

SITE HAZARD ASSESSMENT

Worksheet 1

Summary Score Sheet

SITE INFORMATION:

Family Fun Center

7300 Fun Center Way (15031 & 15034
Monster Rd SW)

Tukwila, King County, WA 98188

Cleanup Site ID: 385

Facility/Site ID: 18434384

Section: 23N

Latitude: 47.46564

Township: 04E

Longitude: -122.24345

Range: 24

Tax/Parcel ID: 2423049063, 2423049013,
2423049092

Site scored/ranked for the Hazardous Sites List Publication: February 2019

SITE DESCRIPTION:

The Family Fun Center site (Site) is a amusement park located in Tukwila, King County, Washington. The 14.38-acre property is located approximately 15 feet from the Green River, and zoned for commercial/light industrial (C/LI) use.

The Family Fun Center Site is located in the northeastern corner of the intersection of Interurban Avenue S and S Grady Way in Tukwila, Washington, with the current street address of 7100 to 7300 Fun Center Way (Property). Historically, the Property was occupied by multiple residences and businesses, which were associated with multiple street addresses. These historic street addresses included 15031 and 15034 Monster Road SW (for Renton Sand and Gravel), and 7100 to 7170 SW Monster Road (for other residences and businesses).

The Property is bounded by the Interurban Trail and the Green River to the north, with a hotel building and an office building beyond. The Property is bounded by Burlington Northern Santa Fe (BNSF) railway tracks and Monster Road SW to the east, with a warehouse building beyond. The Property is bounded by BNSF tracks, S Grady Way and Interstate 405 to the south, with a hotel and a warehouse building beyond. The Property is bounded by Fun Center Way to the west, with an undeveloped property and Interurban Avenue S (State Route 181) beyond. The Property location is presented on Figure 1.

The Site is currently operated as an amusement park by Family Fun Center Tukwila LLC.

The Family Fun Center Site consists of the Property, and potentially City of Tukwila property including S Grady Way to the south. Currently, the Site boundary is not fully defined.

The Property consists of three parcels (Parcels 1, 2, and 3, from west to east). Among the three parcels, Parcel 1 is a 2.56-acre parcel, with a parcel number of 2423049092, and a street address of 7100 Fun Center Way. Parcel 1 is currently owned by H2 Office LLC, and occupied by a one-story retail and office building. The current building occupants include two restaurants (Subway and Taco Del Mar), a dentistry, and a chiropractic clinic. Parcel 2 is a 3.57-acre parcel, with a parcel number of 2423049013, and a street address of 7200 Fun Center Way. Parcel 2 is currently owned by Charles Lee and Suk Hyon, and occupied by a four-story hotel building and associated parking lot (Comfort Suites). Parcel 3 is a 8.25-acre parcel with a parcel number of 2423049063, and a street address of 7300 Fun Center Way. Parcel 3 is currently occupied by a two-story amusement park (Family Fun Center). The current layout of the three parcels of the Property is presented on Figure 2.

SITE BACKGROUND:

A summary of prior operations/tenants at the subject property is presented below.

<u>From</u>	<u>To</u>	<u>Operator/Tenant</u>	<u>Activity</u>
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1901	1998	Nielson Family	Parcel 2 & 3 - Multiple single family residences and commercial activities, including a plant nursery, a milk processing plant (1950s - 1989), a boat and automotive repair shop (1978 - 1989), and Renton Sand and Gravel (at least 1970s to 1993)
1910	1998	Multiple; final owner D. Michael Dunne	Parcel 1 - Vacant
1998	2001	Family Fun Center Tukwila LLC	Parcel 2 - Vacant
1998	2003	Family Fun Center Tukwila LLC	Parcel 1 - Vacant
2001	2007	H2 Hotel LLC	Parcel 2 - Comfort Suites hotel
2003	2008	H2 Office LLC	Parcel 1 - Vacant
1998	2018	Family Fun Center Tukwila LLC	Parcel 3 - Family Fun Center amusement park
2007	2018	Charles Lee and Suk Hyon	Parcel 2 - Comfort Suites hotel
2008	2018	H2 Office LLC	Parcel 1 - A commercial building, with tenants include Subway, Taco Del Mar, Sunrise Dental, and Washington Chiropractic

SITE CONTAMINATION:

In 1997 the Family Fun Center site was reported to Washington State Department of Ecology (Ecology) and placed on the Confirmed and Suspected Contaminated Sites List (CSCSL).

The Property was redeveloped in 1998 and 1999. Prior to the redevelopment, the Property was occupied by five residences with ancillary buildings, one auto repair shop, one barn, one former nursery retail shop, and one milk processing plant and shed. Most of these building structures were located on Parcel 3, except the barn located on the southern portion of Parcel 2. A Phase I and Phase II Environmental Site Assessment (ESA) was performed at the Property in 1997. The ESA identified the following potential sources of contamination:

1. Petroleum hydrocarbon contamination from historic Site uses. One gasoline underground storage tank (UST), two heating oil USTs, and one diesel aboveground storage tank (AST) were located on Parcel 3 near the former milk processing plant and two residences. One waste oil drum, one heating oil AST, and one oil dump were located on the northern portion of Parcel 3 and southern portion of Parcel 2 near the former auto repair shop. Concentrations of gasoline, diesel- and heavy-oil range petroleum hydrocarbons (TPHg, TPHd and TPHo), and carcinogenic polycyclic aromatic hydrocarbons (cPAH) were detected above the MTCA Method A cleanup levels in shallow soils between 0.5 and 1 foot below ground surface (bgs) near the auto repair shop. TPHd and TPHo were also detected above the MTCA Method A cleanup levels in groundwater near the former diesel AST.

