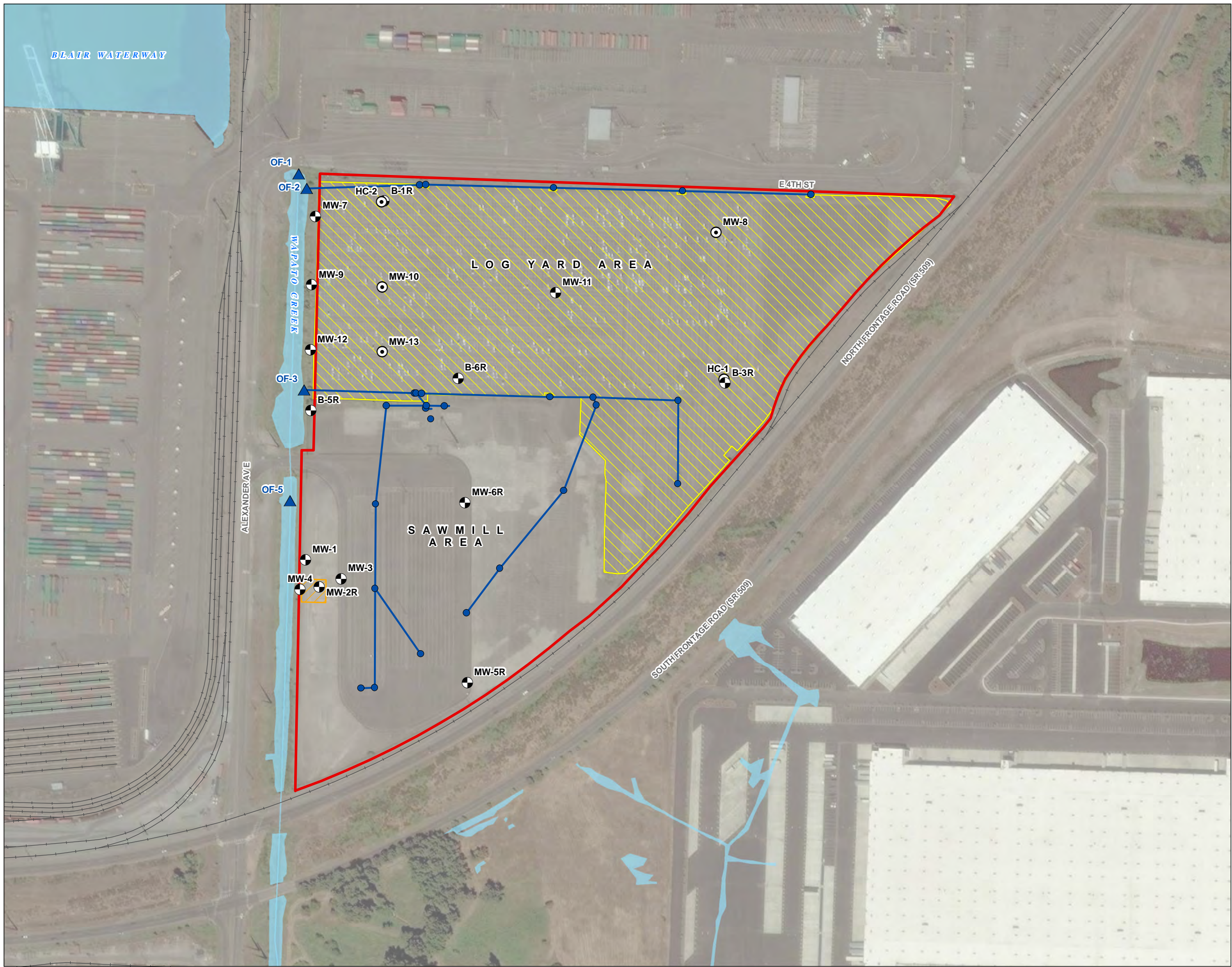


# Figures

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**FIGURE 1**

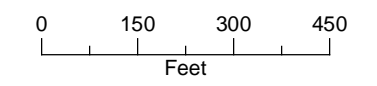
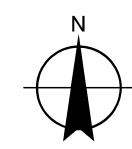
**Site Map**  
 Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA

**LEGEND**

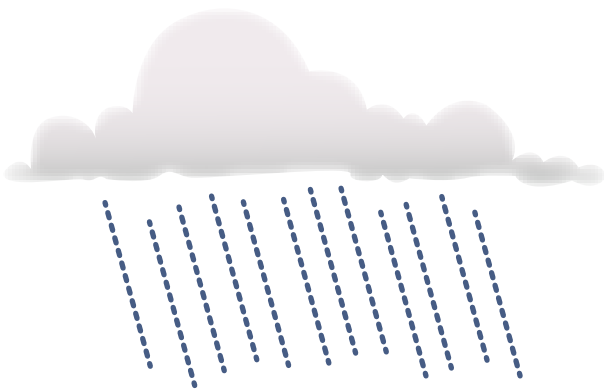
- Monitoring Well
- Perched Monitoring Well
- Outfall
- Vault
- Stormwater Conveyance Pipe
- Site Boundary
- Site Area
- Former Dip Tank
- Fill Containing Slag
- Railroad
- Watercourse
- Waterbody

**NOTE:**

Site boundary defined in Exhibit A of the Draft Agreed Order No. DE 11237 (Ecology, 2015).



Date: April 7, 2020  
 Data Sources: PORTAC, Aerial from METRO 18



**POINT OF EXPOSURE**

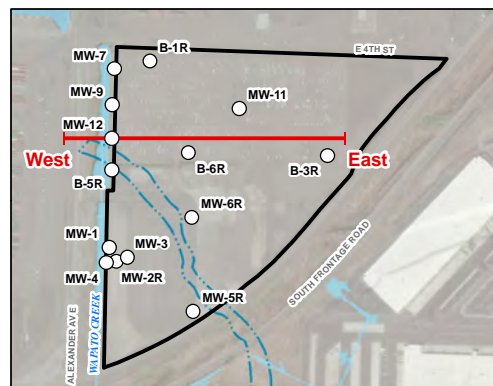
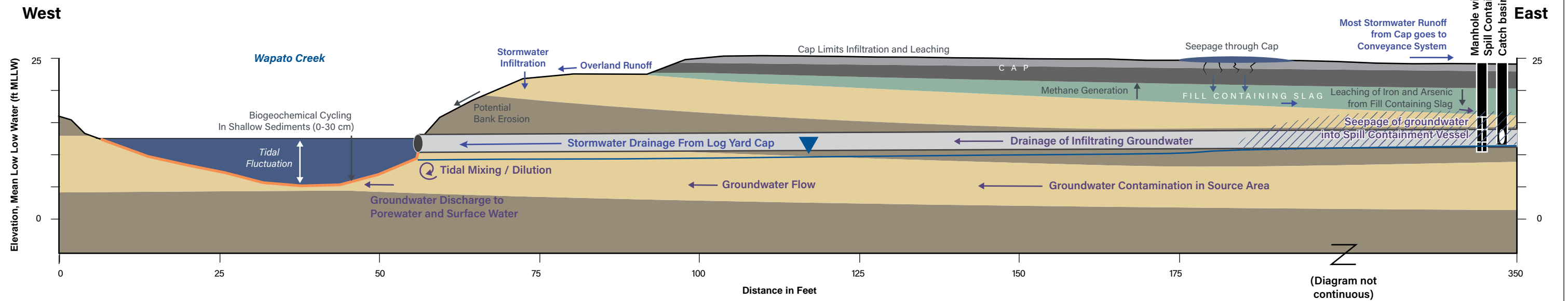
- Bioactive zone sediments (0-10 cm)
- Surface water

**NEARSHORE TRANSITION ZONE**

- Tidally influenced groundwater mixing
- Stormwater infiltration and mixing
- Changes in groundwater geochemistry

**UPLAND CAPPED ZONE**

- Cap limits infiltration and leaching
- Fill containing slag remains a potential source of arsenic to groundwater
- Gradient toward Wapato Creek
- Seasonal fluctuation in groundwater elevation
- Some seepage through the cap occurs through cracks and/or in areas with ponded water
- Some seepage of groundwater into the spill containment vault and stormwater conveyance system



**LEGEND**

- Stormwater Pipe
- Catch Basin/Manhole
- Spill Containment System
- May 2016 Water Level
- /// Perched Groundwater

