

Seeds, Tena (ECY)

From: Seeds, Tena (ECY)
Sent: Tuesday, August 29, 2023 12:28 PM
To: Kristin Anderson
Cc: Lynn Grochala; Pamela Osterhout; Kim Hempel
Subject: RE: Quarterly Monitoring Summary for Time Oil Bulk Terminal, Q3 2023

Thanks Kristin. I agree with your recommendations. The increase in TCE at 01MW85 is a bit concerning, but it's good to see that the downgradient contingency well remains below the CUL. I look forward to seeing the October results and additional data/evaluation for 01MW85.

Tena Seeds, PE (she/her)

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 [Chat or call in Teams](#)

From: Kristin Anderson <Kristin.Anderson@floydsnider.com>
Sent: Monday, August 28, 2023 6:09 PM
To: Seeds, Tena (ECY) <TSEE461@ECY.WA.GOV>
Cc: Lynn Grochala <Lynn.Grochala@floydsnider.com>; Pamela Osterhout <Pamela.Osterhout@floydsnider.com>; Kim Hempel <khempel@pioneerees.com>
Subject: Quarterly Monitoring Summary for Time Oil Bulk Terminal, Q3 2023

Hi Tena,

The summary materials from Q3 quarterly groundwater monitoring at the Time Oil Bulk Terminal Site, including data tables and potentiometric surface maps, are attached. Overall, results are looking positive on the Bulk Terminal property, but we had a couple of anomalous results on the ASKO and East Waterfront properties. Below is a summary of the preliminary findings and recommendations for Q4 groundwater monitoring based on the Q3 results.

BULK TERMINAL

- Samples were collected from Shallow WBZ wells 01MW12, 01MW19R, 01MW35, 01MW40, and 01MW84, and Intermediate WBZ well 01MW49R.

Findings

- Water level measurements in the Shallow WBZ are expectedly lower compared to the wetter season during Q1 and Q2, yet the general north-northwest groundwater flow direction, steep gradients between ISS monoliths and mounding within the backfill area (01MW66 and 01MW12) are consistent with Q1 and Q2 observations.
 - Note: 01MW17, 01MW99, 01MW105, and 01MW110 were decommissioned in preparation for property redevelopment. 01MW99 was retained as an upgradient well to replace 01MW17.
- Generally, the HIS concentrations were consistent with Q1 and Q2, though a few exceptions include: TPH and benzene decreased at 01MW40, and benzene slightly increased at 01MW12. TPH and benzene concentrations were less than CULs at 01MW35 and 01MW49R.

Recommendations

- Perform monitoring per the GMP with no changes in Q4.

ASKO

- Samples were collected from Shallow WBZ wells MW05, 01MW15, 01MW46, 01MW53, 01MW56, 01MW85, 01MW107 and intermediate WBZ well 01MW108. The contingency well 01MW107 was sampled during Q3 due to previous IHS exceedances observed at upgradient wells 01MW53 and 01MW85.

Findings

- Water level measurements in the Shallow WBZ continue to be flat downgradient of the CAA-4 ISS monolith with steeper gradients between the CAA-4 and CAA-2 monoliths. No significant change in water level elevations was observed between the wetter and dryer seasons. Perched WBZ well MW03R remains dry.
- Benzene and CVOC concentrations across the property have generally decreased relative to pre-remediation conditions in the vicinity of the CAA-4 source area (01MW46); however, there are a few notable changes in CVOC concentrations at the following locations:
 - Vinyl chloride concentrations have slightly increased at 01MW15 and 01MW46 relative to pre-remediation conditions. This is an expected observation due to parent product breakdown.
 - Vinyl chloride decreased to less than CULs at 01MW108.
 - TCE remains greater than pre-remediation conditions at 01MW53 and was consistent with Q2 results
 - TCE increased at 01MW85 relative to previous monitoring results. Further investigation at 01MW85 is proposed as discussed below.
 - CVOC concentrations were less than CULs at the downgradient well 01MW107 (non-detect, consistent with pre-remediation conditions), indicating that the exceedances observed at 01MW53 and 01MW85 are localized.

