure compliance until future excavation occurs. See factors below.
Potential risk to human health and environment (1).	**Low** - Contaminated soil concentrations do not exceed direct contact CULs. Contaminated groundwater is not being used as drinking water. There are no current risks to human health and the environment from the contaminants present at the Site.		
Practicability of achieving shorter restoration time frame.	See Disproportionate Cost Analysis (Table 6-2 of this FS report).		
Current use of Site, surrounding area, and associated resources that are, or may be, affected by releases from the Site.	Onsite: Industrial Surrounding areas: Industrial, Commercial Resources: None		
Potential future use of Site, surrounding area, and resources that are, or may be, affected by releases from the Site.	Onsite: Industrial Surrounding areas: Industrial, Commercial Resources: Drinking water		

Table 6-1
AOC A-09 Summary of Remedial Alternatives Compliance with MTCA Threshold Requirements
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	Alternative B1	Alternative B2	Alternative B3
Description:	Monitored Containment and MNA	*In Situ* Groundwater Treatment	Future Excavation (and Monitored Containment)
Availability of alternative water supplies.	**Yes**. The Site is located within the Auburn/Algona/Pacific city limits, which are supplied by municipal water supplies.		
Likely effectiveness/reliability of institutional controls. (1)	**High.** Fenced and access-controlled industrial site.	**Not Applicable**. ICs not required for this remedial alternative.	**Not Applicable.** ICs not required for this remedial alternative.
Ability to monitor migration of hazardous substances. (1)	**High.** Appropriate groundwater monitoring network is present and will be supplemented, as necessary, to adequately monitor groundwater after implementation.		
Toxicity of hazardous substances at the site. (1)	Contaminant and media dependent: Soil (dermal contact): **low** Water (drinking water beneficial uses): **low to moderate**		
Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar conditions.	**Possible**; some metals have shown evidence of decreasing concentrations, while other have variable concentrations; cyanide data insufficient to identify trends.		
Consider Public Concerns (WAC 173-340-600[13])			
Consider public concerns.	**Yes** - Public notice and public comment period will be provided for review of the FS/CAP. No comments from public with concerns about cleanup alternatives that would occur at the Boeing Auburn Facility have been received to date.		

Notes:
(1) Ratings used: Low, Moderate, or High.

Abbreviations and Acronyms:
CAP = cleanup action plan
CULs = cleanup levels (specifically referencing general MTCA cleanup levels rather than proposed cleanup levels developed as part of the feasibility study)
ICs = institutional controls
FS = feasibility study
H&S = health and safety
MTCA = Model Toxics Control Act
O&M = operations and maintenance
pCUL = proposed cleanup level
WAC = Washington Administrative Code

Table 6-2
AOC A-09 Disproportionate Cost Analysis Relative Benefits Ranking Considerations
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:		Alternative B1		Alternative B2		Alternative B3
Alternative Name:		**Monitored Containment and MNA**		***In Situ* Groundwater Chemical Treatment**		**Future Excavation (and Monitored Containment)**
Relative Benefits Ranking for DCA						
Evaluation Criteria: WAC 173-340-360(3)(f)	**Weighting Factor**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**
Overall Protectiveness *(subsection [i])*	**30%**	**7**	**Excellent** • Soil concentrations do not exceed direct-contact CULs. • Cap to mitigate risk of groundwater infiltration through contaminated soil. • Continued routine groundwater monitoring to confirm that groundwater concentrations are not migrating.	**8**	**Excellent** • Soil concentrations do not exceed direct-contact CULs. • *In situ* groundwater chemical treatment provides long-term treatment of contaminated groundwater.	**9**	**Superior** • Soil concentrations do not exceed direct-contact CULs. • Removal of contaminated soil creates additional offsite risks for disposal. • Compliance groundwater monitoring to confirm that groundwater concentrations decrease after source is removed.
Permanence *(subsection [ii])*	**20%**	**6**	**Good** • Contaminated soil left in place. • Permanence of containment maintained through institutional controls. • Groundwater contamination is relatively immobile.	**8**	**Excellent** • Contaminated soil left in place, but contamination is below direct-contact CULs. • Implementation of groundwater treatment will remove impacts of contaminated groundwater. • Contamination not destroyed, but will be immobilized.	**8**	**Excellent** • Permanent removal of contaminated soil. • Groundwater cleanup anticipated to be permanent as result of remedial excavation (will be monitored to confirm after soil cleanup is completed).
Long-Term Effectiveness *(subsection [iv])*	**20%**	**7**	**Excellent** • Exposure and risk is mitigated by cap and by low concentrations of contaminated soil and groundwater. • Long-term effectiveness relies on existing cap, monitoring, and institutional controls, which will be very reliable at this fenced, access-controlled site.	**5**	**Good** • Long-term effectiveness for soil contamination relies on empirical demonstration that soil concentrations are protective of groundwater. Residual soil concentrations are below direct-contact CULs. • Treatment of groundwater is intended to immobilize contamination; however, success and irreversibility of treatment is uncertain.	**9**	**Superior** • Removal of soil permanently removes risk of leaching to groundwater. • Containment will be in place until excavation can occur. • Moderate quantities of contaminated soil moved to engineered landfill.
Manageability of Short-Term Risk *(subsection [v])*	**10%**	**10**	**Superior** • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**7**	**Excellent** • Minimal worker health risk from contact with contaminated media during drilling and installation of *in situ* groundwater treatment systems; will be completed by HAZWOPER-certified drillers and contractors. • Moderate risks with construction and implementation occurring at an active facility and at a high-hazard location at the building. • Long-term O&M of injection wells and treatment system present minor risks. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**8**	**Excellent** • Moderate risk of contact with contaminated soil and groundwater during excavation, transportation, and disposal; will be completed by HAZWOPER-certified drillers and contractors. Work is assumed to be completed after the building is demolished. • Disturbance of contaminated soil could increase short-term impacts to groundwater. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling during containment remedy and after implementation of cleanup activities.