**NOTE**

Vertical Exaggeration = 1X  
ft = feet  
cm = centimeters

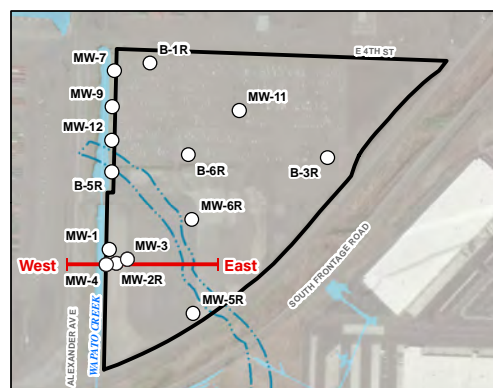
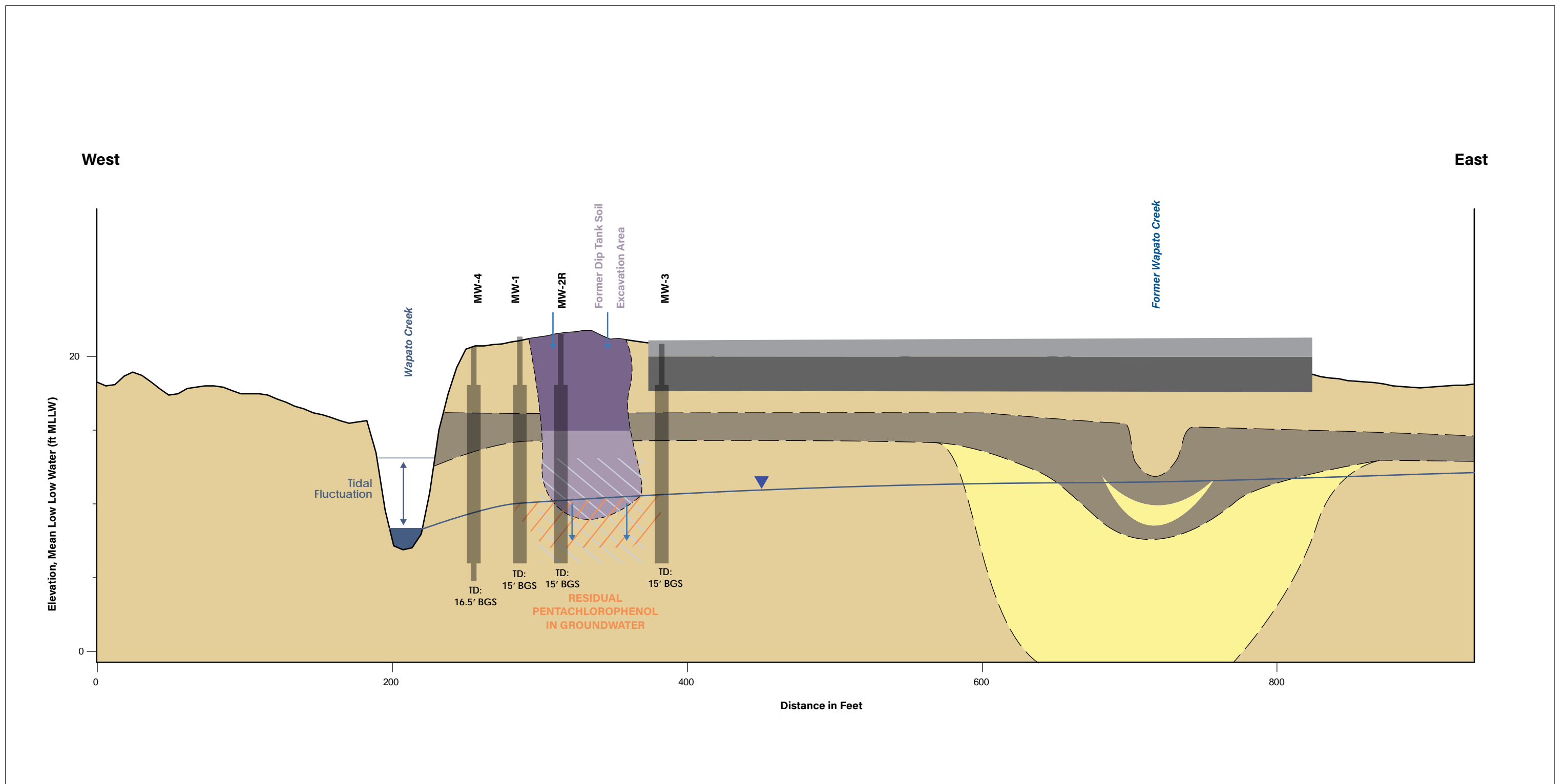
**Geology**

- Roller-Compacted Concrete
- Gravel Base Course
- Fill Containing Slag
- Silty Sand
- Fine-Grained Deposits (Silt and Clay)
- Bioactive Zone Sediments

**FIGURE 2**  
**Conceptual Site Model - Current Conditions - Log Yard**

Cleanup Action Plan  
Parcel 15  
Tacoma, WA





**LEGEND**

- ▼ Groundwater Surface
- May 2016, Estimated Water Level
- Precipitation Infiltration
- ▨ Residual Pentachlorophenol
- ▨ Groundwater with Elevated pH

**Geology**

- Asphalt Concrete
- Gravel Base Coarse
- Crushed Concrete Fill
- Sand Fill (Soil Excavation Area)
- Silty Sand
- Fine-Grained Deposits (Silt and Clay)
- Sand

**NOTES**

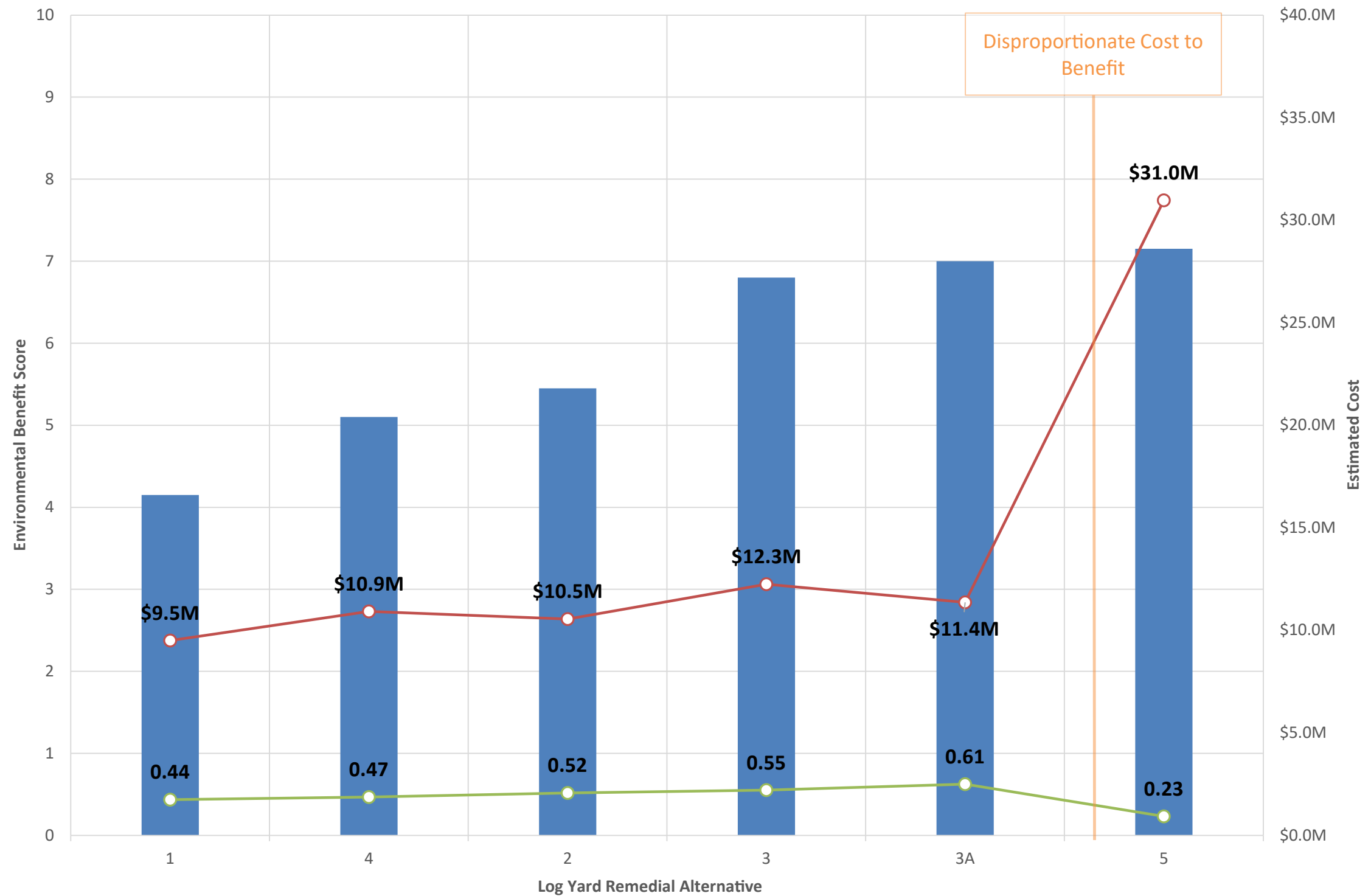
Vertical Exaggeration = 10X  
 Lidar data is from 2010 from Puget Sound Lidar Consortium's website (<http://pugetsoundlidar.ess.washington.edu/lidardata/>). Data converted from NAVD88 to MLLW by adding 2.67', made by GSI.