2. The eastern portion of Parcel 3 was covered with an 80,000-cubic-yard-plus stockpile generated by the operation of Renton Sand and Gravel. Concentrations of TPHd, TPHo, and chromium were detected at elevated concentrations (below the MTCA Method A cleanup levels) in soil at 30 feet bgs in this area.

3. Steel slag fill was reportedly brought to the northern portion of the Property by Renton Sand and Gravel. The slag fill was also observed at the ground surface along the gravel road bisecting Parcels 2 and 3, and on many of the driveways to the residential buildings. Metals including arsenic and chromium were detected above the MTCA Method A cleanup levels in shallow soils between 0.5 and 1 foot bgs near the auto repair shop. In

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Summary Score Sheet

addition, arsenic was detected at concentrations above the MTCA Method A cleanup level in groundwater at the northern portion of the Property. Arsenic was also previously (in 1996) detected in groundwater at concentrations above the MTCA Method A cleanup level at the southeast corner of the Property.

Locations of these source areas and other Site features prior to redevelopment are shown on Figure 3.

REMEDIATION ACTIVITIES:

Remedial soil excavation was conducted at the Site in 1998 and 1999, concurrent with the Property redevelopment. The details of the cleanup actions are described below.

1. Four USTs were removed from Parcel 3 prior to the soil excavation, including one 300-gallon heating oil UST, one 650-gallon heating oil UST, one 1,000-gallon heating oil UST, and one 500-gallon gasoline UST. Three ASTs were also removed from the Site prior to the soil excavation, including one 100-gallon AST, one 275-gallon AST, and one 300-gallon AST. In addition, one 300-gallon oil UST and three 55-gallon drums (one containing waste oil) were removed from the Site during the soil excavation. The soil sampling results indicated TPHg and benzene concentrations above the MTCA Method A soil cleanup levels remained at the 500-gallon gasoline UST excavation at 7 feet bgs. This area was identified as one of the "hot spots" (hot spot G) and later over-excavated.

2. Hot spots A through H were identified in the Phase I&II ESA and UST removal activities. Approximately 1,370 cubic yards of contaminated soil was excavated from these hot spots. The hot spot locations are presented on Figure 4. Soil at the hot spots was excavated to maximum depths ranging from 1.5 feet bgs (at hot spot A and C) to 18 feet bgs (at hot spot F). Among them, Approximately 260 cubic yards of soil was excavated from hot spots A, B, C, E, F, and I, and disposed of off Site. Disposed soil was confirmed or suspected to contain elevated concentrations of pesticide (hot spot A), metals (hot spot B and E), cPAHs (hot spot C and F), and creosote (hot spot I). Approximately 1,100 cubic yards of soil and slag were excavated from hot spots D, F and H, as well as from then-existing gravel road and driveways. These soils and slag were confirmed or suspected to contain TPHd and TPHo contamination, and were placed as fill under the cap in the south parking lot of Parcel 3. Another approximately 10 cubic yards of soil was excavated from hot spot G. This soil was confirmed to contain TPHg and benzene contamination, and was aerated and then used as construction fill on Parcel 3. The post-excavation soil samples indicated no petroleum hydrocarbon concentrations above the MTCA Method A soil cleanup levels remained in these hot spots. Chromium concentrations up to 97.1 milligrams per kilogram (mg/kg) remained in hot spot E between 14 and 15.5 feet bgs.

3. The stockpile formerly located on the eastern portion of Parcel 3 contained TPHd and TPHo concentrations up to 1,726 mg/kg. Approximately 500 cubic yards of soil suspected of containing petroleum hydrocarbon concentrations above the then calculated Site-specific Method B cleanup level of 2,984 mg/kg was segregated from the stockpile based on field screening. Segregated soil was placed as fill under the cap in the south parking lot of Parcel 3. Among the remaining stockpile soil, approximately 4,100 cubic yards of soil was placed on the City of Tukwila property, including beneath S Grady Way, adjacent to the southern Property boundary, and at the southwest entrance to the Site. The rest of the soil was graded onto parcels 1, 2, and 3, which brought the overall Site grade to an average of 30 feet in elevation, up from the average initial 23 feet in elevation. The area with petroleum hydrocarbon contaminated soil capped in place is presented on Figure 2.

Three groundwater monitoring wells (MW-20 through MW-22) were installed along the northern Property boundary (downgradient) in 2002 after the Property redevelopment and remedial soil excavation. These monitoring wells were sampled between April 2002 and January 2005. Petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylenes (BTEX) were not detected in the groundwater samples. Concentrations of arsenic, lead, and chromium were detected above the MTCA Method A groundwater cleanup levels in groundwater of all three monitoring wells. The groundwater metal concentrations in these monitoring wells are presented in Table 1. Groundwater samples collected from a monitoring well (MW-19) installed at the southeast portion of the Property (upgradient) in 1997 did not contain detectable dissolved arsenic concentrations. Therefore, it is likely the elevated metal concentrations in the downgradient wells MW-20 through MW-22 are from on-Site sources. The exact on-Site sources are unknown; but it is likely associated with the steel slag present on the Property.