Table 6-2
AOC A-09 Disproportionate Cost Analysis Relative Benefits Ranking Considerations
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:			Alternative B1		Alternative B2		Alternative B3
Alternative Name:			**Monitored Containment and MNA**		***In Situ* Groundwater Chemical Treatment**		**Future Excavation (and Monitored Containment)**
Relative Benefits Ranking for DCA							
Implementability *(subsection [vi])*	**10%**	**10**	**Superior** • Technical implementation uncomplicated; continued routine groundwater monitoring to confirm containment. • Administration implementation includes filing institutional controls.	**4**	**Fair** • Technical implementation challenges: - complicated at active buildings. - proper treatment of cyanide and metals in groundwater provides moderate technical challenges. - Will need a series of bench-tests to evaluate most appropriate injection solution for treatment of metals and cyanide, if needed. - Long- term O&M of injection wells and treatment system may present challenges. • Administration implementation includes permitting for injection (UIC permit) and filing institutional controls.	**8**	**Excellent** • Technical implementation provides moderate challenges; excavation will have to wait until building is demolished; removal of contaminated soil; continued routine groundwater monitoring after source removed until groundwater concentrations are below pCULs. • Administration implementation challenges include permitting for excavation. Containment will have to be maintained until future excavation can occur.
Consideration of Public Concerns *(subsection [vii])*	**10%**	**8**	**Excellent (assumed equal for all alternatives)** • Protective of human health and the environment. • Provides at least the minimum level of protection under MTCA. • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**8**	**Excellent (assumed equal for all alternatives)** • Protective of human health and the environment. • Provides at least the minimum level of protection under the MTCA. • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**8**	**Excellent (assumed equal for all alternatives)** • Protective of human health and the environment. • Provides at least the minimum level of protection under MTCA. • Public comments/concerns will be addressed during FS/CAP public comment period(s).
Estimated Present Value Cost ($) *(subsection [iii])*		**$187,000**		**$857,000**		**$718,000**	
Overall Weighted Benefit Score		**7.5**	**Excellent**	**6.9**	**Good/Excellent**	**8.5**	**Excellent/Superior**
Comparative Overall Benefit/Cost (2)		**7.5**		**1.5**		**2.2**	

Notes:

(1) Ratings used: Poor (1-2), Fair (3-4), Good (5-6), Excellent (7-8), and Superior (9-10).

(2) Benefit/Cost Ratio calculated by dividing the overall weighted benefit score by the estimated remedy cost and scaled (multiplied) by lowest cost alternative cost in order to compare ranges similar in scale to comparative overall benefit, as presented on Figure 6-1 of this FS report.

Abbreviations and Acronyms:

% = percent
AOC = area of concern
CAP = cleanup action plan
CULs = cleanup levels (specifically referencing general MTCA cleanup levels rather than proposed cleanup levels developed as part of the feasibility study)
DCA = disproportionate cost analysis
FS = feasibility study
HAZWOPER = Hazardous Waste Operations and Emergency Response
MNA = monitored natural attenuation
MTCA = Model Toxics Control Act
O&M = operations and maintenance
pCUL = proposed cleanup level
UIC = Underground Injection Control
WAC = Washington Administrative Code

Table 6-3
AOC A-09 Summary of MTCA Alternatives Relative Benefits Ranking
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number and Name:	Alternative B1 Monitored Containment and Monitored Natural Attenuation				Alternative B2 *In Situ* Groundwater Treatment				Alternative B3 Future Excavation (and Monitored Containment)			
Relative Benefits Ranking for Disproportionate Cost Analysis (Washington Administrative Code [WAC] 173-340-360[2][b][i] and WAC 173-340-36093[f])												
Comparative Overall Benefit **(1)**		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score
Overall Protectiveness	Excellent	7	0.3	2.1	Excellent	8	0.3	2.4	Superior	9	0.3	2.7
Permanence	Good	6	0.2	1.2	Excellent	8	0.2	1.6	Excellent	8	0.2	1.6
Long-Term Effectiveness	Excellent	7	0.2	1.4	Good	5	0.2	1	Superior	9	0.2	1.8
Manageability of Short-Term Risk	Superior	10	0.1	1	Excellent	7	0.1	0.7	Excellent	8	0.1	0.8
Implementability	Superior	10	0.1	1	Fair	4	0.1	0.4	Excellent	8	0.1	0.8
Consideration of Public Concerns	Excellent	8	0.1	0.8	Excellent	8	0.1	0.8	Excellent	8	0.1	0.8
Overall Weighted Benefit Score				**7.5**				**6.9**				**8.5**

Disproportionate Cost Analysis - Quantitative Evaluation

Overall Weighted Benefit Score	7.5	6.9	8.5
Estimated Remedy Present Value Cost	$187,000	$857,000	$718,000
Estimated Remedy Total Cost (Undiscounted)	$226,000	$913,000	$766,000
Relative Benefit/Cost Ratio (2)	7.5	1.5	2.2
Most Permanent Solution	No	No	**Yes**
Lowest Cost Alternative	**Yes**	No	No
Costs Disproportionate to Incremental Benefits	No	**Yes**	**Yes**
Remedy Permanent to the Maximum Extent Practicable?	**Yes**	No	No
Preferred Alternative	**Yes**	**No**	**No**

Cost of Lowest Present Value Cost Alternative	**$187,000**
Benefit Score of Highest Ranked Alternative	**8.5**
Cost of Highest Present Value Cost Alternative	**$857,000**

Notes:

(1) Ratings used: Poor (1-2), Fair (3-4), Good (5-6), Excellent (7-8), and Superior (9-10).

(2) Benefit/Cost Ratio calculated by dividing the overall weighted benefit score by the estimated remedy cost and scaled (multiplied) by lowest cost alternative cost in order to compare ranges similar in scale to comparative overall benefit, as presented on Figure 6-1 of this FS report.

Table 6-4
AOC A-09 Cost Estimate Summary
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative	Total Cost (undiscounted)	Present Value Total Cost (1)
Alternative B1: Monitored Containment and MNA	$ 226,000	$ 187,000
Alternative B2: *In situ* Chemical Treatment	$ 913,000	$ 857,000
Alternative B3: Future Excavation (and Monitored Containment)	$ 766,000	$ 718,000

Notes:

(1) Present Value Project Costs for long term operations, maintenance, and monitoring (Assume 1.5% discount rate - real discount, 30-year note, Per Office of Management and Budget, Circular A-94 Appendix C, Revised Nov. 2018).

Detailed cost estimates are provided in Appendix G.