**FIGURE 3**

**Conceptual Site Model - Sawmill**

Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA





**LEGEND**  
 ■ Environmental Benefit Score  
 ○ Relative Benefit / Cost (\$M)  
 ○ Estimated Cost

**NOTE**  
 M = Millions

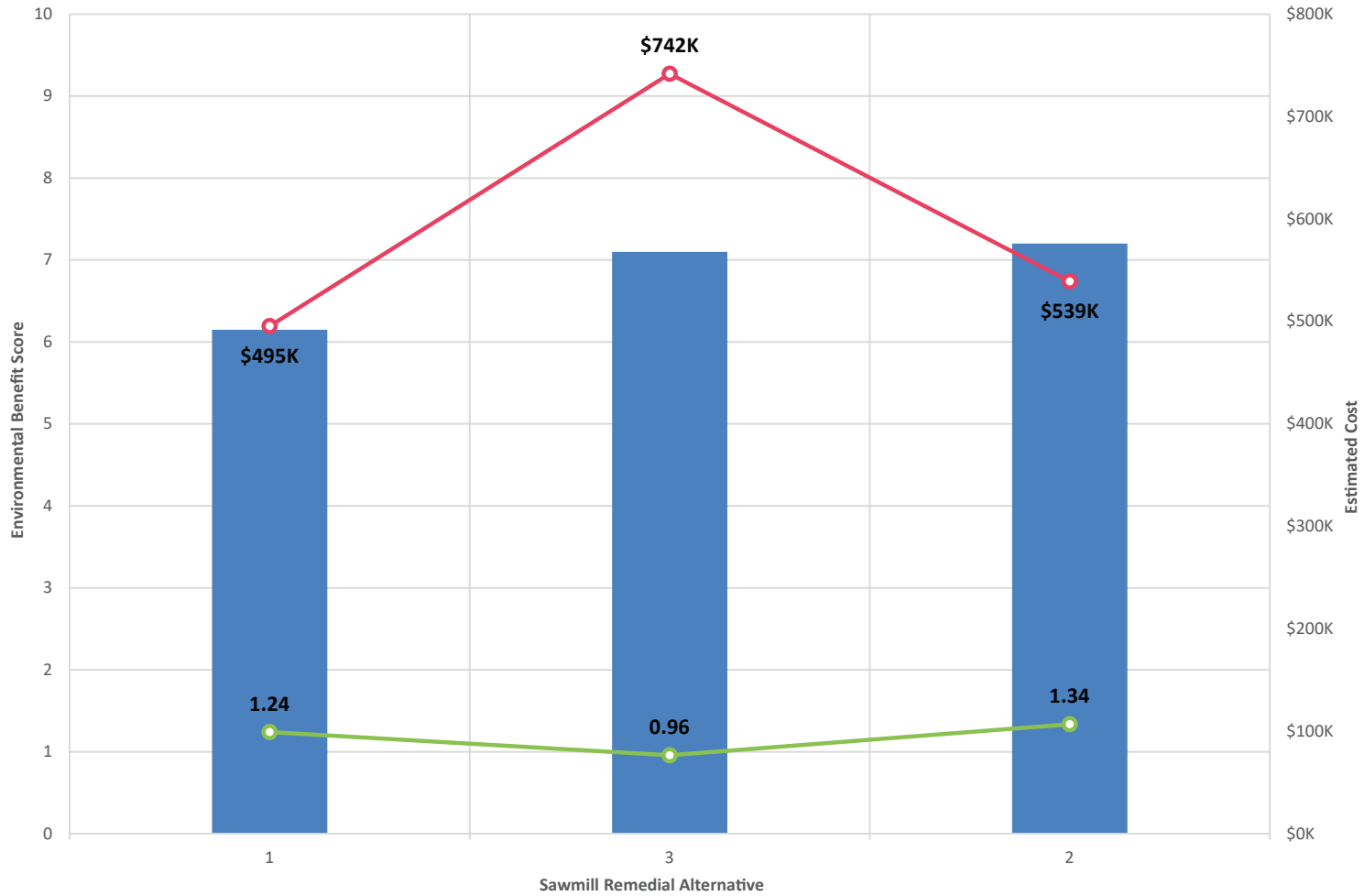
**FIGURE 4**  
**Log Yard Disproportionate Cost Analysis**

Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA



**FIGURE 5**

**Sawmill  
Disproportionate  
Cost Analysis**  
Cleanup Action Plan  
Parcel 15  
Tacoma, WA



**LEGEND**

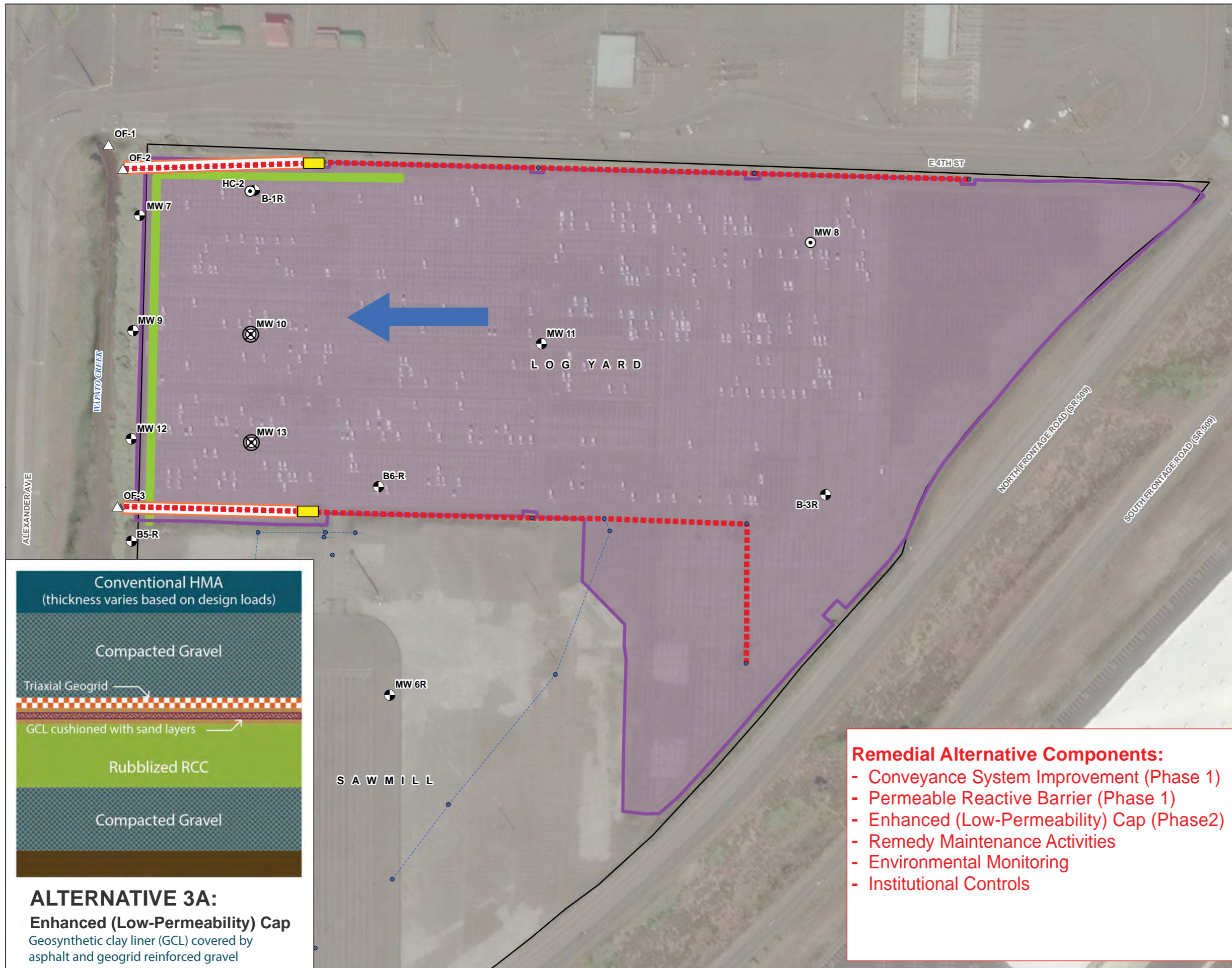
- Environmental Benefit Score
- Relative Benefit / Cost (\$100K)
- Estimated Cost

**NOTE**

K = Thousands



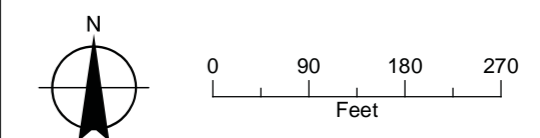
**FIGURE 6**  
**Log Yard Remedial Alternative 3A**  
 Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA



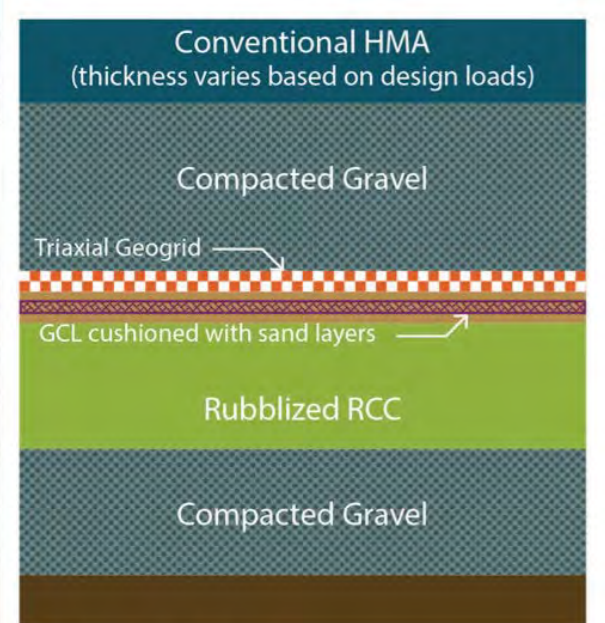
- LEGEND**
- Site Features<sup>1</sup>**
- Monitoring Well
  - ⊙ Perched Monitoring Well
  - △ Stormwater Outfall
- Site Storm Features**
- ▲ Outfall
  - Vault
  - Storm Line
- Remedial Alternative Features**
- ⊗ Well to be Abandoned and Replaced
  - Replace Stormwater Vault
  - ▭ Slip Line Stormwater Pipe
  - Permeable Reactive Barrier<sup>4</sup>
  - ▭ Enhanced Cap
  - Replace Stormwater System
- All Other Features**
- ▭ Site Boundary<sup>2</sup>
  - ← Groundwater Flow Direction

- NOTES**
1. Locations surveyed May 2016.
  2. Site boundary defined in Exhibit A of the Draft Agreed Order No. DE 11237 (Ecology, 2015).
  3. Cap extent defined on Figure 2 of the Former Portac Inc. Site (AQEA, 2014).
  4. Permeable reactive barrier dimensions and extent are subject to change during remedial design.