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CURRENT SITE CONDITIONS:

The Site is connected to city water, sewer and storm water systems. One public water supply well from Highline Water District (McMicken Heights Well) is located approximately 1.9 mile southwest of the Site. Based on the separation of this well from the Site by the Green River, it is unlikely the shallow contaminated groundwater at the Site will reach the well.

The Interurban Trail, a recreational trail, is located adjacent to the northern Property boundary. Tukwila Park, a 6-acre park featuring a picnic area, a playground, and basketball and tennis courts, is located approximately 900 feet west of the Site. Fort Dent Park, a 54-acre park featuring a picnic area, playgrounds, hiking trails and a soccer field, is located approximately 1,000 feet north of the Site. The closest school is Albert Talley High School, which is located approximately 1.3 miles north of the Site.

There are 35 additional Ecology cleanup sites located within one mile of the Site. One is awaiting cleanup, eight are cleanup started, and 26 have received a No Further Action determination. The closest cleanup site is the Gull 240 Site, located approximately 800 feet south of the Site. The Gull 240 Site is confirmed with TPHg and benzene above the MTCA Method A cleanup levels in soil and groundwater. The current status is cleanup started.

The approximate depth to groundwater is 18 to 23 feet below ground surface, with groundwater flowing to the north-northwest. Subsurface soils are sand, silt, and silty sand.

SPECIAL CONSIDERATIONS:

Checked boxes indicate routes applicable for Washington Ranking Method (WARM) scoring

☒ **Surface Water**

The Green River is located immediately north of the northern Property boundary. Metal-contaminated groundwater likely discharges directly to the Green River.

☐ **Air**

Considered for scoring, but not scored. See reasoning below.

☒ **Groundwater**

Residual petroleum hydrocarbon contaminated soil and slag are capped in place and will likely leach to groundwater if the cap is removed. In addition, groundwater is confirmed to be contaminated with arsenic, chromium, and lead.

Petroleum hydrocarbon contaminated soil and slag were capped in place at the south parking lot of Parcel 3 (Figure 2). A restrictive covenant was recorded with King County for Parcel 3 with Record Number 20001101001246. The restrictive covenant requires no use of the groundwater at the Parcel, and the cap over the contained soil and slag be maintained. The contained soil and slag were confirmed to contain TPHd and TPHo concentrations above the MTCA Method A soil cleanup levels. No TPHg or volatile organic compounds contamination has been detected in soil or groundwater. Due to the lack of volatile contaminants, the air route is not included in scoring.

One City of Renton public water supply well is located approximately 2.1 miles east of the Site. Because this well is outside of the 2-mile radius of the Site, it is not considered in scoring. Highline Water District's McMicken Heights Well is located approximately 1.9 miles southwest of the Site. Because this well is located on the west side of the Green River while the Site is located at the east side of the Green River, the well is not considered hydraulically connected to the groundwater at the Site, and is not considered in scoring.

Before the Property redevelopment, there was a detention pond present on the northern portion of the Property (Figure 3). The detention pond has been removed and the whole Property was paved during the Property redevelopment. Therefore the detention pond is not considered in scoring.

ROUTE SCORES:

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Surface Water/ Human Health: 29.8

Surface Water/ Environment: 48.3

Air/ Human Health:

Air/ Environment:

Groundwater/ Human Health: 42.0

Overall Rank: 1

REFERENCES:

- 1 ESRI. Accessed September 2018. World Annual Evapotranspiration Map. <https://www.esri.com/arcgis-blog/products/arcgis-online/mapping/world-average-annual-evapotranspiration-web-map-now-available/>
- 2 GeoEngineers, 2004/2005 Compliance Groundwater Sampling, Family Fun Center Site, Tukwila, Washington, July 6, 2005.
- 3 GeoEngineers, Phase I Environmental Site Assessment Report, Proposed Family Fun Center, Tukwila, Washington, August 12, 1997.
- 4 GeoEngineers, Phase II Environmental Site Assessment Report, Proposed Family Fun Center, Tukwila, Washington, November 17, 1997.
- 5 GeoEngineers, Report of Environmental Services, Compliance Monitoring Well Installation and 2002 Groundwater Sampling, Family Fun Center Site, Tukwila, Washington, November 15, 2002.
- 6 GeoEngineers, Report of Environmental Services, Underground Storage Tank Removal, Monitoring, Supplemental Subsurface Assessment and Research Findings, Family Fun Centers, Tukwila, Washington, April 22, 1998.
- 7 GeoEngineers, Restrictive Covenant, Family Fun Centers, Family Fun Center Site, 7300 Fun Center Way, Tukwila, Washington, November 1, 2000.
- 8 GeoEngineers, Revised Cleanup Action Report, Family Fun Center Site, Tukwila, Washington, February 19, 2002.
- 9 King County. Accessed November 2018. King County Official Records Search. <https://recordsearch.kingcounty.gov/LandmarkWeb/Home/Index>
- 10 King County. Accessed September 2018. King County iMAP. <http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx>
- 11 NOAA National Centers for Environmental Information. Accessed September 2018. Global Summary of the Year 2009 - 2017 for Renton Station. <https://www.ncdc.noaa.gov/cdo-web/>
- 12 USGS. Accessed September 2018. The national Map. <https://viewer.nationalmap.gov/advanced-viewer/>
- 13 WA Dept. of Ecology. Accessed September 2018. Water Rights Tracking System (WRTS). <http://ecyapwr/waterrighttrackingssystem/WaterRights/default.aspx>
- 14 WA Dept. of Ecology. Accessed September 2018. Well Report Viewer. <https://fortress.wa.gov/ecy/waterresources/map/WCLSWebMap/default.aspx>
- 15 WA Dept. of Ecology. Accessed September 2018. What's in My Neighborhood. <https://fortress.wa.gov/ecy/neighborhood/>
- 16 WA Dept. of Fish & Wildlife. Accessed September 2018. Priority Habitats and Species (PHS on the web). <http://apps.wdfw.wa.gov/phsontheweb/>
- 17 WA Dept. of Health Office of Drinking Water. Accessed September 2018. Find Water System. <https://fortress.wa.gov/doh/eh/portal/odw/si/FindWaterSystem.aspx>

