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TECHNICAL MEMORANDUM

Date:	November 17, 2009
To:	Lynn Price, P.E - City of Bremerton
From:	David Dinkuhn, P.E. DLD
Subject:	Summary of Brownfields Assessment Work
cc:	Phil Williams - City of Bremerton Joanne LaBaw - EPA
Project Number:	235-1896-087
Project Name:	Old Bremerton Gasworks Site

SUMMARY OF BROWNFIELDS ASSESSMENT WORK – OLD BREMERTON GASWORKS SITE BREMERTON, WASHINGTON

This technical memorandum summarizes recent Brownfields Assessment (BA) work completed for the Old Bremerton Gasworks site located at 1725 Pennsylvania Avenue in Bremerton Washington. The purpose of the summary is to provide stakeholders with a concise roll up of the assessment results and cleanup cost estimates developed. Assessment work was performed under a United States Environmental Protection Agency (EPA) Brownfields Assessment (BA) grant awarded to the City of Bremerton in 2006 (Cooperative Agreement No. BF – 9604651 – 0). All assessment work was conducted according to the EPA-approved work plan (Bremerton 2006).

The Old Bremerton Gasworks Site consists of three private parcels referred to as the McConkey and Sesko properties. The purpose of the Brownfields Assessment was to investigate for potential contamination that may have been released at the site during past commercial/industrial activities. The site owners are interested in redeveloping the properties; bringing to light any potential issues regarding contamination is a necessary step in the formulation of redevelopment plans.

The City of Bremerton sponsored the Brownfields Assessment in the interests of cleaning up a potentially-contaminated shoreline property and assisting in the redevelopment efforts. The City does not currently own any potentially- impacted property with the possible exception of the road rights of way (ROWs) abutting the site.

Phase I Environmental Site Assessments

Techlaw 2006

The first assessment task performed was the performance of a Phase I Environmental Site Assessment (ESA) at each of the McConkey and Sesko properties. The purpose of the Phase I ESAs was to research the properties and identify potential environmental concerns prior to the collection of environmental samples under a follow-on Phase II ESA. Costs for this work were in excess of the funding available under the BA grant and were funded under EPA's Targeted Brownfields Assessment (TBA) grant program. The following property descriptions are based on information provided by the Phase I ESA reports (Techlaw 2006a;b).

The site was originally developed by the Western Gas and Utilities Corporation to provide the city of Bremerton with light, heat, and electricity by natural gas products. A coal gasification plant was in operation from approximately 1930 to 1956. The plant was fueled by shipments of coal delivered by boat. The gasification process may have started by processing the coal with high temperature and pressure, using boiler plant steam and measured amounts of oxygen. The final product (coal gas) was sent by pipeline to local residences in Bremerton. This site also was utilized for petroleum storage and distribution from approximately 1963 to 1985. Petroleum products were stored in above-ground storage tanks (ASTs) and distributed by underground pipeline or offloaded to vehicles. Aerial photographs suggest that the former gasification physical plant, boiler, and ASTs apparently were removed between 1985 and 1993.

The McConkey properties cover approximately 3.13 acres and currently contain five separate buildings, which are leased to a metal fabrication shop, piston ring shop, granite countertop workshop, and a welding shop. Past commercial uses include sheet metal fabrication, drum storage facilities, automotive and marine repair, metal salvage yard, painting/sandblasting activities, and petroleum bulk storage and distribution.

The Sesko property covers approximately 0.55 acres and is currently vacant but appears to be used as temporary storage for heavy equipment. The only structures on this property are the former foundations of the AST farm. The Sesko property was formerly utilized as a commercial AST and petroleum distribution facility. A bulk petroleum storage facility (ARCO, now owned by BP West Coast Products LLC) was previously located northwest of the McConkey properties. Currently, SC Fuels, a petroleum bulk storage facility, is located east of the Sesko property and Pennsylvania Avenue. Historical data in Washington State Department of Ecology (Ecology) files indicate that petroleum releases have occurred at the SC Fuels facility.