Table 6-5
AOC A-14 Summary of Remedial Alternatives Compliance with MTCA Threshold Requirements
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	Alternative D1	Alternative D2	Alternative D3	Alternative D4 (A/B)	Alternative D5
Description:	Site-Wide MNA	SVE and EISB at Release Areas and MNA	SVE and DGR at Release Areas and MNA	PRB at Facility Boundary and MNA	SVE and EISB at Release Areas, EISB at Downgradient Focus Areas, and MNA
Compliance with MTCA Threshold Criteria (WAC 173-340-360[2][a])					
- **Protect human health and the environment.**	**Yes** - Alternative will protect human health and the environment through containment of contaminated soil and MNA of groundwater.	**Yes** - Alternative will protect human health and the environment through treatment of contaminated soil, treatment of groundwater in former release areas, and MNA of groundwater.	**Yes** - Alternative will protect human health and the environment through treatment of contaminated soil, treatment of groundwater in former release areas, and MNA of groundwater.	**Yes** - Alternative will protect human health and the environment through containment of contaminated soil, treatment of groundwater emanating from the Facility, and MNA of groundwater.	**Yes** - Alternative will protect human health and the environment through treatment of contaminated soil, treatment of groundwater in former release areas and focus areas at the Facility boundary and downgradient, and MNA of groundwater.
- **Comply with cleanup standards (WAC 173-360-700 through 760).**	**Yes** - Containment and ICs used for soil not complying with pCULs; groundwater complies with pCULs after cleanup remedy is completed.	**Yes** - Soil and groundwater complies with pCULs after cleanup remedy is completed.	**Yes** - Soil and groundwater complies with pCULs after cleanup remedy is completed.	**Yes** - Containment and ICs used for soil not complying with pCULs; groundwater complies with pCULs after cleanup remedy is completed.	**Yes** - Soil and groundwater complies with pCULs after cleanup remedy is completed.
- **Comply w/applicable state/federal laws (WAC 173-360-710).**	**Yes** - Alternative complies with applicable laws (see Section 3.0 of this FS report).				
- **Provide for compliance monitoring (WAC 173-360-410).**	**Yes** - Alternative includes provisions for compliance monitoring (soil cap monitoring for ICs and long-term routine groundwater monitoring during MNA and confirmation sampling).	**Yes** - Alternative includes provisions for compliance monitoring (H&S monitoring during construction/O&M, long-term routine groundwater monitoring during MNA and confirmation sampling).	**Yes** - Alternative includes provisions for compliance monitoring (H&S monitoring during construction/O&M, long-term routine groundwater monitoring during MNA and confirmation sampling).	**Yes** - Alternative includes provisions for compliance monitoring (H&S monitoring during construction/O&M, soil cap monitoring for ICs, long-term routine groundwater monitoring during MNA and confirmation sampling).	**Yes** - Alternative includes provisions for compliance monitoring (H&S monitoring during construction/O&M, long-term routine groundwater monitoring during MNA and confirmation sampling).
Compliance with Other Requirements (WAC 173-340-360[2][b])					
Permanent Solutions to the Maximum Extent Practicable (WAC 173-340-360[3])					
- **Permanent to the Maximum Extent Practicable.**	**Yes** - See Disproportionate Cost Analysis (Table 6-6 of this FS report).	**No** - See Disproportionate Cost Analysis (Table 6-6 of this FS report).	**No** - See Disproportionate Cost Analysis (Table 6-6 of this FS report).	**No** - See Disproportionate Cost Analysis (Table 6-6 of this FS report).	**No** - See Disproportionate Cost Analysis (Table 6-6 of this FS report).
Reasonable Restoration Time Frame (WAC 173-340-360[4][b])					
- **Provide for a reasonable restoration time frame.**	**No** - Long-restoration time frame due to the aquifer heterogeneity and life stage of the CVOC plumes. Approximately **95 years** to meet groundwater pCULs. Approximately **233 years** to meet SWQS in groundwater.	**No** - Long-restoration time frame due to the aquifer heterogeneity and life stage of the CVOC plumes. Approximately **94 years** to meet groundwater pCULs. Approximately **230 years** to meet SWQS in groundwater.	**No** - Long-restoration time frame due to the aquifer heterogeneity and life stage of the CVOC plumes. Approximately **85 years** to meet groundwater pCULs. Approximately **208 years** to meet SWQS in groundwater.	**No** - Long-restoration time frame due to the aquifer heterogeneity and life stage of the CVOC plumes. Approximately **86 years** to meet groundwater pCULs. Approximately **212 years** to meet SWQS in groundwater.	**No** - Long-restoration time frame due to the aquifer heterogeneity and life stage of the CVOC plumes. Approximately **86 years** to meet groundwater pCULs. Approximately **210 years** to meet SWQS in groundwater.
- **Potential risk to human health and environment (1).**	**Low**. Contaminated soil concentrations do not exceed direct-contact CULs. Contaminated stormwater and groundwater is not being used as drinking water. There are no current risks to human health and the environment from the contaminants present at the Site.	**Low.** Contaminated soil concentrations do not exceed direct-contact CULs. Contaminated stormwater and groundwater is not being used as drinking water. There are no current risks to human health and the environment from the contaminants present at the Site.	**Moderate**. Contaminated soil concentrations do not exceed direct-contact CULs. Contaminated stormwater and groundwater is not being used as drinking water. There are no current risks to human health and the environment from the contaminants present at the Site. Implementation of DGR system could cause contaminants to move in different directions that could cause impacts to groundwater where there is no current contamination.	**Low**. Contaminated soil concentrations do not exceed direct-contact CULs. Contaminated stormwater and groundwater is not being used as drinking water. There are no current risks to human health and the environment from the contaminants present at the Site.	**Moderate.** Contaminated soil concentrations do not exceed direct-contact CULs. Contaminated stormwater and groundwater is not being used as drinking water. There are no current risks to human health and the environment from the contaminants present at the Site. Implementation of groundwater cleanup activities closer to stormwater/surface water features and the large amount of injected donor needed to treat the downgradient focus areas could create reduced groundwater conditions that increase solubility of natural metals (e.g., arsenic, iron, and manganese) causing water quality concerns.
- **Practicability of achieving shorter restoration time frame.**	No practicable alternatives allow for significant reduction in restoration time frame because of heterogeneity of aquifer/saturated soil matrix and life stage of the CVOC plumes.				