Recommendations

- Continue to sample contingency well 01MW107, downgradient of 01MW53 and 01MW85, for the Q4 monitoring event.
- Further investigate conditions at 01MW85:
 - Collect another round of dissolved gases to supplement the other MNA parameter results (which are generally positive and consistent with breakdown of TCE)
 - Deploy a passive flux meter in the well after sampling to assess the groundwater flux and TCE flux throughout the water column in this area

EAST WATERFRONT

- Samples were collected from Shallow WBZ wells 02MW04R, 02MW07, and 02MW19.

Findings

- Water level measurements in the Shallow WBZ were consistent with Q1 and Q2 observations, including a primary flow direction to north with a relatively flat gradient towards the shoreline and steeper gradients in the southern portion of the property.
- TPH and arsenic results at all locations were less than CULs for the third consecutive quarter
- Benzene exceeded the CUL at one location, 02MW04R. This result is greater than the most recent pre-remediation concentration and is considered anomalous, however it remains less than the historically greatest groundwater benzene concentrations at this location.
- Downgradient well 02MW07 was non-detect for benzene.

Recommendations

- Monitor benzene at 01MW04R to confirm the Q3 result, consistent with the decision tree flowchart in the GMP.

SITE-WIDE

We also recommend reducing the number of wells we gauge for water levels now that we have 3 quarters of site-wide water level elevations that show relatively consistent groundwater contours and flow patterns. Starting in Q4, water level measurements are proposed to be collected at all wells within the sampling network (regardless of frequency), plus an upgradient well for each property and some key additional locations for spatial coverage across the shallow WBZ as shown on the attached map. We are proposing to eliminate shallow WBZ water levels primarily in/near the ROW or far

outside the IHS plumes, with the goal of focusing on the potential migration directions of IHSs in groundwater. Given that the intermediate WBZ has few monitoring points and IHSs are generally less than CULs, we're also not proposing to collect any supplemental water levels for this WBZ. We are not proposing to decommission any of the wells yet (since redevelopment is delayed on a majority of the site), just to remove them from the quarterly water level schedule.

Please let us know if you have any questions or input regarding our recommendations for Q4 monitoring. The Q4 monitoring event is tentatively scheduled to occur on October 10th.

Thanks,

Kristin Anderson, LHG Senior Geologist (she/her)

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Preliminary Draft
Pre- and Post-Remediation Groundwater Results for Indicator Hazardous Substances

Analyte Class		Total Metals	TPH		VOCs	cVOCs			SVOCs	
Analyte		Arsenic	GRO	Total DRO + ORO	Benzene	TCE	cis-1,2-DCE	Vinyl Chloride	Penta	
Unit		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Cleanup Level		5.0	800	500	0.44	0.50		0.20	0.20	
Parcel	Location	Sample Date								
Bulk Terminal	01MW12									
	Pre-remediation	4/30/2019		100 U	590 ⁽¹⁾	3.0				41.96
	Post-remediation	1/31/2023		100 U	1,000 ⁽¹⁾	0.35 U				44.73
		6/28/2023		110	1,200 ⁽¹⁾	1.3	increasing trend for TPH			39.38
	01MW19/01MW19R									
	Pre-remediation	4/30/2019		10,000	1,900 ⁽¹⁾	2,600	1.0 U	1.0 U	0.20 U	32.78
	Post-remediation	1/31/2023		990	910 ⁽¹⁾	5.2				31.94
		4/7/2023		1,100	700 ⁽¹⁾	4.4				31.94
		6/28/2023		1,300	810 ⁽¹⁾	2.1				29.94
	01MW35									
	Pre-remediation	5/1/2019		100 U	550 ⁽¹⁾	0.35 UJ				25.44
	Post-remediation	1/31/2023		100 U	110 ⁽¹⁾	0.35 U			~2-3 ft lower gw elevation	28.89
		4/7/2023		100 U	120 ⁽¹⁾	0.35 U				27.83
		6/28/2023		100 U	76 ⁽¹⁾	0.35 U				27.27
	01MW40									
	Pre-remediation	4/30/2019			1,100 ⁽¹⁾	0.35 UJ				39.02
	Post-remediation	1/31/2023		100 U	5,300 ⁽¹⁾	0.73				38.40
		6/28/2023		100 U	620 ⁽¹⁾	0.35 U				34.85
	01MW49/01MW49R (previously Shallow/Int) Now INT WBZ									
	Pre-remediation	5/1/2019		100 U	850 ⁽¹⁾	0.35 UJ				NM
	Post-remediation	1/31/2023		100 U	260 ⁽¹⁾	0.35 U				18.61 (Q2 19.40)
		6/29/2023		100 U	160 ⁽¹⁾	0.35 U				19.34
	01MW51 INT WBZ									
	Pre-remediation	5/26/2016		370	1,800 ⁽¹⁾	1.0 U				22.46
	Post-remediation	4/7/2023		100 U	250 U	0.35 U				NM (Q2 23.79)
	01MW66									
	Pre-remediation	4/30/2019		100 U	250	0.35 UJ				39.23
	Post-remediation	1/31/2023								1.9
	01MW84									
	Pre-remediation	5/1/2019		8,400	2,800 ⁽¹⁾	5.0 U			~2-3 ft lower gw elevation	25.72
Post-remediation	1/31/2023		2,300	810 ⁽¹⁾	0.35 U				28.93	
			2,200	830 ⁽¹⁾	0.35 U				28.93	
	4/7/2023		5,500	1,500 ⁽¹⁾	0.35 U				28.32	
	6/28/2023		4,600	1,400 ⁽¹⁾	0.35 U				27.91	
01MW87										
Pre-remediation	5/26/2019		100 U		1.0 U				29.45	
	5/1/2019			110						
Post-remediation	4/7/2023		100 U	250 U	0.35 U				31.72	