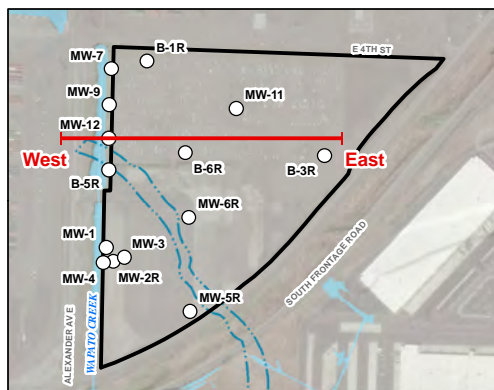
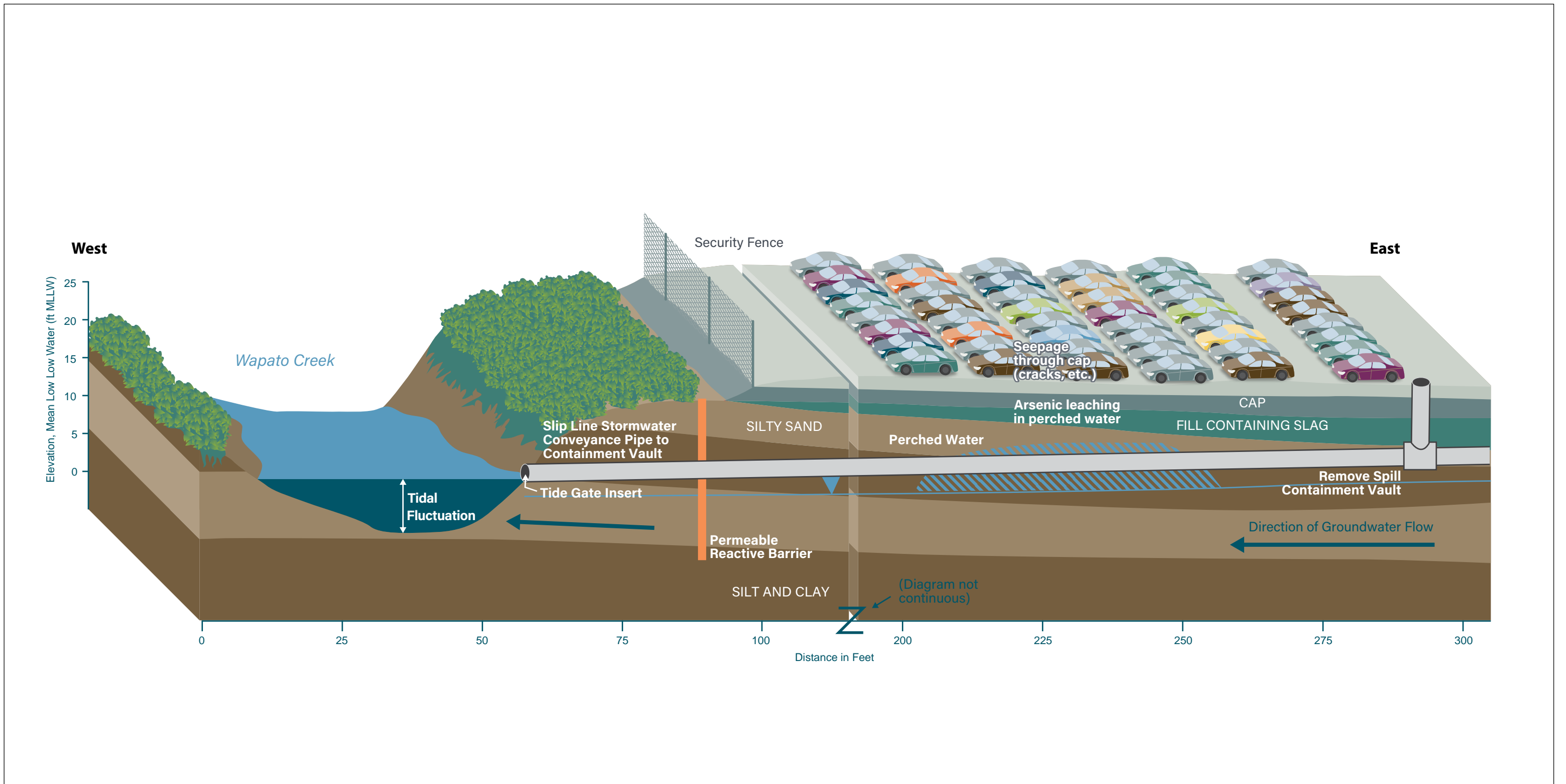
HMA: Hot Mix Asphalt  
 RCC: Roller-Compacted Concrete  
 GCL: Geosynthetic Clay Liner



- Remedial Alternative Components:**
- Conveyance System Improvement (Phase 1)
  - Permeable Reactive Barrier (Phase 1)
  - Enhanced (Low-Permeability) Cap (Phase 2)
  - Remedy Maintenance Activities
  - Environmental Monitoring
  - Institutional Controls



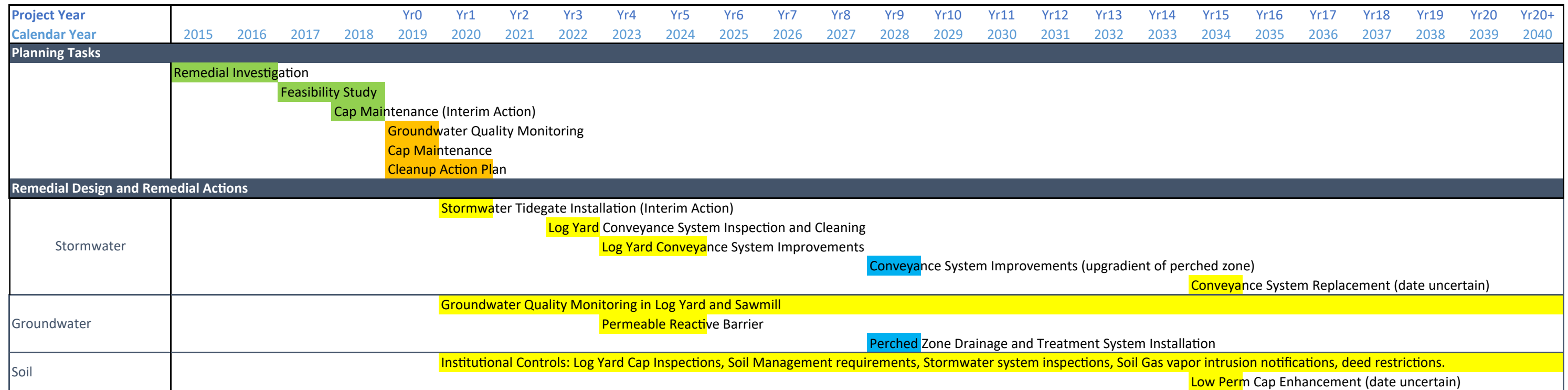
**ALTERNATIVE 3A:**  
**Enhanced (Low-Permeability) Cap**  
 Geosynthetic clay liner (GCL) covered by asphalt and geogrid reinforced gravel



**FIGURE 7**  
**Log Yard Remedial Alternative 3A Cross Section**  
 Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA

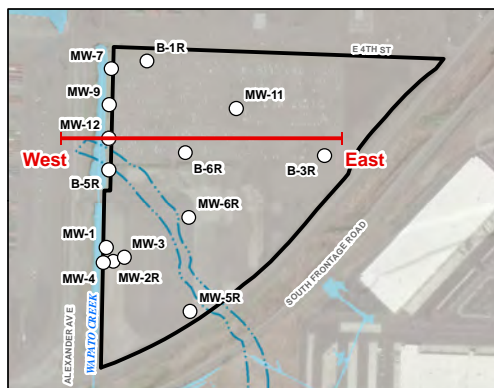
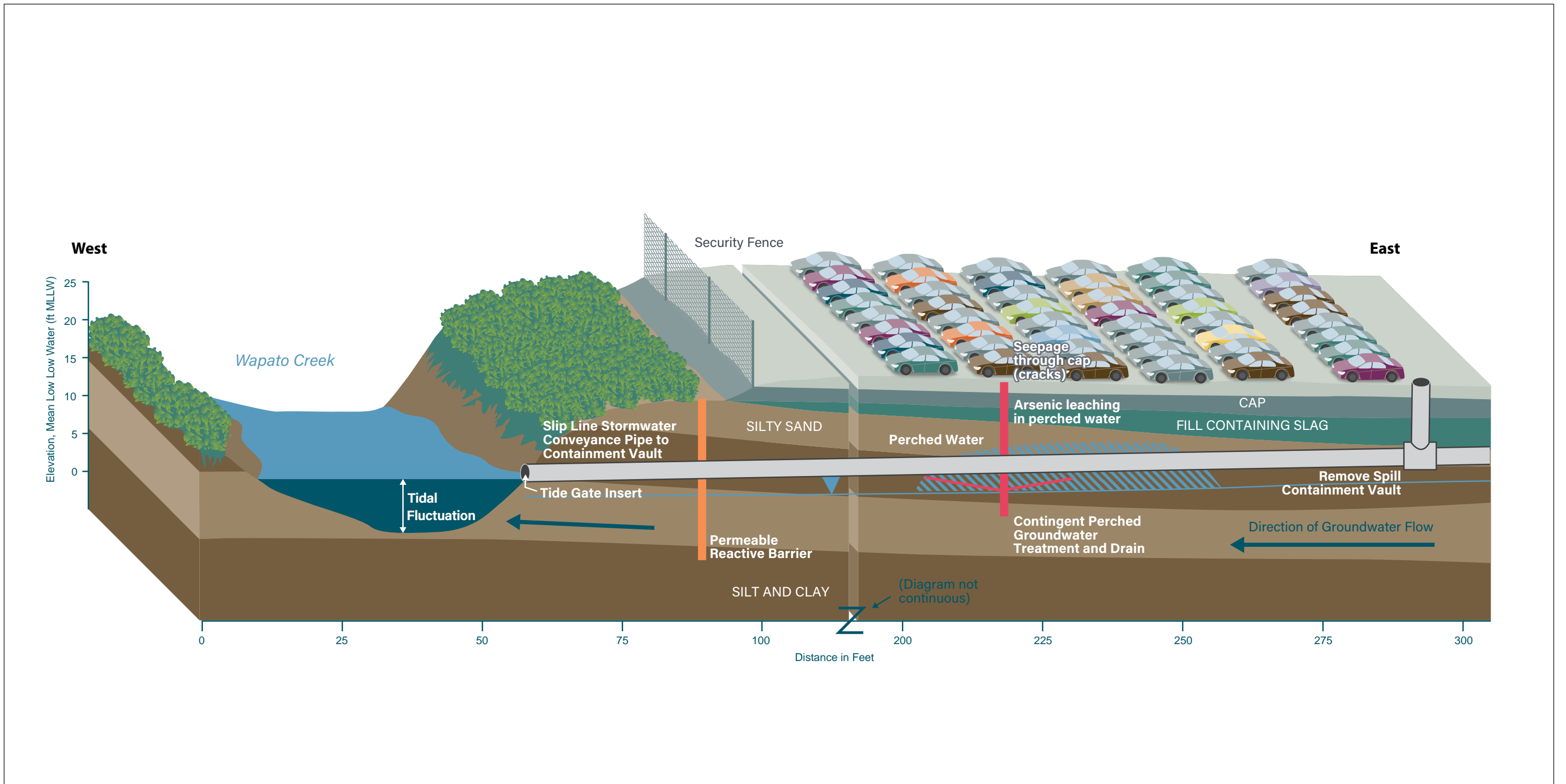