Table 6-5
AOC A-14 Summary of Remedial Alternatives Compliance with MTCA Threshold Requirements
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:	Alternative D1	Alternative D2	Alternative D3	Alternative D4 (A/B)	Alternative D5
Description:	Site-Wide MNA	SVE and EISB at Release Areas and MNA	SVE and DGR at Release Areas and MNA	PRB at Facility Boundary and MNA	SVE and EISB at Release Areas, EISB at Downgradient Focus Areas, and MNA
- Current use of Site, surrounding area, and associated resources that are, or may be affected by releases from the Site.	Onsite: Industrial Surrounding areas: Industrial, Commercial, Residential Resources: Stormwater (2)				
- Potential future use of Site, surrounding area, and resources that are, or may be, affected by releases from the Site.	Onsite: Industrial Surrounding areas: Industrial, Commercial, Residential Resources: Groundwater as drinking water and surface water as drinking water				
- Availability of alternative water supplies.	**Yes**. The Site is located within the Auburn/Algona/Pacific city limits, which are supplied by municipal water supplies.				
- Likely effectiveness/reliability of institutional controls. (1)	**High**. Site is fenced and access-controlled industrial site.	**Not Applicable**. ICs not required for this remedial alternative.	**Not Applicable**. ICs not required for this remedial alternative.	**High**. Site is fenced and access controlled industrial Site.	**Not Applicable**. ICs not required for this remedial alternative.
- Ability to monitor migration of hazardous substances. (1)	**High**. Appropriate groundwater monitoring network is present and will be supplemented, as necessary, to adequately monitor groundwater after implementation.	**High**. Appropriate groundwater monitoring network is present and will be supplemented, as necessary, to adequately monitor groundwater after implementation.	**Moderate**. Appropriate groundwater monitoring network is present and will be supplemented, as necessary, to adequately monitor groundwater after implementation. However, mounding created by DGR alternative can cause concentrations to migrate to unexpected areas that might not be monitored.	**High**. Appropriate groundwater monitoring network is present and will be supplemented, as necessary, to adequately monitor groundwater after implementation.	**Moderate**. Appropriate groundwater monitoring network is present and will be supplemented, as necessary, to adequately monitor groundwater after implementation. However, remediation activities closer to stormwater/surface water features could cause increases of naturally occurring metals to migrate to stormwater/surface water bodies and be difficult to monitor.
- Toxicity of hazardous substances at the site. (1)	Contaminant and media dependent - Soil (dermal contact): L**ow** Water (drinking water/surface water beneficial uses): L**ow to moderate**				
- Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the Site or under similar conditions.	**High**; natural attenuation has been proven to be an active natural process that reduces concentrations of TCE and reductive dechlorination breakdown products at the Site.				
Consider Public Concerns (WAC 173-340-600[13])					
- Consider public concerns.	**Yes** - Public notice and public comment period will be provided for review of the FS/CAP. No comments from public with concerns about Site cleanup alternatives have been received. However, assumptions about public concerns are taken into account in the Disproportionate Cost Analysis (See Table 6-5)				

Notes:
(1) Ratings used: Low, Moderate, or High.
(2) Stormwater is not required to meet pCULs until the final discharge point of the stormwater into surface water bodies.

Abbreviations and Acronyms:
CAP = cleanup action plan
CULs = cleanup levels (specifically referencing general MTCA cleanup levels rather than proposed cleanup levels developed as part of the feasibility study)
CVOC = chlorinated volatile organic compound
DGR = dynamic groundwater recirculation
EISB = enhanced *in situ* bioremediation
ICs = institutional controls
FS = feasibility study
H&S = health and safety
MNA = monitored natural attenuation
MTCA = Model Toxics Control Act
O&M = operations and maintenance
pCUL = proposed cleanup level
PRB = permeable reactive barrier
SVE = soil vapor extraction
SWQS = surface water quality standards
TCE = trichloroethene
WAC = Washington Administrative Code

Table 6-6
AOC A-14 Disproportionate Cost Analysis Relative Benefits Ranking Considerations
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:		Alternative D1		Alternative D2		Alternative D3		Alternative D4A		Alternative D4B		Alternative D5
Alternative Name:		**Site-wide MNA**		**SVE and EISB at Release Areas and MNA**		**SVE at DGR at Release Areas and MNA**		**EISB PRB at Facility Boundary and MNA**		**ZVI PRB at Facility Boundary and MNA**		**SVE and EISB at Release Areas, EISB Downgradient Focus Areas, and MNA**
Relative Benefits Ranking for DCA												
Evaluation Criteria: WAC 173-340-360(3)(f)	**Weighting Factor**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**	**Benefit Score**	**Ranking Considerations (1)**
- Overall Protectiveness *(subsection [i])*	**30%**	**5**	**Good** • ICs and containment to limit infiltration of water and direct human contact with contaminated soil. • Current risks to human health and the environment are negligible, therefore, protectiveness is not appreciably greater through remedy implementation . • Time required to meet SWQS in groundwater is extensive.	**5**	**Good** • Implementation of SVE will remove impacts of contaminated soil and soil gas contributions to groundwater. • Current risks to human health and the environment are negligible, therefore, protectiveness is not appreciably greater through remedy implementation • Time required to meet SWQS in groundwater is extensive.	**5**	**Good** • Implementation of SVE will remove impacts of contaminated soil and soil gas contributions to groundwater. • Current risks to human health and the environment are negligible, therefore, so protectiveness is not appreciably greater through remedy implementation • Time required to meet SWQS in groundwater is extensive.	**5**	**Good** • ICs and containment to limit infiltration of water to contact contaminated soil. • Current risks to human health and the environment are negligible, therefore, protectiveness is not appreciably greater through remedy implementation • Time required to meet SWQS in groundwater is extensive.	**5**	**Good** • ICs and containment to limit infiltration of water to contact contaminated soil. • Current risks to human health and the environment are negligible, therefore, protectiveness is not appreciably greater through remedy implementation • Time required to meet SWQS in groundwater is extensive.	**5**	**Good** • Implementation of SVE will remove impacts of contaminated soil and soil gas contributions to groundwater. • Current risks to human health and the environment are negligible, therefore, protectiveness is not appreciably greater through remedy implementation • Time required to meet SWQS in groundwater is extensive.
- Permanence *(subsection [ii])*	**20%**	**8**	**Excellent** • Contaminated soil left in place at the Facility; however, no concentrations above direct-contact CULs. • MNA will result in site-wide contaminant mass destruction; routine groundwater monitoring conducted until pCULs are met. • Treatment is actively taking place via natural processes and the effectiveness of those natural processes will be monitored during implementation of the cleanup.	**9**	**Superior** • Implementation of SVE will remove impacts of contaminated soil and soil gas contributions to groundwater. • Implementation of EISB at release areas will remove impacts of contaminated groundwater in those areas; however, other areas still affect Site restoration time frames. • Contaminant mass is more rapidly decreased in limited areas with treatment, but does not result in significantly decreased restoration time frames. • MNA will result in site-wide contaminant mass destruction; routine groundwater monitoring conducted until pCULs are met.	**6**	**Good** • Implementation of SVE will remove impacts of contaminated soil and soil gas contributions to groundwater. • Implementation of DGR at release areas will remove impacts of contaminated groundwater in those areas; however, other areas still affect Site restoration time frames. • Contaminant mass is more rapidly decreased in limited areas with treatment, but does not result in significantly decreased restoration time frames. • Spent carbon created from *ex situ* treatment of DGR system will need to be treated or disposed offsite as solid or hazardous waste. • MNA will result in site-wide contaminant mass destruction; routine groundwater monitoring conducted until pCULs are met.	**8**	**Excellent** • Implementation of EISB at Facility boundary will remove impacts of contaminated groundwater in those areas; however, other areas still affect Site restoration time frames. • Contaminant mass is more rapidly decreased in limited areas with treatment, but does not result in significantly decreased restoration time frames. • MNA will result in site-wide contaminant mass destruction; routine groundwater monitoring conducted until pCULs are met.	**8**	**Excellent** • Implementation of ZVI at Facility boundary will remove impacts of contaminated groundwater in those areas; however, other areas still affect Site restoration time frames. • Contaminant mass is more rapidly decreased in limited areas with treatment, but does not result in significantly decreased restoration time frames. • MNA will result in site-wide contaminant mass destruction; routine groundwater monitoring conducted until pCULs are met.	**9**	**Superior** • Implementation of SVE will remove impacts of contaminated soil and soil gas contributions to groundwater. • Implementation of EISB at release areas and downgradient focus areas will remove impacts of contaminated groundwater in those areas; however, other areas still affect Site restoration time frames. • Contaminant mass is more rapidly decreased in limited areas with treatment, but does not result in significantly decreased restoration time frames. • MNA will result in site-wide contaminant mass destruction; routine groundwater monitoring conducted until pCULs are met.
- Long-Term Effectiveness *(subsection [iv])*	**20%**	**3**	**Fair** • ICs and cap will be effective in minimizing leaching to groundwater from and direct human contact with contaminated soil. • Long-term groundwater treatment effectiveness relies on natural degradation and attenuation processes for in site destruction and detoxification of contaminants to reach pCULs in groundwater and surface water. • Technical ability for any treatment to meet SWQS in groundwater very uncertain; however, MNA may achieve after extensive time frame.	**3**	**Fair** • SVE may be effective in reducing soil and soil gas contamination. • Long-term groundwater treatment effectiveness relies on natural degradation and attenuation processes for in site destruction and detoxification of contaminants to reach pCULs in groundwater and surface water. • Technical ability of EISB to meet SWQS in groundwater at release areas very uncertain and not possible for site-wide groundwater; however, MNA may achieve after extensive time frame.	**3**	**Fair** • SVE may be effective in reducing soil and soil gas contamination. • Long-term groundwater treatment effectiveness relies on natural degradation and attenuation processes for in site destruction and detoxification of contaminants to reach pCULs in groundwater and surface water. • Technical ability of DGR to meet SWQS in groundwater at release areas very uncertain and not possible for site-wide groundwater; however, MNA may achieve after extensive time frame.	**3**	**Fair** • ICs and cap will be effective in minimizing leaching to groundwater from and direct human contact with contaminated soil. • Long-term groundwater treatment effectiveness relies on natural degradation and attenuation processes for in site destruction and detoxification of contaminants to reach pCULs in groundwater and surface water. • Technical ability of EISB PRB to meet SWQS in groundwater at property boundary very uncertain and not possible for site-wide groundwater; however, MNA may achieve after extensive time frame.	**3**	**Fair** • ICs and cap will be effective in minimizing leaching to groundwater from and direct human contact with contaminated soil. • Long-term groundwater treatment effectiveness relies on natural degradation and attenuation processes for in site destruction and detoxification of contaminants to reach pCULs in groundwater and surface water. • Technical ability of ZVI PRB to meet SWQS in groundwater at property boundary very uncertain and not possible for site-wide groundwater; however, MNA may achieve after extensive time frame.	**3**	**Fair** • SVE may be effective in reducing soil and soil gas contamination. • Long-term groundwater treatment effectiveness relies on natural degradation and attenuation processes for in site destruction and detoxification of contaminants to reach pCULs in groundwater and surface water. • Technical ability of EISB to meet SWQS in groundwater at release areas and downgradient focus areas very uncertain and not possible for site-wide groundwater; however, MNA may achieve after extensive time frame.