GWE

Preliminary Draft
Pre- and Post-Remediation Groundwater Results for Indicator Hazardous Substances

Analyte Class		Total Metals	TPH		VOCs	cVOCs			SVOCs	
Analyte		Arsenic	GRO	Total DRO + ORO	Benzene	TCE	cis-1,2-DCE	Vinyl Chloride	Penta	
Unit		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
Cleanup Level		5.0	800	500	0.44	0.50		0.20	0.20	
Parcel	Location	Sample Date								
ASKO	01MW15									GWE
	Pre-remediation	5/2/2019		100 U	220 ⁽¹⁾	0.41	0.50 U	1.7	7.2	29.11
	Post-remediation	2/1/2023					0.50 U	6.4	36	31.51
		6/28/2023					0.50 U	5.7	28	31.32
	01MW46									
	Pre-remediation	5/2/2019			280 ⁽¹⁾	14	880	220	11	22.28
	Post-remediation	2/1/2023				3.8	240	140	17	24.35
		4/7/2023				3.5 U	140	110	9.3	24.31
		6/28/2023				4.3	280	260	25	22.86
	01MW53									
	Pre-remediation	5/2/2019			94 ⁽¹⁾	0.35 U	0.50 U	4.4	0.26	20.10
	Post-remediation	2/1/2023					2.9	5.4	0.57	20.64
		4/7/2023					2.1	3.2	0.36	20.69
		6/28/2023					2.0	2.9	0.51	20.41
	01MW56									
	Pre-remediation	5/2/2019			1,000 ⁽¹⁾	0.35 U	0.50 U	1.0 U	0.61	22.63
	Post-remediation	2/1/2023					0.81	1.0 U	0.99	24.88
		6/28/2023					0.62	1.0 U	0.97	24.15
	01MW85									
	Pre-remediation	5/3/2019			450 ⁽¹⁾		0.50 U	2.4	7.9	20.65
	Post-remediation	1/31/2023					5.7	1,200	13	21.55
		4/7/2023					6.2	1,200	17	21.49
		6/28/2023				increasing trend for TCE	110	1,000	13	21.05
	01MW107									
	Pre-remediation	5/6/2019					0.50 U	1.0 U	0.020 U	16.18
	Post-remediation	6/28/2023					0.50 U	1.0 U	0.020 U	20.37
	01MW108 INT WBZ									
	Pre-remediation	5/3/2019					0.50 U	1.0 U	0.33	19.95
Post-remediation	2/1/2023					0.50 U	1.0 U	0.27	34.67	
	6/29/2023					0.50 U	1.0 U	0.065	32.03	
MW05										
Pre-remediation	5/3/2019		140	310 ⁽¹⁾	1.0	240	120	27	25.92	
Post-remediation	2/1/2023				1.4	140	360	6.8	25.68	
	6/28/2023				1.5 J	160	360	6.9	24.83	
MW06										
Pre-remediation	5/3/2019			370 ⁽¹⁾	2.6	330	31	2.8	23.24	
Post-remediation	2/1/2023				0.35 U	0.50 U	1.0 U	2.6	24.38	