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Worksheet 2

Route Documentation

Cleanup Site ID: 385

Family Fun Center

Facility/Site ID: 18434384

1. SURFACE WATER ROUTE

List those substances to be considered for scoring:

arsenic, lead, chromium

Explain the basis for choice of substances to be used in scoring:

Substances have been detected in groundwater and groundwater likely discharges directly to surface water.

List those management units to be considered for scoring:

Groundwater

Explain basis for choice of unit to be used in scoring:

Substances have been detected in groundwater.

2. AIR ROUTE

List those substances to be considered for scoring:

Not scored

Explain the basis for choice of substances to be used in scoring:

List those management units to be considered for scoring:

Explain basis for choice of unit to be used in scoring:

3. GROUNDWATER ROUTE

List those substances to be considered for scoring:

diesel, arsenic, lead, chromium

Explain the basis for choice of substances to be used in scoring:

Diesel-contaminated soil and slag were capped in place. Metals were detected in groundwater after the remediation activities were completed.

List those management units to be considered for scoring:

Soil, Groundwater

Explain basis for choice of unit to be used in scoring:

Substances have been detected in soil and groundwater.

Table 1 Summary of Groundwater Metal Analytical Data from 2002 to 2005

Monitoring Well	Date Sampled	Metals							
		Arsenic		Chromium		Lead		Nickel	
MTCA Method A Cleanup Levels		5		50		15			
		Total	Dissovled	Total	Dissovled	Total	Dissovled	Total	Dissovled
MW-20	4/1/2002	33	25	<10	<10	7	<4	<20	<20
	10/3/2002	72	55	<10	<10	<3	<3	<20	<20
	4/14/2004	20	<5	9	<7	7	<3	20	<20
	7/15/2004	40	26	62	<7	58	<3	40	<20
	11/4/2004	20	11	76	10	68	17	100	20
	1/19/2005	15	10	45	<7	20	<3	20	<20
MW-21	4/1/2002	170	77	10	<10	<4	<4	<20	<20
	10/3/2002	62	41	<10	<10	<3	<3	<20	<20
	4/14/2004	21	<5	10	<7	4	<3	<20	<20
	7/15/2004	19	10	59	<7	17	<3	<20	<20
	11/4/2004	21	21	15	7	7	5	<20	<20
	1/19/2005	50	15	<7	<7	3	<3	<20	<20
MW-22	4/1/2002	5	<5	<10	<10	<4	<4	<20	<20
	10/3/2002	12	6	<10	<10	<3	<3	<20	<20
	4/14/2004	9	<5	10	<7	9	<3	<20	<20
	7/15/2004	15	7	33	<7	30	<3	<20	<20
	11/4/2004	12	10	22	<7	17	14	20	<20
	1/19/2005	6	<5	10	<7	17	<3	30	<20