Table 6-6
AOC A-14 Disproportionate Cost Analysis Relative Benefits Ranking Considerations
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:			Alternative D1		Alternative D2		Alternative D3		Alternative D4A		Alternative D4B		Alternative D5
Alternative Name:			Site-wide MNA		SVE and EISB at Release Areas and MNA		SVE at DGR at Release Areas and MNA		EISB PRB at Facility Boundary and MNA		ZVI PRB at Facility Boundary and MNA		SVE and EISB at Release Areas, EISB Downgradient Focus Areas, and MNA
Relative Benefits Ranking for DCA													
- Manageability of Short-Term Risk *(subsection [v])*	**10%**	**10**	**Superior** • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**5**	**Good** • Minor worker health and safety risk for drilling equipment operation and from contact with contaminated media during drilling and installation of SVE and EISB systems; will be completed by HAZWOPER-certified drillers and contractors. • Long-term O&M of SVE system and operation during bio-injection events present minor risks. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**2**	**Poor** • Minor worker health and safety risk for drilling equipment operation and from contact with contaminated media during drilling and installation of SVE and EISB systems; will be completed by HAZWOPER-certified drillers and contractors. • Long-term O&M of extraction/injection wells and treatment system present minor risks. • Moderate short-term risks of moving contaminants to new areas during the injection/extraction process • Moderate risk of causing settlement during implementation. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**4**	**Fair** • Minor worker health and safety risk for drilling equipment operation and from contact with contaminated media during drilling and installation of EISB treatment barriers; will be completed by HAZWOPER-certified drillers and contractors. • Long-term O&M of injection wells and operations during EISB PRB injection events present minor risks. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**4**	**Fair** • Minor worker health and safety risk for drilling equipment operation and from contact with contaminated media during drilling and installation of ZVI treatment barriers; will be completed by HAZWOPER-certified drillers and contractors. • Long-term O&M of injection wells and operations during ZVI PRB injection events present minor risks. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling.	**2**	**Poor** • Minor worker health and safety risk for drilling equipment operation and from contact with contaminated media during drilling and installation of SVE and extensive EISB injection systems; will be completed by HAZWOPER-certified drillers and contractors. • Long-term O&M of SVE system present minor risks • Operation of pumps and equipment for long periods of time during extensive bio-injection events present additional risks to workers. • Minimal worker health risk from contact with contaminated media during ongoing groundwater sampling. • Moderate short-term risks from implementation of groundwater remediation closer to stormwater/surface water features that could create reduced water conditions and cause higher concentrations of naturally occurring metals (iron, manganese, and arsenic) and migrate to stormwater/surface water features.
- Implementability *(subsection [vi])*	**10%**	**10**	**Superior** • Technical implementation uncomplicated; continued routine groundwater monitoring until pCULs are met. • Administration implementation includes filing ICs.	**6**	**Good** • Technical implementation challenges: - complicated at active buildings and other actively used properties. - proper treatment of groundwater provides limited technical challenges (achieving adequate distribution and contact of injectate, difficulties to inject in low-permeability zones, and challenges with injection solution mounding and entering subsurface utilities). - Long-term O&M of injection wells and treatment system may present challenges such as rehabilitation of injection/extraction wells and additional equipment required. • Administration implementation challenges include permitting for discharge of treated air and permitting for injection (UIC permit).	**1**	**Poor** • Technical implementation challenges: - Complicated at active buildings and other actively used properties. - Needed locations for extraction and injection wells may not be accessible due to location of buildings, infrastructure, off-property access restrictions. - Proper hydraulic modification of groundwater provides technical challenges. Significant precautions and care would need to be taken to ensure that no settlement to surrounding buildings or structures would occur. - Long-term O&M and fouling rehabilitation of extraction/injection wells and treatment system may present challenges. • Administration implementation challenges include permitting for discharge of treated air and permitting for injection (UIC permit).	**5**	**Good** • Technical implementation challenges: - Complicated to install PRB at Facility boundary along active roadways. - Proper treatment of groundwater provides limited technical challenges (achieving adequate distribution and contact of injectate, difficulties to inject in low-permeability zones, and challenges with injection solution mounding and entering subsurface utilities). - Uncertainty with barrier uniformity and longevity. • Administration implementation includes filing ICs and permitting for injection to install PRB (UIC permit).	**5**	**Good** • Technical implementation challenges: - Complicated to install PRB at Facility boundary along active roadways. - Proper treatment of groundwater provides limited technical challenges (achieving adequate distribution and contact of injectate, difficulties to inject in low-permeability zones, and challenges with injection solution mounding and entering subsurface utilities). - Uncertainty with barrier uniformity and longevity. • Administration implementation includes filing ICs and permitting for injection to install PRB (UIC permit).	**1**	**Poor** • Technical implementation challenges: - Complicated at active buildings and other actively used properties. - Drilling and injection activities in publicly used parking areas and active areas around The Outlet Collection extremely difficult. - Needed locations for injection wells may not be accessible due to location of buildings, infrastructure, off-property access restrictions. - Proper treatment of groundwater provides limited technical challenges (achieving adequate distribution and contact of injectate, difficulties to inject in low-permeability zones, and challenges with injection solution mounding and entering subsurface utilities). - Long- term O&M of injection wells and treatment system may present challenges. - Planned injection locations are closer to stormwater/surface water features and could cause water quality concerns due to increased solubility of natural metals (e.g., arsenic, iron, and manganese). - No access under the building; therefore, treatment will not extend the entire extent of the building (approximately 70% of area will remain untreated). • Administration implementation challenges include permitting for injection (UIC permit), and off-property site access/access agreements.
- Consideration of Public Concerns *(subsection [vii])*	**10%**	**4**	**Fair** • Protective of human health and the environment. • Public may not understand that MNA is an active and protective treatment remedy. • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**6**	**Good** • Protective of human health and the environment. • Public may appreciate that release area treatment is occurring, but not understand that MNA is an active and protective treatment remedy. • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**4**	**Fair** • Protective of human health and the environment. • Public may appreciate that release area treatment is occurring, but not understand that MNA is an active and protective treatment remedy. • Public may be concerned about the possibility of settlement during implementation and movement of contaminants to new locations with groundwater movement in different directions. • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**7**	**Excellent** • Protective of human health and the environment. • Public may appreciate that Facility treatment and treatment along Facility boundary is occurring, but not understand that MNA is an active and protective treatment remedy. • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**7**	**Excellent** • Protective of human health and the environment. • Public may appreciate that Facility treatment and treatment along Facility boundary is occurring, but not understand that MNA is an active and protective treatment remedy • Public comments/concerns will be addressed during FS/CAP public comment period(s).	**7**	Excellent • Protective of human health and the environment. • Public may appreciate that release area and downgradient focus area treatment is occurring, but not understand that MNA is an active and protective treatment remedy. • Additional public concerns may be created by extensive activity in public and commercial areas and near residential areas for downgradient focus area treatments. • Public perception of risk at focus areas (Algona and The Outlet Collection) could cause false perception of environmental risk and create lost revenue for commercial businesses (within The Outlet Collection) impacted by treatment of focus areas. • Public comments/concerns will be addressed during FS/CAP public comment period(s).