Phase II Environmental Site Assessments

GeoEngineers 2007

GeoEngineers developed a sampling program for the site based on the Phase I ESA results (GeoEngineers 2007). Eight groundwater monitoring wells were installed at locations of concern (MW-1 through MW-8). Soil samples were collected from multiple depths within the soil borings drilled for the wells and a groundwater sample was collected from each well. Samples were analyzed for contaminants of concern (COCs) including petroleum, heavy metals, and constituents associated with coal tar. Of particular concern when coal tar is present are carcinogenic polycyclic aromatic hydrocarbons (cPAHs). Contaminants were detected in soil and groundwater at concentrations exceeding potentially-applicable cleanup levels in seven of the eight wells. The soil contamination was detected from near the ground surface to depths as great as 35 feet below ground surface (bgs). Refer to Figure 1 for a site plan showing wells locations.

Ecology and Environment 2008/2009.

Ecology and Environment (E&E) performed additional sampling in 2008 to supplement the GeoEngineers study (E&E 2009). This work was performed under the TBA similar to the Phase I ESAs. A total of seven soil borings were installed and soil and groundwater samples were collected from each boring (MP01 through MP04 and SP01 through SP03; Figure 1). Two of the borings (MP04 and SP02) were completed as monitoring wells. The samples were analyzed for COCs similar to the GeoEngineers study. Soil contaminants exceeded potential cleanup levels in four borings; groundwater contaminants exceeded potential cleanup levels in six borings.

E&E also collected five sediment samples from the shoreline below the site along Port Washington Narrows (WN01 through WN05; Figure 1). The sediment samples were analyzed for heavy metals and semi-volatile organic compounds including cPAHs. Four of the five samples (WN01 through WN04) contained cPAHs at concentrations that could potentially trigger a sediment cleanup under Ecology's Sediment Management

Standards. In addition to the sediment contamination, E& E reported that "product seeps" were visible on the beach in the vicinity of samples WN01 through WN03.

Summary and Cleanup Cost Estimates

Soils containing petroleum and cPAHs at concentrations in excess of potential cleanup levels are prevalent throughout the northern half of the site. Groundwater containing these contaminants and heavy metals is present in the same location with a slightly larger area of impact. Soil contamination appears to extend from near the ground surface to depths as great as 35 feet bgs. The deeper contamination extends to the approximate average depth of the groundwater table. Petroleum floats on water and would migrate downward only until it encountered the groundwater table, at which point it would migrate laterally.

Contamination from coal gasification wastes appeared as "charcoal pieces" and "creosote odor" according to the soil boring logs and was observed to depths of 10 to 15 feet.

Sediment contamination is present at the site and appears to be bounded by the WN05 location to the west. The limits of sediment contamination in the easterly direction have not been determined.

Cleanup levels have not been established at the site but would likely include Model Toxics Control Act (MTCA) Method A cleanup levels. An estimated footprint of soil contaminated above these levels is shown on Figure 1. The footprint is approximately 1.5 acres in area. Approximate depths of contaminated soil in each boring are provided on Figure 1. Assuming soil between 3 feet bgs and the depths shown is contaminated above cleanup levels, an estimated 50,000 tons of contaminated soil are present on site.

E&E provided estimated cleanup costs for three alternatives as summarized below:

- **Alternative 1**: Hot Spot Excavation and Monitoring Well Installation - **$338,984**. Lowest cost option that includes limited removal of the worst soils and new well installation to allow for collection of additional data to aid in future decision making.

- **Alternative 2**: Hot Spot Excavation and Groundwater Pump and Treat - **$973, 331.** This mid-range cost option would add an active groundwater treatment system to Alternative 1 to prevent migration of contaminated groundwater to Port Washington Narrows. The system would be operated for 5 years.

- **Alternative 3**: Dredging of Shoreline Sediments, Installation of an Upland Barrier Wall, and Installation of an Upland Asphalt Cap - **$2,867,432.** High-range cost option that would add a barrier wall, asphalt cap, and sediment dredging to Alternatives 1 and 2.

Tables 4-1 and 4-2 containing detailed descriptions of the rational and approaches for these alternatives are attached.