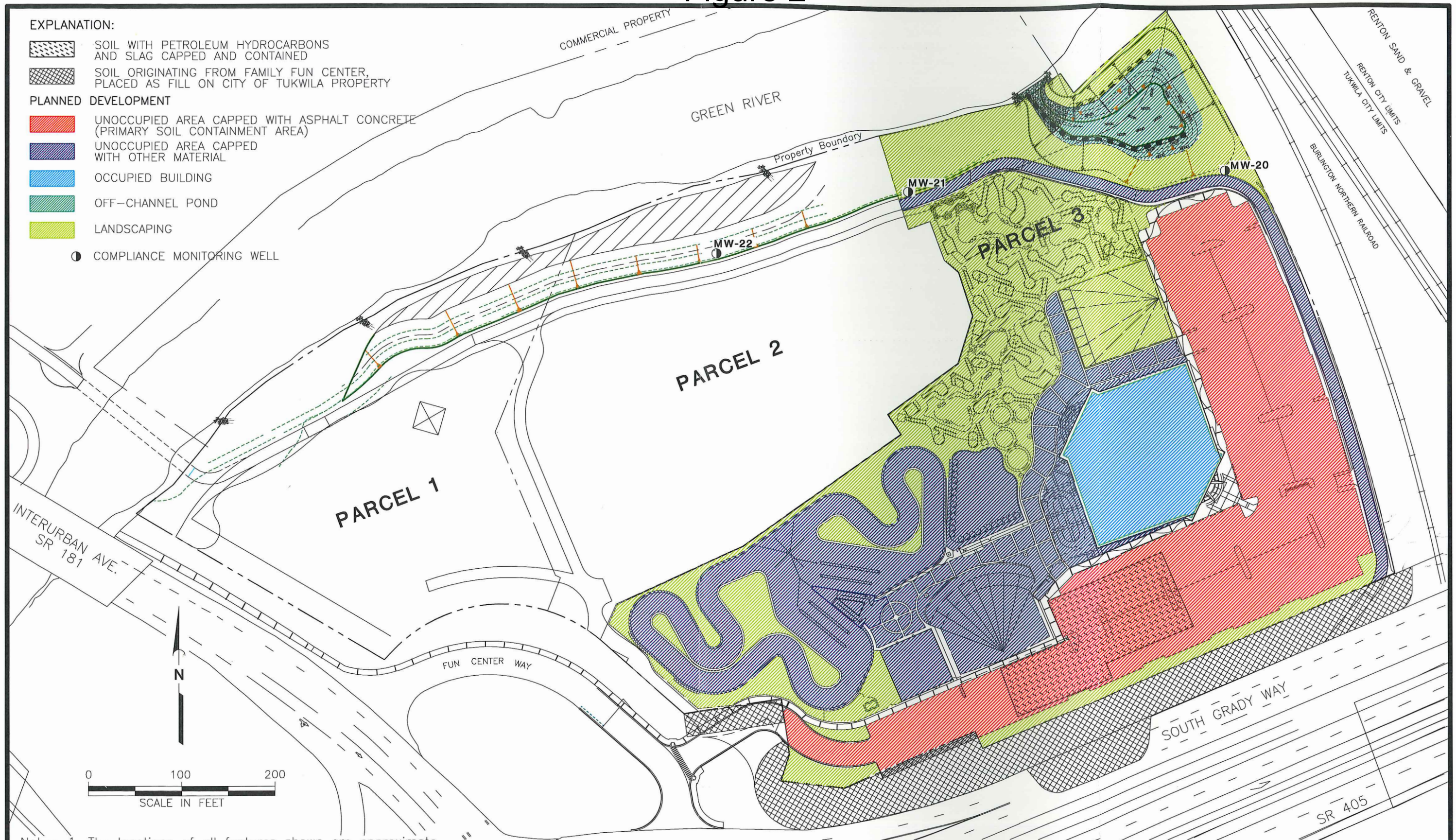
All results are in micrograms per liter (µg/L).

Bolded and shaded results are in excess of MTCA Method A cleanup levels for groundwater.

Figure 1



Figure 2



Notes: 1. The locations of all features shown are approximate.
 2. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document. Data were compiled from sources as listed in this figure. The data sources do not guarantee these data are accurate or complete. There may have been updates to the data since the publication of this figure. This figure is a copy of a master document. The master hard copy is stored by GeoEngineers, Inc. and will serve as the official document of record.

Reference: Drawing entitled "Overall Site Plan, Family Fun Center" by Mulvanny Partnership Architects, 01/27/99.