Preliminary Draft
Pre- and Post-Remediation Groundwater Results for Indicator Hazardous Substances

Analyte Class		Total Metals	TPH		VOCs	cVOCs		SVOCs			
Analyte		Arsenic	GRO	Total DRO + ORO	Benzene	TCE	cis-1,2-DCE	Vinyl Chloride	Penta		
Unit		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		
Cleanup Level		5.0	800	500	0.44	0.50		0.20	0.20		
Parcel	Location	Sample Date									
East Waterfront	02MW04/02MW04R									GWE	
	Pre-remediation	5/18/2016		3,100	2,000 ⁽¹⁾	19					??
		5/3/2019				3.7					18.87
	Post-remediation	2/1/2023		100 U	69 ⁽¹⁾	0.35 U					18.60
		4/7/2023		100 U	250 U	0.35 U					19.66
		6/29/2023		100 U	65 ⁽¹⁾	29	significant increase in benzene				18.55
	02MW07										
	Pre-remediation	5/19/2016		100 U	160 ⁽¹⁾	1.0 U					??
		5/3/2019			670 ⁽¹⁾						18.83
		7/25/2019	3.9								??
	Post-remediation	2/1/2023	1.0 U	100 U	86 ⁽¹⁾	0.35 U					17.99
		4/7/2023	1.0 U	100 U	250 U	0.35 U					19.08
		6/29/2023	1.1	100 U	76 ⁽¹⁾	0.35 U					18.50
	02MW19										
	Pre-remediation	5/6/2019		100 U	380 ⁽¹⁾						19.07
		7/25/2019	14								??
	Post-remediation	2/1/2023	3.3	100 U	150 ⁽¹⁾	0.35 U					18.61
		4/7/2023	4.7	100 U	76 ⁽¹⁾	0.35 U					19.41
			4.8	100 U	84 ⁽¹⁾	0.35 U					19.41
		6/29/2023	4.2	100 U	76 ⁽¹⁾	0.35 U					19.03

Notes:

Blanks are intentional. Data not collected for specific analyte.

BOLD Detected exceedance of cleanup level.

Italic Reporting limit exceeds cleanup level.

1 Laboratory noted that the sample chromatographic pattern does not resemble the fuel standard used for quantitation for one or more of the detected concentrations in the sum.

Abbreviations:

- cVOC Chlorinated volatile organic compound
- DCE Dichloroethene
- DRO Diesel-range organics
- GRO Gasoline-range organics
- µg/L Micrograms per liter
- ORO Oil-range organics
- Penta Pentachlorophenol
- SVOC Semivolatile organic compound
- TCE Trichloroethene
- TPH Total petroleum hydrocarbon
- VOC Volatile organic compound

Qualifiers:

- J Analyte was detected; concentration is an estimate.
- U Analyte was not detected at the given reporting limit.
- UJ Analyte was not detected at the given reporting limit, which is considered estimated.