Table 6-6
AOC A-14 Disproportionate Cost Analysis Relative Benefits Ranking Considerations
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number:		Alternative D1	Alternative D2	Alternative D3	Alternative D4A	Alternative D4B	Alternative D5
Alternative Name:		Site-wide MNA	SVE and EISB at Release Areas and MNA	SVE at DGR at Release Areas and MNA	EISB PRB at Facility Boundary and MNA	ZVI PRB at Facility Boundary and MNA	SVE and EISB at Release Areas, EISB Downgradient Focus Areas, and MNA
Relative Benefits Ranking for DCA							
Estimated Present Value Cost ($) *(subsection [iii])*	pCULs	$3,900,000	$8,410,000	$25,800,000	$17,100,000	$38,200,000	$44,800,000
	SWQS in GW	$7,700,000	$12,100,000	$39,000,000	$20,800,000	$41,800,000	$48,500,000
Overall Weighted Benefit Score		6.1 Good/Excellent	5.6 Good	4 Fair	5.3 Good	5.3 Good	4.9 Good
Comparative Overall Benefit/Cost GW pCULs (2)		6.1	2.6	0.6	1.2	0.5	0.4
Comparative Overall Benefit/Cost SWQS in GW (2)		6.1	3.6	0.8	2.0	1.0	0.8

Notes:

(1) Ratings used: Poor (1-2), Fair (3-4), Good (5-6), Excellent (7-8), and Superior (9-10).

(2) Benefit/Cost Ratio calculated by dividing the overall weighted benefit score by the estimated remedy cost and scaled (multiplied) by lowest cost alternative cost in order to compare ranges similar in scale to comparative overall benefit, as presented on Figure 6-1 of this FS report.

Abbreviations and Acronyms:

CAP = cleanup action plan
CULs = Cleanup Levels (specifically referencing general MTCA cleanup levels rather than proposed cleanup levels developed as part of the feasibility study)
DGR = dynamic groundwater recirculation
EISB = enhanced *in situ* bioremediation
GW = groundwater
ICs = institutional controls
FS = feasibility study
HAZWOPER = hazardous waste operations and emergency
MNA = monitored natural attenuation
O&M = operations and maintenance
pCUL = proposed cleanup level
PRB = permeable reactive barrier
SVE = soil vapor extraction
SWQS = surface water quality standards
UIC = Underground Injection Control
WAC = Washington Administrative Code
ZVI = zero-valent iron