**FIGURE 8**  
**Log Yard Estimated Cleanup Action Timeline**  
 Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA





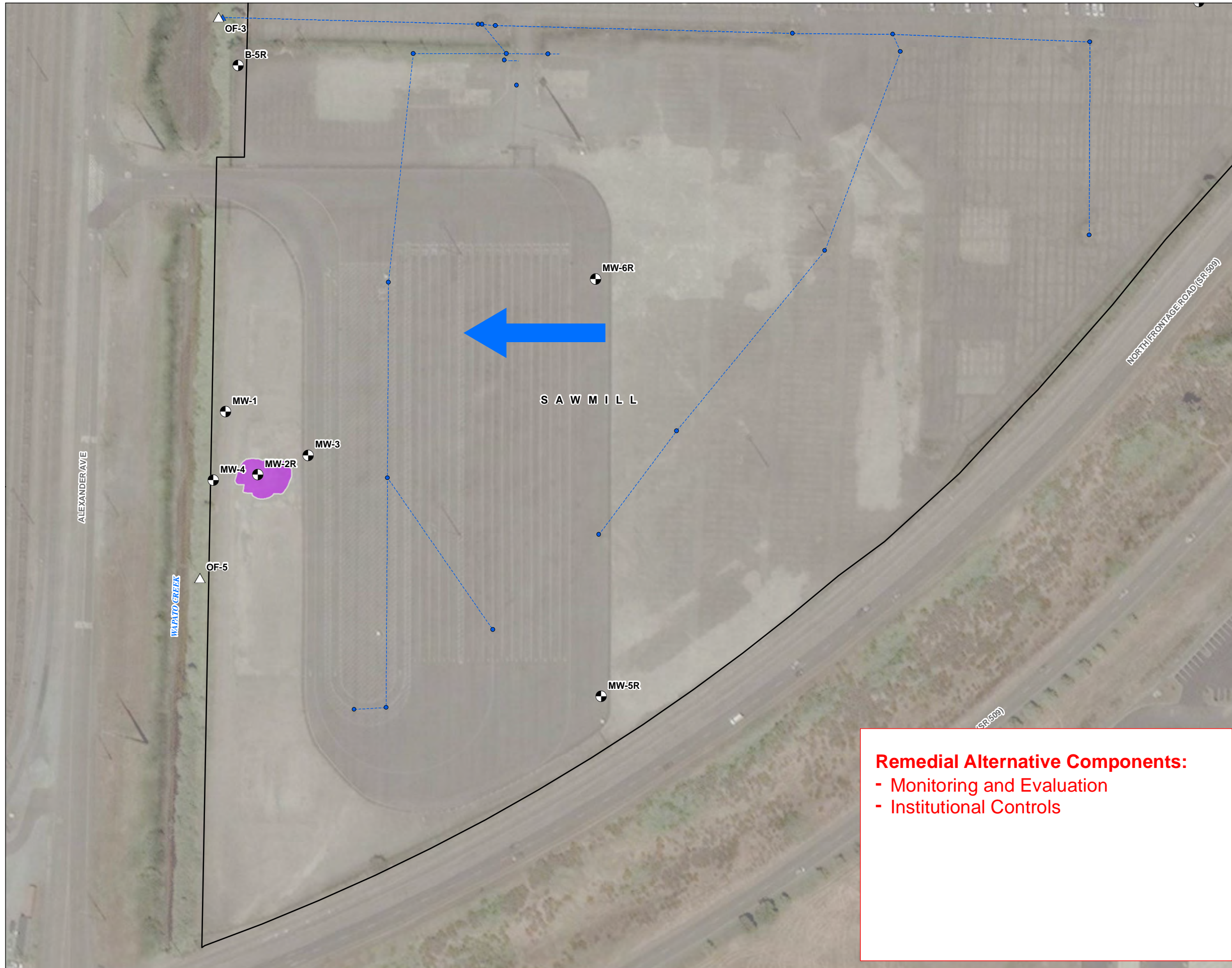
Y:\0603\_Port\_Tacoma\Source\_Figures\Cleanup\_Action\_Plan\2020\_Update

**FIGURE 9**  
**Log Yard Remedial Alternative 3A Contingent Perched Groundwater Treatment**

Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA



**FIGURE 10**  
**Sawmill Remedial Alternative 1**  
 Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA



**LEGEND**

**Site Features<sup>1</sup>**

- Monitoring Well
- △ Stormwater Outfall

**Storm Features**

- ▲ Outfall
- Vault
- Stormwater Conveyance Pipe

**Remedial Alternative Features**

- Former Dip Tank Excavation/Fill Extent (Approximate)

**All Other Features**

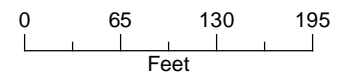
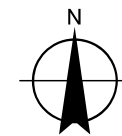
- Site Boundary<sup>2</sup>
- ← Groundwater Flow Direction

**Remedial Alternative Components:**

- Monitoring and Evaluation
- Institutional Controls

**NOTES**

1. Locations have been surveyed, May 2016.
2. Site boundary defined in Exhibit A of the Draft Agreed Order No. DE 11237 (Ecology, 2015).



Date: April 13, 2020  
 Data Sources: PORTAC, Aerial photo taken September 2018 by Metro



**FIGURE 11**  
**Point of Compliance Locations**  
 Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA

**LEGEND**

**Point of Compliance Location**

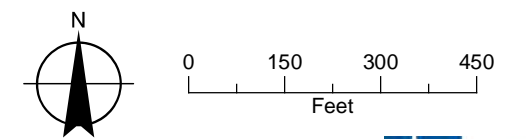
- Monitoring Well
- △ Surface Water

**All Other Features**

- Vault
- Stormwater Conveyance Pipe
- ▨ Former Dip Tank
- Site Boundary<sup>1</sup>
- Railroad
- ~ Watercourse
- Waterbody

**NOTE**

1. Site boundary defined in Exhibit A of the Draft Agreed Order No. DE 11237 (Ecology, 2015).



Date: April 9, 2020  
 Data Sources: PORTAC, Aerial photo taken September 2018 by Metro

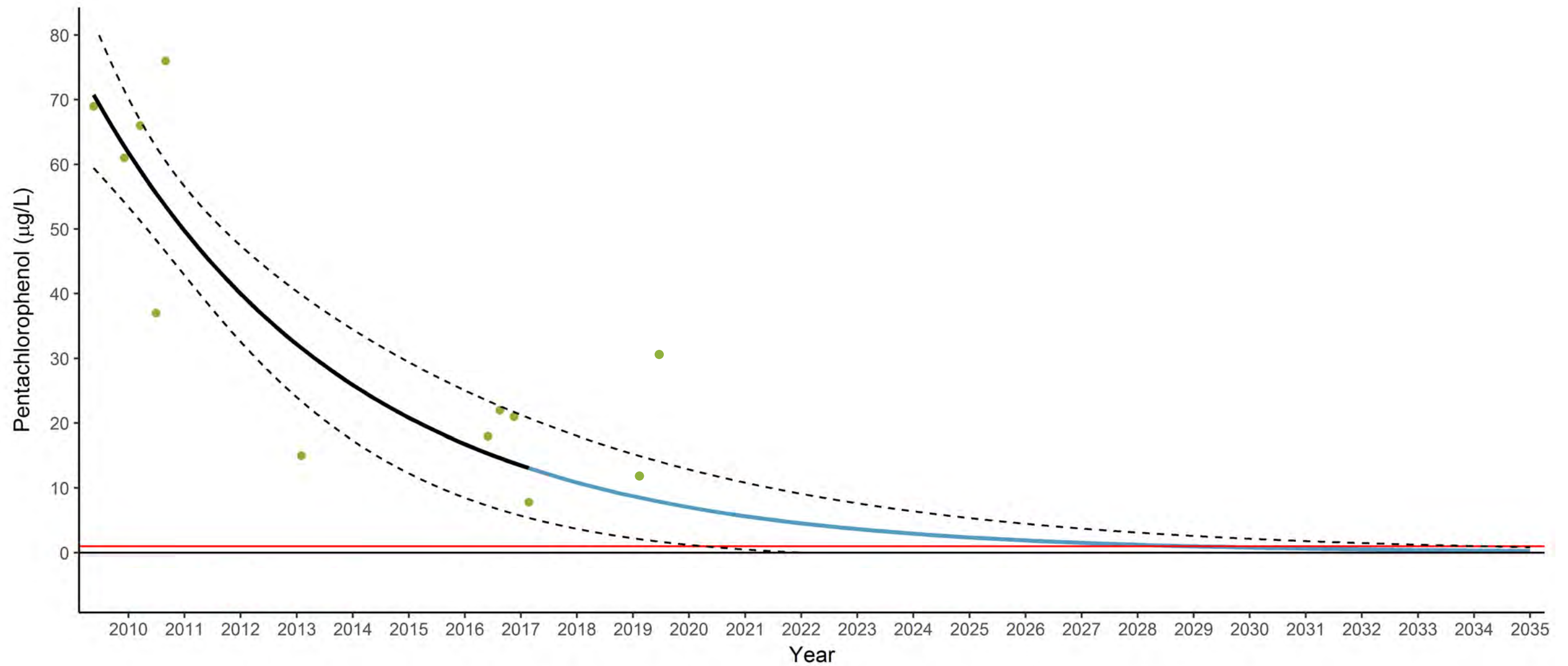


# Appendix A

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## PCP Concentrations at Site Well MW-2R