**Preliminary Draft
June 2023 Post-Remediation Groundwater Results for
Monitored Natural Attenuation Parameters**

Analyte Class		Primary MNA Parameters						Secondary MNA Parameters				
		Field Measurement						Anions				
Analyte		Dissolved Oxygen	Specific Conductance	ORP	pH	Temperature	Turbidity	Ferrous iron	Nitrate (as Nitrogen)	Nitrite (as Nitrogen)	Sulfate	Sulfide
CAS No.		--	--	--	--	--	--	15438-31-0	14797-55-8	14797-65-0	14808-79-8	18496-25-8
Unit		mg/L	µS/cm	mV	pH	°C	ntu	mg/L	mg/L	mg/L	mg/L	mg/L
Location Name	Date											
Bulk Terminal												
01MW12	6/28/2023	0.10	625.0	-47.1	6.69	14.6	3.02					
01MW19R	6/28/2023	0.24	216.2	-84.6	7.08	16.3	0.61					
01MW35	6/28/2023	0.41	160.7	82.5	6.39	14.8	0.50					
01MW40	6/28/2023	0.11	431.8	14.2	6.68	15.2	1.89					
01MW49R	6/29/2023	1.22	828.0	-110.8	7.14	15.2	1.32					
01MW84	6/28/2023	0.20	86.8	-18.6	6.51	14.5	11.83					
ASKO												
01MW15	6/28/2023	0.23	591.0	-50.3	7.06	15.4	0.93					
01MW46	6/28/2023	0.19	490.9	-68.9	7.21	15.4	2.44	3.5	0.50 U	0.60 U	190	2.4
01MW53	6/28/2023	0.19	729.0	-24.6	6.69	15.8	5.54					
01MW56	6/28/2023	0.17	702.0	20.1	6.69	14.7	1.83	4.5	0.91	0.60 U	29	4.4
01MW85	6/28/2023	0.11	619.0	-59.7	6.98	15.3	2.59	4.0	0.50 U	0.60 U	61	4.8
01MW107	6/28/2023	0.93	320.2	100.2	6.22	15.4	2.41					
01MW108	6/29/2023	1.43	697.0	-86.4	7.02	15.3	4.40					
MW05	6/28/2023	0.13	576.0	-84.6	7.29	14.0	1.99	3.0	0.50 U	0.60 U	130	3.6
East Waterfront												
02MW04R	6/29/2023	3.25	352.6	50.8	6.82	15.4	1.52					
02MW07	6/29/2023	2.52	844.0	91.1	6.04	16.5	1.57					
02MW19	6/29/2023	0.17	576.0	-6.8	6.50	14.1	1.68					

Notes:

Field Measurements are presented to the decimal places reported on the field meters.

Abbreviations:

- °C Degrees celcius
- EW East Waterfront
- µS/cm micro-siemens per centimeter
- mg/L milligram per liter
- MNA Monitored natural attenuation
- mV Millivolt
- NTU Nephelometric turbidity unit
- ORP Oxydation-reduction potential

Qualifiers:

U Analyte was not detected at the given reporting limit.