Table 6-7
AOC A-14 Summary of MTCA Alternatives Relative Benefits Ranking
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative Number and Name	Alternative D1				Alternative D2				Alternative D3				Alternative D4A				Alternative D4B				Alternative D5			
	Site-Wide MNA				SVE and EISB at Release Areas and MNA				SVE at DGR at Release Areas and MNA				EISB PRB at Facility Boundary and MNA				ZVI PRB at Facility Boundary and MNA				SVE and EISB at Release Areas, EISB Downgradient Focus Areas, and MNA			
Relative Benefits Ranking for Disproportionate Cost Analysis WAC 173-340-360(2)(b)(i) and WAC 173-340-36093)(f)																								
Comparative Overall Benefit **(1)**		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score		Score	Weighting Factor	Weighted Score
- Overall Protectiveness	Good	5	0.3	1.5	Good	5	0.3	1.5	Good	5	0.3	1.5	Good	5	0.3	1.5	Good	5	0.3	1.5	Good	5	0.3	1.5
- Permanence	Excellent	8	0.2	1.6	Superior	9	0.2	1.8	Good	6	0.2	1.2	Excellent	8	0.2	1.6	Excellent	8	0.2	1.6	Superior	9	0.2	1.8
- Long-Term Effectiveness	Fair	3	0.2	0.6	Fair	3	0.2	0.6	Fair	3	0.2	0.6	Fair	3	0.2	0.6	Fair	3	0.2	0.6	Fair	3	0.2	0.6
- Manageability of Short-Term Risk	Superior	10	0.1	1	Good	5	0.1	0.5	Poor	2	0.1	0.2	Fair	4	0.1	0.4	Fair	4	0.1	0.4	Poor	2	0.1	0.2
- Implementability	Superior	10	0.1	1	Good	6	0.1	0.6	Poor	1	0.1	0.1	Good	5	0.1	0.5	Good	5	0.1	0.5	Poor	1	0.1	0.1
- Consideration of Public Concerns	Fair	4	0.1	0.4	Good	6	0.1	0.6	Fair	4	0.1	0.4	Excellent	7	0.1	0.7	Excellent	7	0.1	0.7	Excellent	7	0.1	0.7
Overall Weighted Benefit Score				**6.1**				**5.6**				**4.0**				**5.3**				**5.3**				**4.9**

Disproportionate Cost Analysis - Quantitative Evaluation

Overall Weighted Benefit Score	6.1	5.6	4.0	5.3	5.3	4.9
Estimated Remedy Present Value Cost to meet **GW pCULs**	$3,900,000	$8,410,000	$25,800,000	$17,100,000	$38,200,000	$44,800,000
Estimated Remedy Total Cost (Undiscounted) to meet **GW pCULs**	$7,030,000	$11,700,000	$29,300,000	$20,700,000	$44,400,000	$50,600,000
Relative Benefit/Cost Ratio (2) for **GW pCULs**	6.1	2.6	0.6	1.2	0.5	0.4
Estimated Remedy Present Value Cost to meet **SWQS in GW**	$7,700,000	$12,100,000	$39,000,000	$20,800,000	$41,800,000	$48,500,000
Estimated Remedy Total Cost (Undiscounted) to meet **SWQS in GW**	$26,900,000	$31,100,000	$57,800,000	$34,900,000	$58,600,000	$68,300,000
Relative Benefit/Cost Ratio (2) for **SWQS in GW**	6.1	3.6	0.8	2.0	1.0	0.8
Most Permanent Solution	No	No	No	No	No	No
Lowest Cost Alternative	**Yes**	No	No	No	No	No
Costs Disproportionate to Incremental Benefits	No	Yes	Yes	Yes	Yes	Yes
Remedy Permanent to the Maximum Extent Practicable?	**Yes**	No	**No**	No	No	No
Preferred Alternative	**Yes**	**No**	**No**	**No**	**No**	**No**

Cost of Lowest Present Value Cost Alternative (pCUL)	**$3,900,000**	**Cost of Lowest Present Value Cost Alternative (SWQS)**	**$7,700,000**
Benefit Score of Highest Ranked Alternative (pCUL)	**6.1**	**Benefit Score of Highest Ranked Alternative (SWQS)**	**6.1**
Cost of Highest Present Value Cost Alternative (pCUL)	**$44,800,000**	**Cost of Highest Present Value Cost Alternative (SWQS)**	**$48,500,000**

Notes:

(1) Ratings used: Poor (1-2), Fair (3-4), Good (5-6), Excellent (7-8), and Superior (9-10).

(2) Benefit/Cost Ratio calculated by dividing the overall weighted benefit score by the estimated remedy cost and scaled (multiplied) by lowest cost alternative cost in order to compare ranges similar in scale to comparative overall benefit, as presented on Figure 6-1 of this FS report.

Abbreviations and Acronyms:

DGR = dynamic groundwater recirculation
EISB = enhanced *in situ* bioremediation
FS = feasibility study
GW = groundwater
MNA = monitored natural attenuation
pCUL = proposed cleanup level
PRB = permeable reactive barrier
SVE = soil vapor extraction
SWQS = surface water quality standards
WAC = Washington Administrative Code
ZVI = zero-valent iron

Table 6-8
AOC A-14 Cost Estimate Summary
Boeing Auburn Feasibility Study
Auburn, Washington