A fourth alternative involving complete removal of contaminated soil was developed for this memorandum to provide a worst case "upper bound" cost. Removal of the contaminated soil would be considered a permanent solution and is preferred under MTCA cleanup regulations.

- **Alternative 4**: Excavate and Remove all Contaminated Soil - **$6,364,769**. Assumptions include: All contaminated soil from within the footprint shown on Figure 1 will be removed. Excavation sidewalls will be sloped and shoring will not be required. Soils can be disposed of as remediation waste and not dangerous/persistent waste. Dewatering will be required to completely remove soils from the groundwater table depth. Contaminated soil will be replaced with compacted structural fill to original grade.

A spreadsheet showing a detailed cost breakdown is attached.

References

Bremerton. 2006. EPA Brownfields Grant Assessment Work Plan for Old Bremerton Gas Plant Park & Property Development, Final. EPA project Number 560-F-06-201. Prepared for the United States Environmental Protection Agency, Seattle Washington. July 23.

E&E. 2009. Final Bremerton Gasworks Targeted Brownfields Assessment Report, Bremerton, Washington, Technical Direction Document Number: 07-01-0008. Prepared for the United States Environmental Protection Agency, Seattle, Washington. August.

GeoEngineers. 2007. Preliminary Upland Assessment Report McConkey/Sesko Site, 1725 Pennsylvania Avenue, Bremerton, Washington. Prepared for the United States Environmental Protection Agency, Seattle, Washington October 26.

Techlaw. 2006a. Old Bremerton Gasworks Site, Sesko Property, Targeted Brownfields Assessment, Bremerton, Washington. Prepared for the United States Environmental Protection Agency, Seattle, Washington. November 10.

Techlaw. 2006b. Old Bremerton Gasworks Site, McConkey Properties, Targeted Brownfields Assessment, Bremerton, Washington. Prepared for the United States Environmental Protection Agency, Seattle, Washington. November 10.

ALTERNATIVE 4 CLEANUP COST ESTIMATE - SOIL REMOVAL

OLD BREMERTON GASWORKS SITE

BREMERTON, WASHINGTON

Parametrix

By: D. Dinkuhn

Date Prepared 11/17/09

Checked: B. Hardy

CONSTRUCTION COSTS	NO. UNITS		UNIT COST	COST
Mobilization (5%)	1	LS	$235,500	$235,500
TESC	1	LS	$10,000	$10,000
Building Demolition	1	LS	$100,000	$100,000
Excavate, Stockpile, Backfill Overburden	7,200	CY	$14.00	$100,800
Excavate and Dispose of Contaminated Soils	50,000	TN	$70.00	$3,500,000
Backfill and Compact Imported Pit Run	50,000	TN	$20.00	$1,000,000
Excavation Dewatering	1	LS	$150,000	$150,000
Sales Tax (8.6%)				$438,282
Contingency (15%)				$830,187
Total Construction Costs				**$6,364,769**