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**LEGEND**

- Target Concentration
- Log Regression of Available Data
- Predicted Decay Values
- - Upper and Lower 85% Confidence Limit

**NOTE:**

Half-life is 3.19 years, calculated based on modeled decay constant  
 Decay prediction equation,  $y = \exp(6.30 - 0.217 * (x))$ ; where x is the decimal year

**MW-2R DATA**

EVENT	PCP (ug/kg)	pH
1	18	12.01
2	22	11.72
3	21	11.21
4	7.8	11.84
5	12	11.85
6	31	11.02

**APPENDIX A**

**PCP Concentrations at Site Well MW-2R**

Cleanup Action Plan  
 Parcel 15  
 Tacoma, WA



# Appendix B

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## Revised Environmental Benefit and Probable Cost Tables and DCA Figure

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Remedial Alternatives		Net Present Value <sup>2</sup>
<b>Log Yard</b>		
Alternative 1	Asphalt Overlay, Stormwater System Repair, MNA, PRB Contingency	\$9,505,000
Alternative 2	Enhanced Cap, Stormwater System Repair, MNA, PRB Contingency	\$10,549,000
Alternative 3	Low Permeability Cap, Stormwater System Replacement, MNA, PRB Contingency	\$12,254,000
Alternative 3A	Perched Zone Treatment, PRB, Stormwater System Repair, MNA, Low Permeability Cap Contingency	\$11,507,000
Alternative 4	Asphalt Overlay, Stormwater System Repair, Ex Situ Treatment, MNA, PRB Contingency	\$10,921,000
Alternative 5	Excavation & Off-site Disposal, Stormwater System Replacement, MNA, PRB Contingency	\$30,964,000

**Notes:**

1. Estimated costs are in 2017 dollars
2. Net present value (NPV) based on reasonable return on investment (ROI) estimate (5.5%) subtracted from average City of Tacoma consumer price index (CPI) between 1998 and 2016 (2.4%) for a discount rate of (3.1%).



Initial and Annual Costs<sup>1</sup>

Item	Quantity	Unit	Rate / %	Total
<b>Initial (Year 1) Costs</b>				
Mobilization			6%	\$4,000
Stormwater System Repair	1	LS	\$58,500	\$58,500
Design and Permitting			15%	\$9,000
Construction Management			10%	\$6,000
Project Management			8%	\$5,000
Ecology Review/Oversight for Implementation			2%	\$1,000
Sales Tax (City of Tacoma)			10.1%	\$6,000
<b>Year 1 Costs Subtotal</b>				<b>\$89,500</b>
<b>Stormwater System Slip Lining (Year 2) Costs</b>				
Mobilization			6%	\$23,000
Stormwater System Repair (Slip Line)	1	LS	\$270,000	\$270,000
Stormwater System Repair (Vault Replacement)	1	LS	\$107,000	\$107,000
Design and Permitting			8%	\$30,000
Construction Management			4%	\$15,000
Project Management			3%	\$11,000
Ecology Review/Oversight for Implementation			1%	\$4,000
Sales Tax (City of Tacoma)			10.1%	\$40,000
<b>Year 2 Costs Subtotal</b>				<b>\$500,000</b>
<b>Perched Zone Treatment and Drain (Year 5) Costs</b>				
Mobilization			8%	\$27,000
Perched Zone Treatment and Drain Installation (8- 12' bgs, ZVI sumps 12-18'bgs)	1	LS	\$342,000	\$342,000
Design and Permitting			12%	\$41,000
Construction Management			8%	\$27,000
Project Management			5%	\$17,000
Ecology Review/Oversight for Implementation			2%	\$7,000
Sales Tax (City of Tacoma)			10.1%	\$37,000
<b>Year 5 Costs Subtotal</b>				<b>\$498,000</b>
<b>PRB (Year 10) Costs</b>				
Mobilization			6%	\$60,000
PRB Installation (10% ZVI @ 25'-10'bgs)	1,000	LF	\$1,000	\$1,000,000
Design and Permitting			8%	\$80,000
Construction Management			4%	\$40,000
Project Management			3%	\$30,000
Ecology Review/Oversight for Implementation			1%	\$10,000
Sales Tax (City of Tacoma)			10.1%	\$107,000
<b>Year 10 Costs Subtotal</b>				<b>\$1,327,000</b>
<b>Cap Improvement Contingency (Year 15) Costs</b>				
Mobilization			4%	\$283,000
Low Permeability Cap (GCL, 5" HMA cover)	1	LS	\$6,360,000	\$6,360,000
Stormwater System Replacement	1	LS	\$672,000	\$672,000
Monitoring well repairs/replacement	18	EA	\$2,500	\$45,000
Design and Permitting			4%	\$281,000
Construction Management			3%	\$211,000
Project Management			2%	\$141,000
Ecology Review/Oversight for Implementation			1%	\$70,000
Sales Tax (City of Tacoma)			10.1%	\$743,000
<b>Year 15 Costs Subtotal</b>				<b>\$8,806,000</b>
<b>Initial Other Costs</b>				
Institutional controls	1	LS	\$10,000	\$10,000
<b>Initial Construction and Other Costs Subtotal</b>				<b>\$9,403,500</b>
<b>Initial Construction Costs Contingency<sup>2</sup> (20%)</b>				<b>\$1,880,700</b>
<b>Total Initial Construction and Other Costs</b>				<b>\$11,284,200</b>