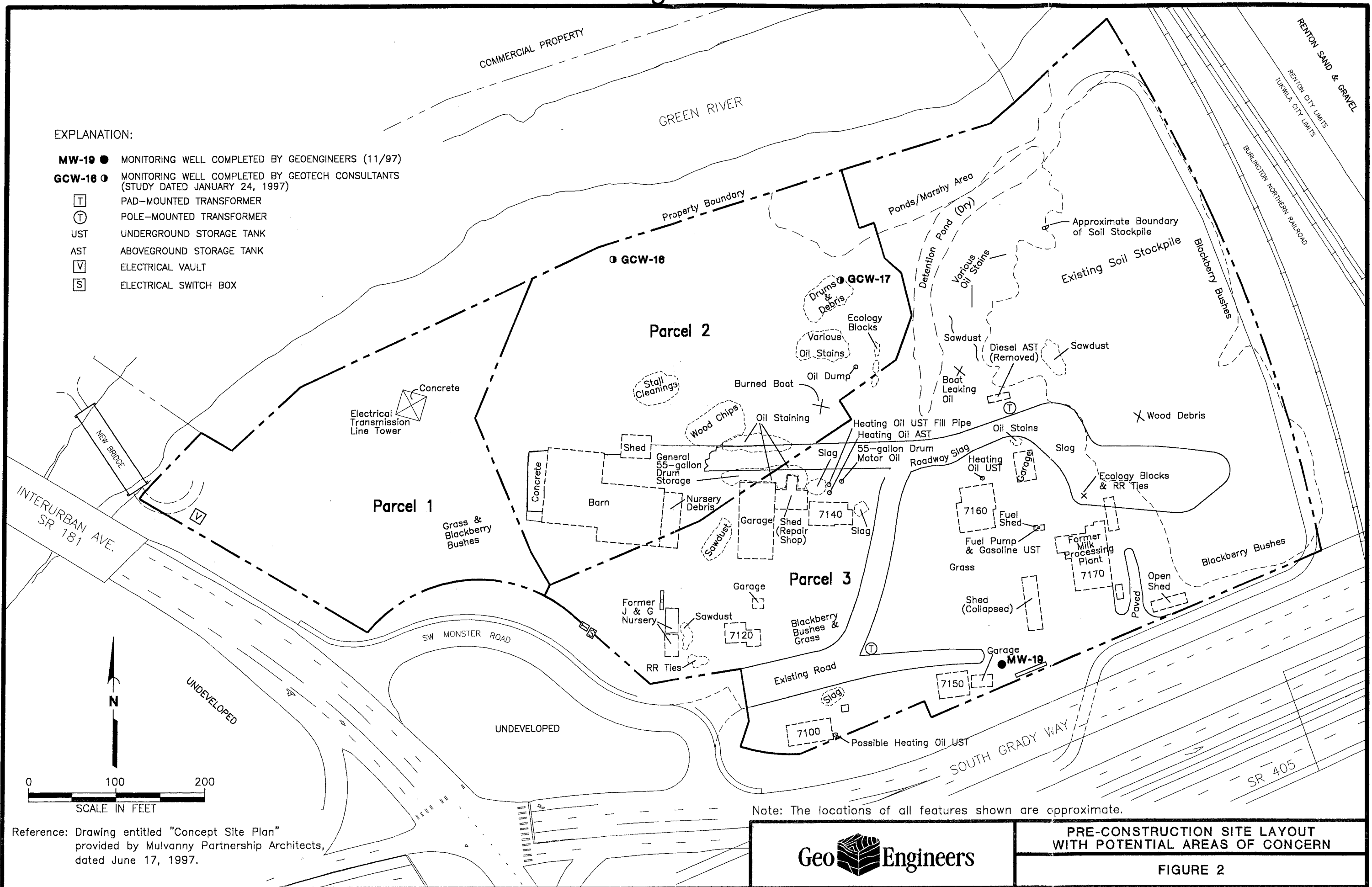
GEOENGINEERS

**SITE PLAN
FAMILY FUN CENTER FACILITIES**

FIGURE 1

EVER:\P\5\5925003\06\CAD\592500306A.DWG LJB:AKF 03/01/05

Figure 3



09/09/99

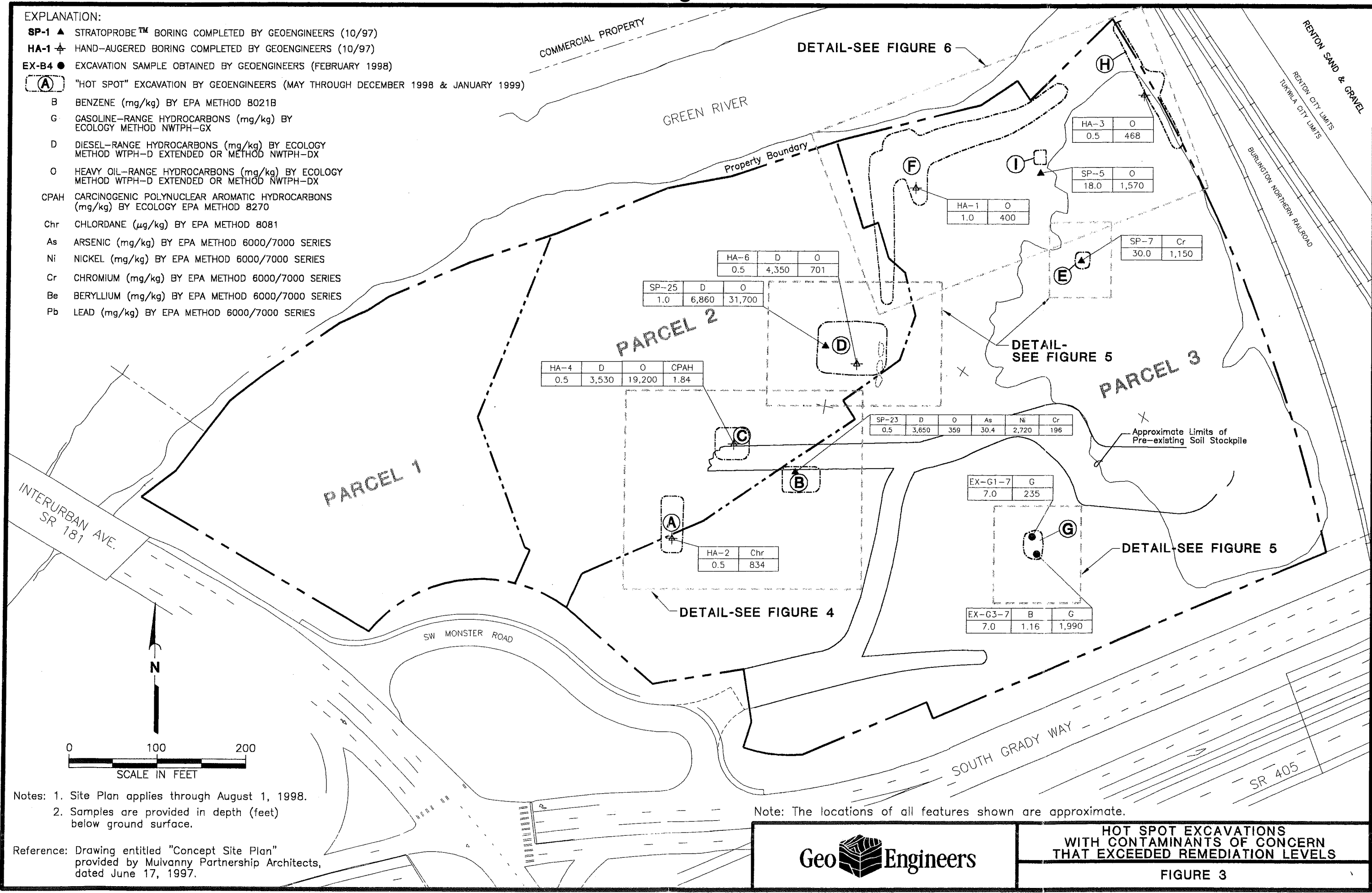
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LJB:KKT

Figure 4

EXPLANATION:

- SP-1 ▲ STRATOPROBE™ BORING COMPLETED BY GEOENGINEERS (10/97)
- HA-1 ⚡ HAND-AUGERED BORING COMPLETED BY GEOENGINEERS (10/97)
- EX-B4 ● EXCAVATION SAMPLE OBTAINED BY GEOENGINEERS (FEBRUARY 1998)
- ⓐ "HOT SPOT" EXCAVATION BY GEOENGINEERS (MAY THROUGH DECEMBER 1998 & JANUARY 1999)
- B BENZENE (mg/kg) BY EPA METHOD 8021B
- G GASOLINE-RANGE HYDROCARBONS (mg/kg) BY ECOLOGY METHOD NWTPH-GX
- D DIESEL-RANGE HYDROCARBONS (mg/kg) BY ECOLOGY METHOD WTPH-D EXTENDED OR METHOD NWTPH-DX
- O HEAVY OIL-RANGE HYDROCARBONS (mg/kg) BY ECOLOGY METHOD WTPH-D EXTENDED OR METHOD NWTPH-DX
- CPAH CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBONS (mg/kg) BY ECOLOGY EPA METHOD 8270
- Chr CHLORDANE (μg/kg) BY EPA METHOD 8081
- As ARSENIC (mg/kg) BY EPA METHOD 6000/7000 SERIES
- Ni NICKEL (mg/kg) BY EPA METHOD 6000/7000 SERIES
- Cr CHROMIUM (mg/kg) BY EPA METHOD 6000/7000 SERIES
- Be BERYLLIUM (mg/kg) BY EPA METHOD 6000/7000 SERIES
- Pb LEAD (mg/kg) BY EPA METHOD 6000/7000 SERIES



- Notes: 1. Site Plan applies through August 1, 1998.
2. Samples are provided in depth (feet) below ground surface.

Reference: Drawing entitled "Concept Site Plan" provided by Mulvanny Partnership Architects, dated June 17, 1997.

Note: The locations of all features shown are approximate.



HOT SPOT EXCAVATIONS
WITH CONTAMINANTS OF CONCERN
THAT EXCEEDED REMEDIATION LEVELS

FIGURE 3

09/09/99

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Worksheet 4

Surface Water Route

CSID: 18434384

Site: Family Fun Center

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human Toxicity

Substance	Drink. Wat. Std.		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
	Value (ug/L)	Score	Value (mg/kg)	Score	Value (mg/kg/day)	Score	Adj. CPTO (risk/mg/kg-day)	Score
Arsenic	10	8	763	5	3.00E-04	5	1.50E+00	7
Lead	15	6	<0.001	10	--	X	--	X
Chromium	100	6	--	X	3.00E-03	3	--	X

Maximum score: 10

Bonus points: 2

Source: WARM Toxicity Database

Human Toxicity Score: 12

Range: 1-12

1.2 Environmental Toxicity

Freshwater: Yes

Marine:

Substance	Acute Water Quality Criterion Value	
	(ug/L)	Score
Arsenic	340	4
Lead	15	6
Chromium	15	6

Maximum score: 6

Source: WARM Toxicity Database

Environmental Toxicity Score: 6

Range: 2-10

1.3 Substance Quantity

Amount: 0.6 acres

Basis: Estimated area of capped soil and slag contamination on Figure 2.

Source: Site Report

Substance Quantity Score: 8

Range: 1-10

2.1 Containment

Description:	Pathway is groundwater to surface water, and chemicals were detected in groundwater.	
Source:	Site Report	Containment Score: 10 Range: 0-10

SUBSTANCE PARAMETER CALCULATIONS

Human Health Pathway

SUBh (Human Toxicity + 3) x (Containment + 1) + Substance Quantity	173.0
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Environmental Pathway

SUBe (Environ. Toxicity + 3) x (Containment + 1) + Substance Quantity	107.0
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2.0 MIGRATION POTENTIAL

2.2 Surface Soil Permeability

Description:	Silt and sand mixtures	
Source:	Site Report	Soil Permeability Score: 3 Range: 1-7

2.3 Total Annual Precipitation

Amount (in.):	45.9	Annual Precipitation Score: 3
Source:	Mean annual precip (NOAA, 2009-2017 data)	Range: 1-5

2.4 Maximum Two-Year/24-Hour Precipitation

Amount (in.):	1.75	24-Hour Precipitation Score: 2
Source:	NOAA Atlas2	Range: 1-5

2.5 Flood Plain

Classification:	Northeast corner of Parcel 3 is in 100-yr flood plain	Floodplain Score: 2
Source:	King County iMap	Range: 0-2

2.6 Terrain Slope

Degree of slope:	1.80%	
Source:	The National Map (USGS)	Terrain Slope Score: 1 Range: 1-5

MIGRATION PARAMETER CALCULATION

MIG = Soil Permability + Annual Precip. + 24-Hour Precip. + Floodplain + Slope	11.0
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3.0 TARGETS

3.1 Distance to Surface Water

Name:	Green River	
Distance (ft):	90 ft	Distance to Surface Water Score: 10
Source:	King County iMap	Range: 0-10

3.2 Population Served within 2 Miles

Population:	0	Population Served Score:	0
Source:	WA DOH - water sources map	Range:	0-75

3.3 Area Irrigated within 2 Miles

Basis:	Searched 2 miles downstream on Green/Duwamish waterway		
Area (acres):	423	Area Irrigated Score:	15
Source:	Ecology WRTS database	Range:	0-30