Alternative	Technology	Treatment to Meet Groundwater pCULs			Treatment to Meet SWQS in Groundwater		
		Length of Treatment (Years)	Total Cost (undiscounted)	Present Value Total Cost (1)	Length of Treatment (Years)	Total Cost (undiscounted)	Present Value Total Cost (1)
Alternative D1: Site-Wide MNA	MNA	95	$ 7,030,000	$ 3,900,000	233	$ 26,900,000	$ 7,697,000
	Total Cost		**$ 7,030,000**	**$ 3,900,000**		**$ 26,900,000**	**$ 7,697,000**
Alternative D2: SVE and EISB at Release Areas and MNA	SVE at Former Building 17-03	5	$ 544,000	$ 544,000	5	$ 544,000	$ 544,000
	EISB at Former Building 17-03	10	$ 702,000	$ 661,000	10	$ 702,000	$ 661,000
	SVE at Building 17-07	5	$ 561,000	$ 561,000	5	$ 561,000	$ 561,000
	EISB at Building 17-07	10	$ 3,020,000	$ 2,860,000	10	$ 3,020,000	$ 2,860,000
	MNA	94	$ 6,850,000	$ 3,780,000	230	$ 26,300,000	$ 7,470,000
	Total Cost		**$ 11,680,000**	**$ 8,410,000**		**$ 31,100,000**	**$ 12,100,000**
Alternative D3: SVE and DGR at Release Areas and MNA	SVE at Former Building 17-03	5	$ 544,000	$ 544,000	5	$ 544,000	$ 544,000
	SVE at Building 17-07	5	$ 561,000	$ 561,000	5	$ 561,000	$ 561,000
	DGR at Release Areas	6	$ 22,200,000	$ 21,200,000	29	$ 33,400,000	$ 30,800,000
	MNA	85	$ 6,010,000	$ 3,460,000	208	$ 23,300,000	$ 7,050,000
	Total Cost		**$ 29,300,000**	**$ 25,800,000**		**$ 57,800,000**	**$ 39,000,000**
Alternative D4A: EISB PRB at Facility Boundary and MNA	EISB at Building 17-07 Facility Boundary	20	$ 7,240,000	$ 6,790,000	20	$ 7,240,000	$ 6,790,000
	EISB at Prologis Facility Boundary	20	$ 7,240,000	$ 6,790,000	20	$ 7,240,000	$ 6,790,000
	MNA	86	$ 6,180,000	$ 3,550,000	212	$ 20,400,000	$ 7,210,000
	Total Cost		**$ 20,700,000**	**$ 17,100,000**		**$ 34,900,000**	**$ 20,800,000**
Alternative D4B: ZVI PRB at Facility Boundary and MNA	ZVI at Building 17-07 Facility Boundary	20	$ 19,100,000	$ 17,300,000	20	$ 19,100,000	$ 17,300,000
	ZVI at Prologis Facility Boundary	20	$ 19,100,000	$ 17,300,000	20	$ 19,100,000	$ 17,300,000
	MNA	86	$ 6,180,000	$ 3,550,000	212	$ 20,400,000	$ 7,210,000
	Total Cost		**$ 44,400,000**	**$ 38,200,000**		**$ 58,600,000**	**$ 41,800,000**
Alternative D5: SVE and EISB at Release Areas, EISB Downgradient Focus Areas, and MNA	SVE at Former Building 17-03	5	$ 544,000	$ 544,000	5	$ 544,000	$ 544,000
	EISB at Former Building 17-03	10	$ 702,000	$ 661,000	10	$ 702,000	$ 661,000
	SVE at Building 17-07	5	$ 561,000	$ 561,000	5	$ 561,000	$ 561,000
	EISB at Building 17-07	10	$ 3,020,000	$ 2,860,000	10	$ 3,020,000	$ 2,860,000
	Facility boundary EISB	20	$ 7,240,000	$ 6,790,000	20	$ 7,240,000	$ 6,790,000
	Algona EISB	20	$ 2,700,000	$ 2,050,000	20	$ 2,700,000	$ 2,050,000
	Outlet Collection EISB	20	$ 29,700,000	$ 27,800,000	20	$ 29,700,000	$ 27,800,000
	MNA	86	$ 6,180,000	$ 3,550,000	210	$ 23,800,000	$ 7,200,000
	Total Cost		**$ 50,600,000**	**$ 44,800,000**		**$ 68,300,000**	**$ 48,500,000**

Notes:

(1) Present value project costs for long-term operations, maintenance, and monitoring
(Assume 1.5% discount rate - real discount, 30-year note, per Office of Management and Budget, Circular A-94 Appendix C, Revised Nov. 2018)

Detailed cost estimates are provided in Appendix G.

Detailed information about assumed length of treatment is provided in Appendices D, E, and F.

Abbreviations and Acronyms:

DGR = dynamic groundwater recirculation
EISB = enhanced *in situ* bioremediation
MNA = monitored natural attenuation
pCULS = proposed cleanup levels
PRB = permeable reactive barrier
SVE = soil vapor extraction
SWQS = surface water quality standards
ZVI = zero-valent iron

Table 7-1
Summary of Selected Remedial Alternatives
Boeing Auburn Feasibility Study
Auburn, Washington

AOC	Building	Description	Primary Constituents of Concern	Remedial Alternatives	Selected Remedy	Description of Selected Remedy	Point of Compliance (Soil)	Point of Compliance (Groundwater)
A-01	17-06	Former USTs (TAU-01 and TAU-02)	GRO, ORO, DRO, BTEX	A1: Excavation and Chemical Oxidation	A1: Excavation and Chemical Oxidation	Excavation of soil contamination; Application of *in situ* groundwater chemical treatment to excavation backfill. Periodic groundwater sampling after soil is removed until groundwater concentrations are below pCULs.	Standard; Site-Wide	Standard; Site-Wide
A-09	17-07	Acid Scrubber Drain Line Leak	Metals (cadmium, nickel, copper), Cyanide	B1: Monitored Containment and MNA B2: *In Situ* Groundwater Treatment B3: Future Excavation (and Monitored Containment)	B3: Future Excavation (and Monitored Containment)	Future excavation of soil contamination when Building 17-07 is demolished. Periodic groundwater sampling after soil is removed until groundwater concentrations are below pCULs. Until excavation can occur, containment of contaminated soil and groundwater will continue by maintaining the asphalt/concrete, routine inspection and reporting of containment and periodic groundwater sampling of existing monitoring wells.	Standard; Site-Wide	Standard; Site-Wide
A-13	17-06	Petroleum contamination in soil and groundwater on east side of Building 17-06	DRO, ORO	No contamination above pCULs in soil or groundwater; no remedial alternatives evaluated	No Remediation Required	N/A	N/A	N/A
A-14	Site-wide	Site-wide TCE and VC contamination in soil and groundwater	TCE, VC	D1: Site-Wide MNA D2: SVE and EISB at Release Areas and MNA D3: SVE and DGR at Release Areas and MNA D4: PRB at Facility Boundary and MNA D5: SVE and EISB at Release Areas, EISB at Downgradient Focus Areas, and MNA	D1: Site-Wide MNA	Continue containment of contaminated soil Site-wide with pavement and buildings acting as a cap. Remediation of groundwater through naturally occurring biotic and abiotic degradation and other attenuation processes (MNA). Continue to monitor concentrations in groundwater with periodic groundwater sampling. Institutional controls consisting of an environmental covenant to limit activities that could result in exposure to soil and outline the required continued maintenance for the cap to soil concentrations exceeding protection of groundwater.	Standard; Site-Wide (with institutional controls for residual soil contamination)	Option 1: Standard; Site-Wide with RELs equal to pCULs protective of Drinking Water Option 2: CPOC Off-Facility in Groundwater Near Surface Water Option 3: Area-Wide CPOC Off-Facility Option 4: CPOC at Facility Boundary with RELs equal to pCULs protective of Drinking Water
A-15	Site-wide	Site-wide TCE and VC in stormwater and/or surface water	TCE, VC	Remediation of AOC A-14 will provide cleanup of AOC A-15	Remediation will be completed with AOC A-14	N/A	N/A	N/A

Abbreviations and Acronyms:

AOC = area of concern
BTEX = benzene, toluene, ethylbenzene, xylenes
CPOC = conditional point of compliance
DGR = dynamic groundwater recirculation
DRO = diesel-range organics
EISB = enhanced *in situ* bioremediation
GRO = gasoline-range organics
MNA = monitored natural attenuation
N/A = not applicable
ORO = oil-range organics
pCUL = proposed cleanup levels
PRB = permeable reactive barrier
REL = remediation level
SVE = soil vapor extraction
TCE = trichloroethene
UST = underground storage tank
VC = vinyl chloride