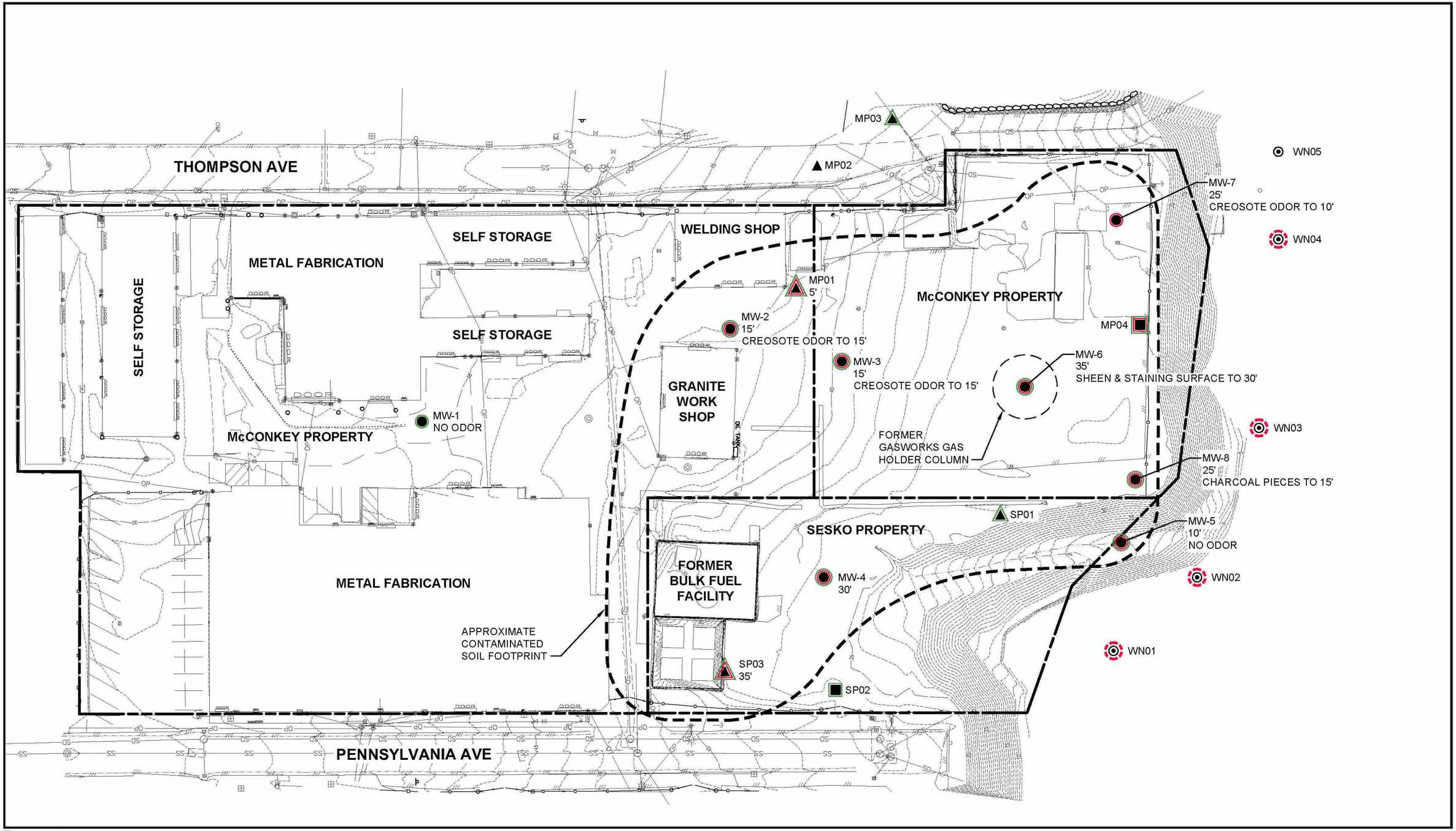
Table 4-1 Cleanup Estimate Option and Rationale

Cleanup Action	Rationale
Option 1 - Excavation of contaminated soil and monitoring well installation	Lowest cost option: removing contaminated soil and collection of additional data for future remediation decision making purposes.
Option 2 - Excavation of contaminated soil and installation of a pump and treat groundwater system	Mid-range cost option: collecting additional data, removing contaminated soil, and treating groundwater. This option immediately addresses upland contamination.
Option 3 - Dredging of shoreline sediments, installation of an upland barrier wall, and installation of an upland asphalt cap.	High range cost, the most comprehensive option: addresses removal of contaminated soils, sediments, and groundwater. This option also prevents residual contamination from migrating into the lowland sediments.