Net Present Value Calculation

Year	Initial/One Time Costs	Annual	Contingency (20%)	Total	Inflated Cost (2.4%)	NPV Cost (ROI 5.5%)	Year	Initial/One Time Costs	Annual	Contingency (20%)	Total	Inflated Cost (2.4%)	NPV Cost (ROI 5.5%)
1	\$89,500	\$115,000	\$40,900	\$245,400	\$251,290	\$238,189	51	\$0	\$18,000	\$3,600	\$21,600	\$72,402	\$4,719
2	\$500,000	\$98,000	\$119,600	\$717,600	\$752,458	\$676,048	52	\$0	\$18,000	\$3,600	\$21,600	\$74,140	\$4,581
3	\$0	\$98,000	\$19,600	\$117,600	\$126,272	\$107,535	53	\$0	\$18,000	\$3,600	\$21,600	\$75,919	\$4,446
4	\$0	\$127,000	\$25,400	\$152,400	\$167,566	\$135,262	54	\$0	\$18,000	\$3,600	\$21,600	\$77,741	\$4,315
5	\$1,327,000	\$98,000	\$285,000	\$1,710,000	\$1,925,289	\$1,473,105	55	\$0	\$18,000	\$3,600	\$21,600	\$79,607	\$4,189
6	\$0	\$96,500	\$19,300	\$115,800	\$133,508	\$96,826	56	\$0	\$18,000	\$3,600	\$21,600	\$81,518	\$4,065
7	\$0	\$96,500	\$19,300	\$115,800	\$136,713	\$93,981	57	\$0	\$18,000	\$3,600	\$21,600	\$83,474	\$3,946
8	\$0	\$96,500	\$19,300	\$115,800	\$139,994	\$91,220	58	\$0	\$18,000	\$3,600	\$21,600	\$85,477	\$3,830
9	\$0	\$125,500	\$25,100	\$150,600	\$186,434	\$115,147	59	\$0	\$18,000	\$3,600	\$21,600	\$87,529	\$3,718
10	\$498,000	\$96,500	\$118,900	\$713,400	\$904,342	\$529,429	60	\$0	\$18,000	\$3,600	\$21,600	\$89,630	\$3,608
11	\$0	\$96,500	\$19,300	\$115,800	\$150,317	\$83,412	61	\$0	\$18,000	\$3,600	\$21,600	\$91,781	\$3,502
12	\$0	\$96,500	\$19,300	\$115,800	\$153,925	\$80,961	62	\$0	\$18,000	\$3,600	\$21,600	\$93,983	\$3,399
13	\$0	\$96,500	\$19,300	\$115,800	\$157,619	\$78,583	63	\$0	\$18,000	\$3,600	\$21,600	\$96,239	\$3,299
14	\$0	\$96,500	\$19,300	\$115,800	\$161,402	\$76,273	64	\$0	\$18,000	\$3,600	\$21,600	\$98,549	\$3,203
15	\$8,816,000	\$96,500	\$1,782,500	\$10,695,000	\$15,264,414	\$6,837,436	65	\$0	\$18,000	\$3,600	\$21,600	\$100,914	\$3,108
16	\$0	\$28,200	\$5,640	\$33,840	\$49,457	\$20,999	66	\$0	\$18,000	\$3,600	\$21,600	\$103,336	\$3,017
17	\$0	\$28,200	\$5,640	\$33,840	\$50,644	\$20,382	67	\$0	\$18,000	\$3,600	\$21,600	\$105,816	\$2,928
18	\$0	\$28,200	\$5,640	\$33,840	\$51,860	\$19,783	68	\$0	\$18,000	\$3,600	\$21,600	\$108,355	\$2,842
19	\$0	\$28,200	\$5,640	\$33,840	\$53,104	\$19,201	69	\$0	\$18,000	\$3,600	\$21,600	\$110,956	\$2,759
20	\$49,800	\$28,200	\$15,600	\$93,600	\$150,409	\$51,550	70	\$0	\$18,000	\$3,600	\$21,600	\$113,619	\$2,678
21	\$0	\$18,000	\$3,600	\$21,600	\$35,543	\$11,547	71	\$0	\$18,000	\$3,600	\$21,600	\$116,346	\$2,599
22	\$0	\$18,000	\$3,600	\$21,600	\$36,396	\$11,207	72	\$0	\$18,000	\$3,600	\$21,600	\$119,138	\$2,523
23	\$0	\$18,000	\$3,600	\$21,600	\$37,269	\$10,878	73	\$0	\$18,000	\$3,600	\$21,600	\$121,997	\$2,449
24	\$0	\$18,000	\$3,600	\$21,600	\$38,164	\$10,558	74	\$0	\$18,000	\$3,600	\$21,600	\$124,925	\$2,377
25	\$190,800	\$18,000	\$41,760	\$250,560	\$453,326	\$118,877	75	\$0	\$18,000	\$3,600	\$21,600	\$127,924	\$2,307
26	\$0	\$18,000	\$3,600	\$21,600	\$40,018	\$9,947	76	\$0	\$18,000	\$3,600	\$21,600	\$130,994	\$2,239
27	\$0	\$18,000	\$3,600	\$21,600	\$40,978	\$9,655	77	\$0	\$18,000	\$3,600	\$21,600	\$134,138	\$2,173
28	\$0	\$18,000	\$3,600	\$21,600	\$41,962	\$9,371	78	\$0	\$18,000	\$3,600	\$21,600	\$137,357	\$2,109
29	\$0	\$18,000	\$3,600	\$21,600	\$42,969	\$9,096	79	\$0	\$18,000	\$3,600	\$21,600	\$140,653	\$2,047
30	\$0	\$18,000	\$3,600	\$21,600	\$44,000	\$8,828	80	\$240,600	\$18,000	\$51,720	\$310,320	\$2,069,218	\$28,550
31	\$0	\$18,000	\$3,600	\$21,600	\$45,056	\$8,569	81	\$0	\$18,000	\$3,600	\$21,600	\$147,486	\$1,929
32	\$0	\$18,000	\$3,600	\$21,600	\$46,137	\$8,317	82	\$0	\$18,000	\$3,600	\$21,600	\$151,025	\$1,872
33	\$0	\$18,000	\$3,600	\$21,600	\$47,245	\$8,073	83	\$0	\$18,000	\$3,600	\$21,600	\$154,650	\$1,817
34	\$0	\$18,000	\$3,600	\$21,600	\$48,378	\$7,836	84	\$0	\$18,000	\$3,600	\$21,600	\$158,362	\$1,764
35	\$0	\$18,000	\$3,600	\$21,600	\$49,540	\$7,605	85	\$0	\$18,000	\$3,600	\$21,600	\$162,162	\$1,712
36	\$0	\$18,000	\$3,600	\$21,600	\$50,729	\$7,382	86	\$0	\$18,000	\$3,600	\$21,600	\$166,054	\$1,662
37	\$0	\$18,000	\$3,600	\$21,600	\$51,946	\$7,165	87	\$0	\$18,000	\$3,600	\$21,600	\$170,040	\$1,613
38	\$0	\$18,000	\$3,600	\$21,600	\$53,193	\$6,954	88	\$0	\$18,000	\$3,600	\$21,600	\$174,121	\$1,565
39	\$0	\$18,000	\$3,600	\$21,600	\$54,469	\$6,750	89	\$0	\$18,000	\$3,600	\$21,600	\$178,299	\$1,519
40	\$0	\$18,000	\$3,600	\$21,600	\$55,777	\$6,552	90	\$0	\$18,000	\$3,600	\$21,600	\$182,579	\$1,475
41	\$0	\$18,000	\$3,600	\$21,600	\$57,115	\$6,359	91	\$0	\$18,000	\$3,600	\$21,600	\$186,960	\$1,431
42	\$0	\$18,000	\$3,600	\$21,600	\$58,486	\$6,172	92	\$0	\$18,000	\$3,600	\$21,600	\$191,448	\$1,389
43	\$0	\$18,000	\$3,600	\$21,600	\$59,890	\$5,991	93	\$0	\$18,000	\$3,600	\$21,600	\$196,042	\$1,349
44	\$0	\$18,000	\$3,600	\$21,600	\$61,327	\$5,815	94	\$0	\$18,000	\$3,600	\$21,600	\$200,747	\$1,309
45	\$331,750	\$18,000	\$69,950	\$419,700	\$1,220,217	\$109,667	95	\$0	\$18,000	\$3,600	\$21,600	\$205,565	\$1,270
46	\$0	\$18,000	\$3,600	\$21,600	\$64,306	\$5,478	96	\$0	\$18,000	\$3,600	\$21,600	\$210,499	\$1,233
47	\$0	\$18,000	\$3,600	\$21,600	\$65,849	\$5,317	97	\$0	\$18,000	\$3,600	\$21,600	\$215,551	\$1,197
48	\$0	\$18,000	\$3,600	\$21,600	\$67,430	\$5,161	98	\$0	\$18,000	\$3,600	\$21,600	\$220,724	\$1,162
49	\$0	\$18,000	\$3,600	\$21,600	\$69,048	\$5,009	99	\$0	\$18,000	\$3,600	\$21,600	\$226,021	\$1,128
50	\$240,600	\$18,000	\$51,720	\$310,320	\$1,015,799	\$69,853	100	\$18,000	\$18,000	\$7,200	\$43,200	\$462,892	\$2,189
											<b>Net Present Value<sup>3</sup></b>	<b>\$11,507,000</b>	

Annual Long Term Costs	No. of Events	Unit	Rate / %	Annual Total	Years	Total
<b>Annual Costs - Yr 1-5</b>						
Maintain Inst. Controls	1	LS	\$1,000	\$1,000	5	\$5,000
Cap Inspections	1	LS	\$8,500	\$8,500	5	\$42,500
Cap Repairs	1	LS	\$54,000	\$54,000	5	\$270,000
Ground/Surface Water Sampling & Annual Reporting (YR 1)	4	LS	\$11,500	\$46,000	1	\$46,000
Ground/Surface Water Sampling & Annual Reporting	2	LS	\$14,500	\$29,000	4	\$116,000
Porewater Sampling (YR 4)	2	LS	\$14,500	\$29,000	1	\$29,000
Ecology Review/Oversight for annual events		5%	\$5,500	\$5,500	5	\$27,500
<b>Annual Costs - Yrs 6-15</b>						
Maintain Inst. Controls	1	LS	\$1,000	\$1,000	10	\$10,000
Cap Repairs	1	LS	\$54,000	\$54,000	5	\$270,000
Cap Inspections	1	LS	\$8,500	\$8,500	10	\$85,000
Groundwater Sampling and Annual Reporting	2	LS	\$13,500	\$27,000	10	\$270,000
Porewater Sampling (YR 9)	2	LS	\$14,500	\$29,000	1	\$29,000
Ecology Review/Oversight for annual events		5%	\$6,000	\$6,000	10	\$60,000
<b>Annual Costs - Yrs 16-100</b>						
Maintain Inst. Controls	1	LS	\$1,000	\$1,000	85	\$85,000
Cap Inspections	1	LS	\$8,500	\$8,500	85	\$722,500
Reduced Groundwater Sampling & Reporting (Yrs 16-21)	1	LS	\$17,000	\$17,000	5	\$85,000
Reduced Groundwater Sampling & Reporting (Twice/5YR)	0.4	LS	\$17,000	\$6,800	85	\$578,000
Ecology Review/Oversight for annual events		5%	\$1,700	\$1,700	85	\$144,500
<b>Other Periodic Costs</b>						
GCL Liner Repair		3%	\$190,800	\$190,800	yr 25, 50, 80	\$572,400
PRB Maintenance/Repair		25%	\$331,750	\$331,750	yr 45	\$331,750
Perched Zone PRB Maintenance/Repair		10%	\$49,800	\$49,800	yr 20, 50, 80	\$149,400
Abandon wells	12	EA	\$1,500	\$18,000	yr 100	\$18,000

Table 2. Log Yard DCA Evaluation (revisions show in red font)

Remedial Alternative <sup>1</sup>	Protectiveness (25%) <sup>2</sup>	Permanence (20%)	Long-Term Effectiveness (20%)	Short-Term Risk Management (15%)	Technical and Administrative Implementability (10%)	Public Concerns (10%)	Environmental Benefit Score	Probable Cost <sup>3</sup>	Benefit Score / Probable Cost <sup>4</sup>
Relative Ranking - Scored from 1 (lowest) to 10 (highest)									
Alternative 3	8	7	8	7	7	--			
<p><b>Alternative 3A</b></p> <ul style="list-style-type: none"> <li>- Conveyance System Repair</li> <li>- Permeable Reactive Barrier</li> <li>- Perched Groundwater Treatment</li> <li>-MNA</li> <li>- Low Permeability Cap Contingency</li> <li>- Institutional Controls</li> </ul>	<p>Achieves a high level of overall protectiveness through the use of a PRB with a contingent perched groundwater treatment system. The stormwater conveyance system will be sliplined in areas affected by groundwater infiltration and replaced when the property is developed or contingency low permeability cap implemented. Protectiveness is enhanced by installing a PRB near Wapato Creek. A contingent action will directly remove perched water groundwater and reduce arsenic flux to groundwater and Wapato Creek. A contingent low permeability cap would be implemented if criteria conditions are exceeded. With this tiered approach the overall protectiveness of the remedy is enhanced.</p>	<p>Achieves a high score for permanence. Permanence under this alternative is enhanced over Alternatives 1, 2 and 3 by directly removing perched groundwater. This alternative is more permanent than Alternative 4 as it integrates better with Port land use planning and employs a more robust contingent cap design. The cap design is expected to reduce the generation of high-arsenic perched water in comparison to Alternatives 1, 2 3, and 4. The stormwater system repair (slipline) and eventual replacement will also prevent future seepage of arsenic-containing groundwater into the storm drainage system.</p>	<p>Achieves a high level of long-term effectiveness through the use of perched groundwater treatment, stormwater system improvements, a PRB, and a contingent low-permeability cap to reduce perched water in source material and subsequent migration pathways. At the time of property development or implementation of the contingent low permeability cap, the stormwater conveyance system will be replaced eliminating risks that leaks would recur over the long-term. The reduction in infiltration and groundwater flux under this alternative optimizes conditions for ongoing natural attenuation of arsenic, reducing the likelihood that the contingent PRB will be required. If the PRB is required, the lifespan of the treatment media will be improved relative to other alternatives with higher groundwater flux rates.</p>	<p>This alternative has a medium score for short-term risk management. It involves more extensive construction activities during the perched water drain installation and initially during cap installation than under Alternatives 1, 2, 3, or 4. Construction-related risks are lower than under Alternative 5, because the quantity of arsenic-contaminated soils workers will be exposed to will be much less. The alternative includes significant on-site construction activities, but does not involve extensive off-site transportation of contaminated soils as under Alternative 5.</p>	<p>Alternative 3A has the highest score for implementability because it integrates best with property development planning and current uses. Implementation of the perched water treatment in this alternative is expected to be less complex and requiring less long term maintenance as it is expected to discharge in situ.</p>	<p>Evaluation pending public comment.</p>	7.3	\$11.5M	0.63
	9	9	8	6	7	--			