Legend

- Groundwater Contour (feet NAVD 88)
- Shallow WBZ Groundwater Flow Direction

Existing Monitoring Well Locations

- Shallow WBZ Monitoring Well
- Decommissioned Well

Well Decommissioning Plan

- Damaged—Decommission Required
- Decommission During Redevelopment

Cleanup Action Components

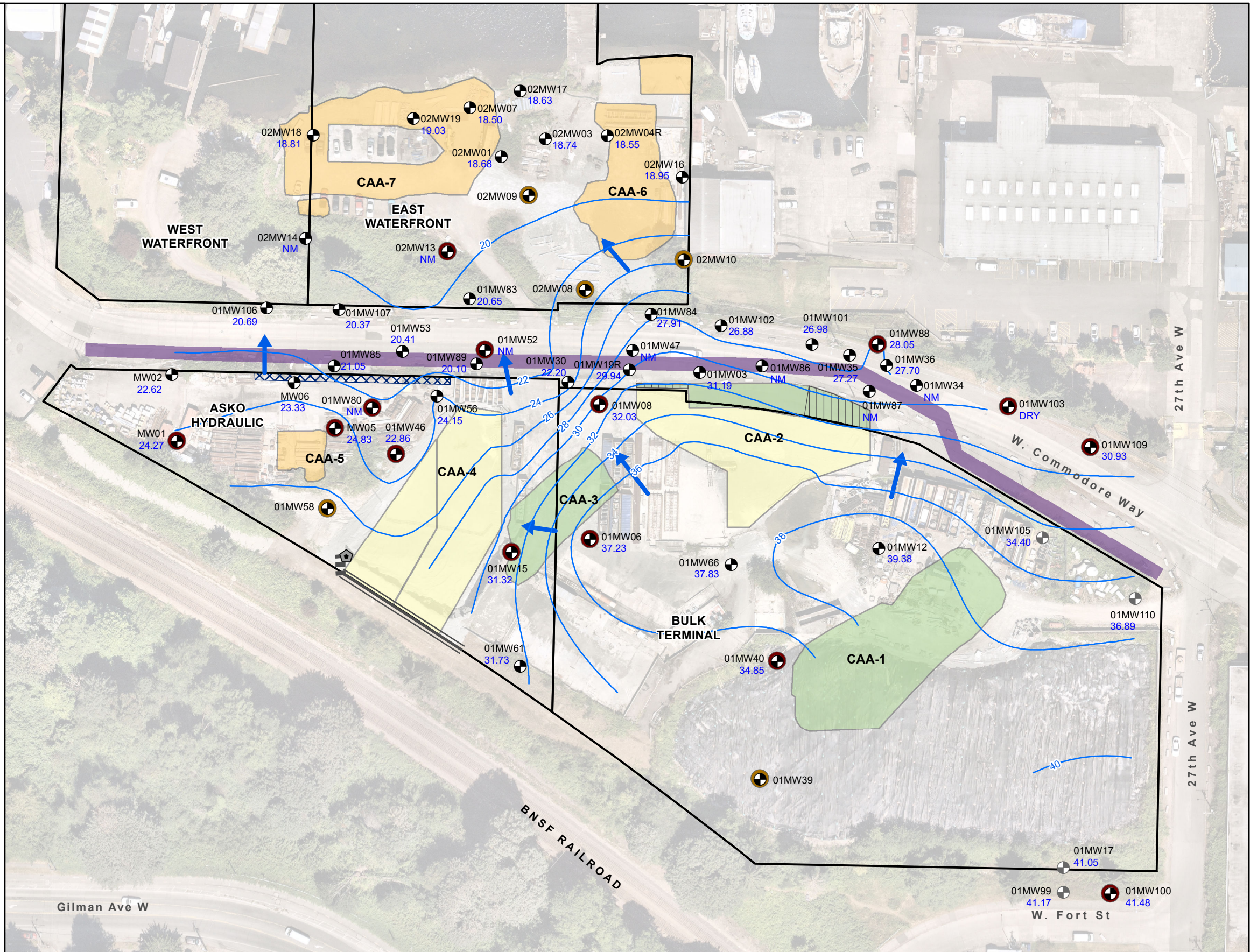
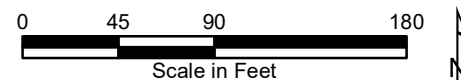
- Excavated to CULs
- Excavated to RELs
- In Situ Stabilization/Solidification
- PlumeStop Injection
- ORC-A Treatment
- Interceptor Trench
- PRB Wall for Trench
- Gravity Well

Other Site Features

- Property Boundary for the Former TOC Seattle Terminal
- Conditional Point of Compliance

Notes:
 · Depth to water measurements not collected at select wells that were inaccessible because they are located within the W. Commodore Way right of way or buried by gravel or vegetation.
 · Parcel boundaries obtained from King County Geographic Information Systems Center, 2011. Lot lines are approximate. Not for legal use.
 · Orthoimagery obtained from Nearmap, 2018.

Abbreviations:
 CUL = Cleanup level
 ORC-A = Oxygen Release Compound Advanced
 NAVD 88 = North American Vertical Datum of 1988
 NM = Not measured
 PRB = Permeable reactive barrier
 REL = Remediation level
 TOC = TOC Holdings Co. and any predecessor entity including Time Oil Company
 WBZ = Water-bearing zone



Legend

- Groundwater Contour (feet NAVD 88)
- Intermediate WBZ Groundwater Flow Direction