Table 4-2 Preliminary Cost Estimate for Cleanup Action

Remediation Options	Description	Estimated Cost
Option 1	**Excavation of hot spot contaminated soil and monitoring well installation**	
	Soil Excavation and Off-Site Disposal (hazardous waste) - assumes excavation of 2 upland hot spots (600 cubic yards total); offsite disposal at hazardous waste facility; backfilling; decontamination facilities; analytical testing	$183,466
	Monitoring Well Installation - Install 4 monitoring wells to 45' bgs (includes initial subsurface soil sampling/analysis, and one year of groundwater monitoring)	$102,582
	Subtotal	**$286,048**
	Contingency[a] (+15%)	$42,907
	2009 Inflation adjustment[b]	$10,029
	Total	**$338,984**
Option 2	**Excavation of hot spot contaminated soil and installation of a pump and treat groundwater system**	
	Soil Excavation and Off-Site Disposal (hazardous waste) - assumes excavation of 2 upland hot spots (600 cy total); offsite disposal at hazardous waste facility; backfilling; decontamination facilities; analytical testing	$183,466
	Monitoring Well Installation - assumes 4 monitoring wells to 45' bgs (includes sampling/analysis)	$42,587
	Groundwater Treatment - assumes 150' x 350' contamination plume; pump and treat with filtration and 2 carbon vessels (in series) w/ treated water discharge to POTW	$148,804
	Groundwater Treatment O&M and Monitoring- assumes 5 year operation and monitoring	$446,477
	Subtotal	**$821,334**
	Contingency[a] (+15%)	$123,200
	2009 Inflation adjustment[b]	$28,797
	Total	**$973,331**
Option 3	**Dredging of shoreline sediments, installation of an upland barrier wall, and installation of an upland asphalt cap.**	
	Soil Excavation and Off-Site Disposal (Haz) - assumes excavation of 2 upland hot spots (600 cy total); offsite disposal at haz facility; backfilling; decontamination facilities; analytical testing	$183,466
	Monitoring Well Installation - assumes 4 monitoring wells to 45' bgs (includes sampling/analysis)	$42,587
	Groundwater Treatment - assumes 150' x 350' contamination plume; pump and treat with filtration and 2 carbon vessels (in series) with treated water discharge to POTW	$148,804
	Groundwater Treatment O&M and Monitoring - assumes 5 year operation and monitoring	$446,477
	Barrier Wall - assumes soil bentonite barrier wall (i.e., slurry wall) around GW plume; dimensions: 1000' long x 60' deep with 12" protective gravel cover	$539,517
	Upland Cap - assumes cap dimensions 150' x 350'; HDPE geomembrane with drainage/protection layer overlain with 3" thick asphalt surface layer (includes gas vents and perimeter security fence)	$411,935
	Sediment Dredging - assumes nearshore sediment dredging using water-based equipment; includes bathymetric surveying (pre and post construction), sediment BMPs (e.g., booms, silt curtains, etc.), and sediment dewatering; dredge area 50' x 350' x 4' deep or approx. 2600 cubic yards	$453,126
	Sediment Disposal - assumes offsite transportation and disposal of dredged sediment (following dewatering/solidification) at non-haz facility; 2600 cubic yards	$193,737
	Subtotal	**$2,419,649**
	Contingency[a] (+15%)	$362,947
	2009 Inflation adjustment[b]	$84,836
	Total	**$2,867,432**

Notes:
1. Costs estimates developed using Remedial Action Cost Engineering and Requirements (RACER®), 2008, Software System for Windows
2. Estimates do not include additional study/investigation (e.g., RI/FS), design, long term monitoring, 5 year reviews, site closeout, etc.
3. Costs includes direct costs plus a location modifier of 1.021 (Washington State Average) and overhead and profit (25% field office overhead, 10% subcontractor profit, and 15% prime profit).
[a] The 15% contingency allows for unforeseen costs.
[b] Inflation mark up estimated using the RSMeans Historical Cost Index inflation mark up from 2008 to the first quarter of 2009



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SCALE IN FEET

LEGEND:

- Sediment Sample Location (E&E 2008)
- Monitoring Well Location (Geoengineers 2007)
- Soil Boring Location (E&E 2008)
- Monitoring Well Location (E&E 2008)
- MTCA A Cleanup Levels Exceeded in Soils
- MTCA A Cleanup Levels Exceeded in Groundwater
- Approximate Property Lines
- 15' Approximate Depth of Contaminated Soil
- Sediment Management Standards Cleanup Levels Potentially Exceed in Sediment

NOTE:

Contour Datum NAVD 88

Figure 1
Old Bremerton Gas Works Site
Site Plan