**Table 2. Log Yard DCA Evaluation**

Remedial Alternative <sup>1</sup>	Protectiveness (25%) <sup>2</sup>	Permanence (20%)	Long-Term Effectiveness (20%)	Short-Term Risk Management (15%)	Technical and Administrative Implementability (10%)	Public Concerns (10%)	Environmental Benefit Score	Probable Cost <sup>3</sup>	Benefit Score / Probable Cost <sup>4</sup>
<b>Relative Ranking - Scored from 1 (lowest) to 10 (highest)</b>									

Notes:

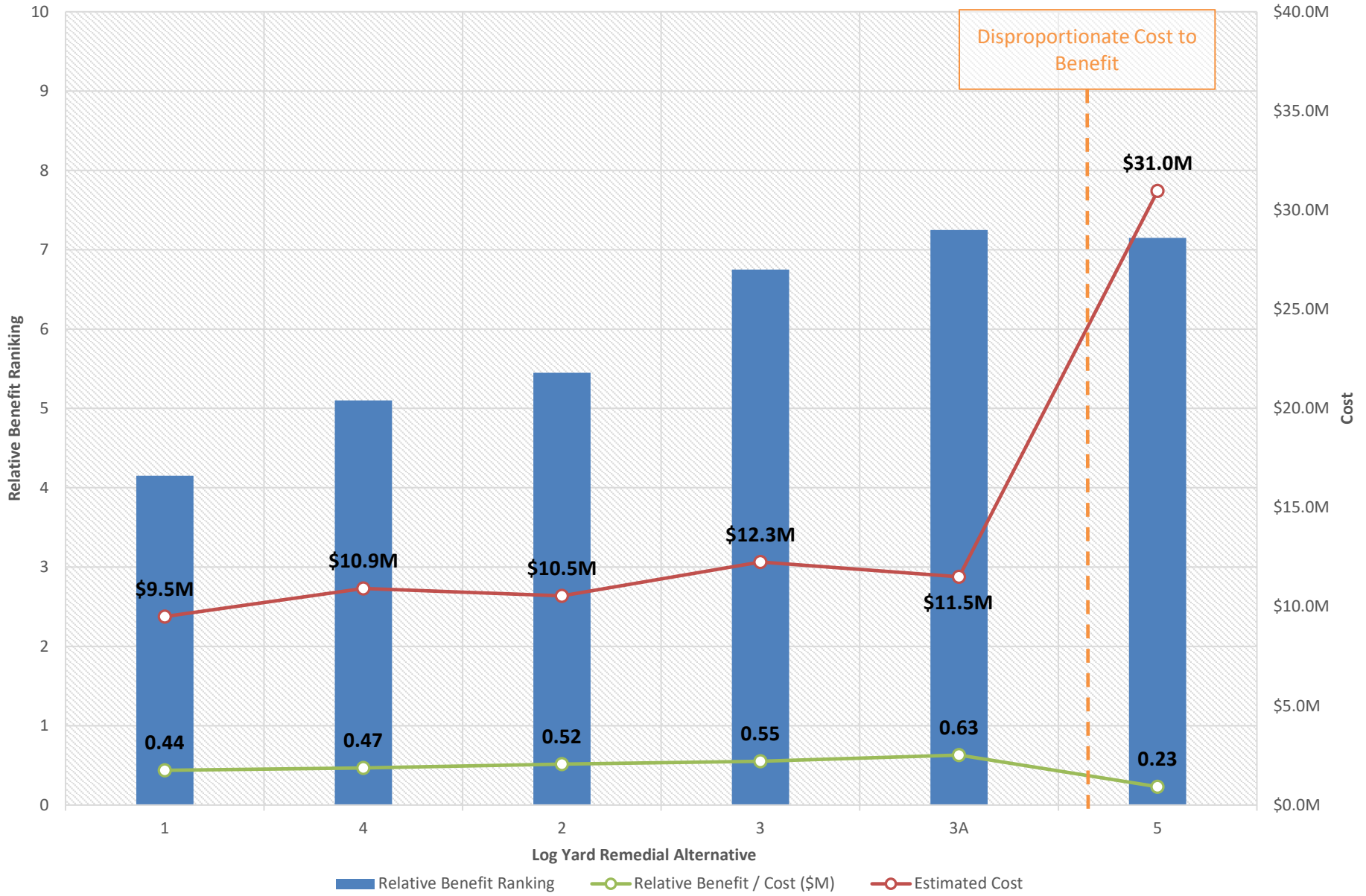
1. Consideration of public concerns is not addressed in this table because the public has not yet had an opportunity to provide comments.
2. Each of the DCA criteria listed were weighted, so the overall DCA score would be influenced by criteria directly relating to protectiveness and effectiveness. A score of 10 represents an alternative that satisfies the criteria to the highest degree.
3. Probable cost reflects the total estimated cost including applicable contingencies (see cost detail in Appendix A).
4. Probable costs were evaluated in increments of \$1 million for comparison to benefit scoring.
5. A formula error in the original FS cost estimating tables for Alternative 4 was corrected as part of this FS Addendum effort, correspondingly Alternative 4's cost has been updated.

PRB = permeable reactive barrier

MNA = monitored natural attenuation

Revised Figure 6 from FS Addendum

# Disproportionate Cost Analysis



# Appendix C

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## Revised Environmental Benefit Table and DCA Figure

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Table 8. Sawmill DCA Evaluation (revisions shown in red font)

Remedial Alternative <sup>1</sup>	Protectiveness (25%) <sup>2</sup>	Permanence (20%)	Long-Term Effectiveness (20%)	Short-Term Risk Management (15%)	Technical and Administrative Implementability (10%)	Public Concerns (10%)	Environmental Benefit Score	Probable Cost <sup>3</sup>	Benefit Score / Probable Cost <sup>4</sup>
Relative Ranking - Scored from 1 (lowest) to 10 (highest)									
<b>Alternative 1</b> - MNA - Institutional Controls	Achieves a medium score for overall protectiveness through ongoing monitored natural attenuation.	Residual contamination can be permanently detoxified through natural processes. This alternative receives a medium-high score for permanent reduction of mass and toxicity of hazardous substances at the Site.	This alternative receives a medium score for effectiveness as the time to complete the cleanup is longer than under the other alternatives. Long term effectiveness of this alternative depends upon maintaining institutional controls until contaminants attenuate and degrade.	This alternative was scored high for short term risk management. This alternative does not require any ex situ handling of residual contamination as treatment would occur in situ. There are no additional construction-related risks requiring management.	This alternative is scored high for implementability. This alternative requires only routine site monitoring.	Evaluation pending public comment.	6.2	\$495K	1.24
	6	6	6	9	9	--			
<b>Alternative 2</b> - Enhanced Bioremediation - MNA - Institutional Controls	Achieves a medium score for overall protectiveness because injection of amendments is not expected to accelerate in situ biodegradation and natural attenuation great than would occur for Alternative 1.	This alternative receives a medium score for permanent reduction of mass and toxicity of hazardous substances at the Site. Injection of amendments is not expected to result in a faster rate than under Alternative 1.	This alternative receives a medium score for effectiveness because the time required to complete the cleanup is expected to be the same as Alternative 1. Long term effectiveness of this alternative depends upon maintaining institutional controls until contaminants attenuate and degrade.	This alternative was scored medium-high for short term risk management. This alternative does not require any ex situ handling of residual contamination as treatment would occur in situ. However, some handling of corrosive chemicals would be required during amendment injection.	This alternative is scored high for implementability. Neutralization agents and injection mechanisms are well-developed technologies that could be rapidly procured and implemented.	Evaluation pending public comment.	5.9	\$539K	1.09
	6	6	6	8	8	--			
<b>Alternative 3</b> - Expanded Excavation and Off-Site Disposal - Temporary Groundwater Extraction and Treatment - MNA - Institutional Controls	Achieves a high score for overall protectiveness by reducing residual contaminant mass through excavation and temporary groundwater treatment, reducing the expected timeline until residual contamination is below cleanup levels in all wells.	This alternative receives a high score for rapid removal of remaining groundwater contamination at the Site, relative to Alternatives 1 or 2.	This alternative receives a high score for long-term effectiveness because it has shortest restoration time-frame and interim institutional controls are not likely required for groundwater.	This alternative was score medium for short term risk management. Excavation and ex situ treatment are included as remedial elements in this alternative. Ex situ handling of contaminated media creates short term exposure potential for site workers or fugitive emissions.	This alternative is scored medium for implementability. The alternative will require management of stormwater and extracted groundwater during construction, and off-site management of excavated soils.	Evaluation pending public comment.	7.1	\$742K	0.96
	9	9	9	5	5	--			

Notes:

1. Consideration of public concerns is not addressed in this table because the public has not yet had an opportunity to provide comments.
  2. Each of the DCA criteria listed were weighted, so the overall DCA score would be influenced by criteria directly relating to protectiveness and effectiveness. A score of 10 represents an alternative that satisfies the criteria to the highest degree.
  3. Probable cost reflects the total estimated cost including applicable contingencies (see cost detail in Appendix C).
  4. Probable costs were evaluated in \$100,000 increments for comparison to benefit scoring.
- MNA = monitored natural attenuation

Revised Figure 14 from Feasibility Study

### Disproportionate Cost Analysis