Existing Monitoring Well Locations

- Intermediate WBZ Monitoring Well

Well Decommissioning Plan

- Damaged—Decommission Required
- Decommission During Redevelopment

Cleanup Action Components

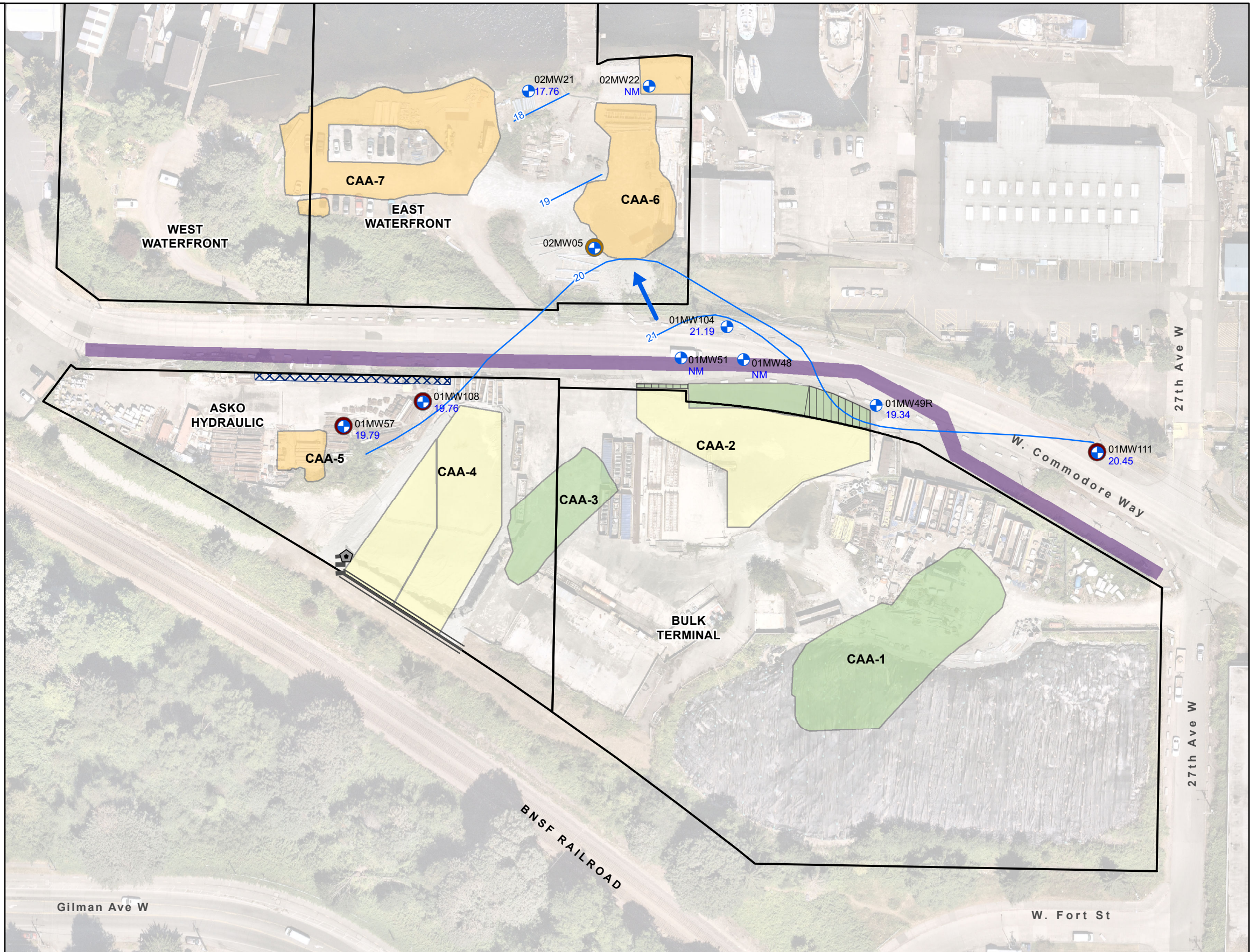
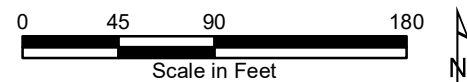
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Notes:
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 WBZ = Water-bearing zone



Legend

- Groundwater Contour (feet NAVD 88)
- Shallow WBZ Groundwater Flow Direction

Existing Monitoring Well Locations

- Shallow WBZ Monitoring Well
- Decommissioned Well

Well Decommissioning Plan

- Damaged—Decommission Required
- Decommission During Redevelopment

Cleanup Action Components

- Excavated to CULs
- Excavated to RELs
- In Situ Stabilization/Solidification
- PlumeStop Injection
- ORC-A Treatment
- Interceptor Trench
- PRB Wall for Trench
- Gravity Well

Other Site Features

- Property Boundary for the Former TOC Seattle Terminal
- Conditional Point of Compliance

Collect Water Level

Notes:
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