3.4 Distance to Nearest Fishery Resource

Name:	Green River		
Distance (ft):	15 ft	Distance to Fishery Score:	12
Source:	PHS on the Web (WA Fish & Wildlife)	Range:	0-12

3.5 Distance to Nearest Sensitive Environment

Name:	Green River		
Distance (ft):	15 ft	Distance to Sensitive Environment Score:	12
Source:	PHS on the Web (WA Fish & Wildlife)	Range:	0-12

TARGET PARAMETER CALCULATIONS

Human Health Pathway

TARh: Dist. to Surface Water + Population Served + Area Irrigated 25.4

Environmental Pathway

TARe Dist. to Surface Water + Dist. to Fishery + Dist. to Sensit. Environ. 34.0

4.0 RELEASE

Evid. of release?	No surface water samples have been collected to confirm release.		
Source:	Site Report	Release Score (REL):	0.0
		Range:	0 or 5

SURFACE WATER ROUTE CALCULATIONS

Human Health Pathway

$SW_h = (SUB_h \times 40/175) \times [(MIG \times 25/24) + REL + (TAR_h \times 30/115)] / 24$ 29.8

Environmental Pathway

$SW_e = (SUB_e \times 40/153) \times [(MIG \times 25/24) + REL + (TAR_e \times 30/34)] / 24$ 48.3

Range: 0-100

Worksheet 5

Air Route

CSID: 18434384

Site: Family Fun Center

Not Scored

Worksheet 6

Groundwater Route

CSID: 18434384

Site: Family Fun Center

1.0 SUBSTANCE CHARACTERISTICS

1.1 Human toxicity

Substance	Drink. Wat. Std		Acute Toxicity		Chronic Toxicity		Carcinogenicity	
	Value	Score	Value	Score	Value	Score	Adj. CPFo	Score
	(ug/L)		(mg/kg)		(mg/kg/day)		(risk/mg/kg-day)	
Diesel	--	X	490	5	2.00E-02	1	--	X
Arsenic	10	8	763	5	3.00E-04	5	1.50E+00	7
Lead	15	6	<0.001	10	--	X	--	X
Chromium	100	6	--	X	3.00E-03	3	--	X
Maximum score:	10							
Bonus points:	2						Human Toxicity Score:	12
Source:	WARM Toxicity Database						Range: 1-12	

1.2 Mobility

Substance	Solubility	
	Value	Score
	(mg/L)	
Diesel	3.10E+01	1
Arsenic	K > 1	3
Lead	0.1 < K < 1	2
Chromium	K < 0.1	1
Maximum value:	3	
Source:	WARM Toxicity Database	
		Mobility Score: 3
		Range: 1-3

1.3 Substance quantity

Quantity:	1,600 yd ³	
	Approximately 1,100 yd ³ of excavated soil and slag, and 500 yd ³ of segregated soil from the then-existing stockpile, were placed under cap at south parking lot of Parcel 3.	
Basis:	Site Report	
Source:		Substance Quantity Score: 4
		Range: 1-10

2.1 Containment

Description:	Contamination was detected in groundwater.	
Source:	Site Report	Containment Score: 10
		Range: 0-10

SUBSTANCE PARAMETER CALCULATION

SUB = (Human Toxicity + Mobility + 3) x (Containment + 1) + Substance Quantity

202.0

2.0 MIGRATION POTENTIAL

2.2 Net precipitation

Amount (in.): 27.2

Source: Mean annual precip (NOAA, 2009-2017 data)
- Annual evapotranspiration (ESRI)

Net Precipitation Score: 3

Range: 0-5

2.3 Subsurface Hydraulic Conductivity

Description: Silt and sand mixtures

Source: Site Report

Hydraulic Conductivity Score: 3

Range: 1-4

2.4 Vertical Depth to Aquifer

Depth (ft): 18

Source: Site Report

Depth to Aquifer Score: 8

Range: 1-8

MIGRATION PARAMETER CALCULATION

MIG = Depth to Aquifer + Net Precipitation + Hydraulic Conductivity

14.0

3.0 TARGETS

3.1 Aquifer Usage

Description: Groundwater is not used but usable.

Source: iMap, WDOH Water System Database

Aquifer Use Score: 2

Range: 1-10

3.2 Distance to Nearest Drinking Water Well

Distance (ft): 0

Well Distance Score: 0

Please see Special Considerations above for wells considered but not included in scoring.

Source: iMap, WDOH Water System Database, Well Log Viewer

Range: 0-5

3.3 Population Served by Drinking Water Wells within Two Miles

No. of people: 0

Population Served Score: 0.0

Range: 0-100

Please see Special Considerations above for wells considered but not included in scoring.

Source: WDOH Water System Database

3.4 Area Irrigated by Wells within Two Miles

Area (acres): 0

Area Irrigated Score: 0.0

Range: 0-50

Source: Ecology WRTS database

TARGET PARAMETER CALCULATION

2.0

TAR = Aquifer Use + Well Distance + Population Served + Area Irrigated

4.0 RELEASE

Evid. of release? Contamination was detected in groundwater.

Source: Site Report

Release Score (REL): 5.0

Range: 0 or 5

GROUND WATER ROUTE CALCULATION

42.0

GW = (SUB x 40/208) x {(MIG x 25/17) + REL + (TAR x 30/165)} / 24

Range: 0-100

Washington Ranking Method

Route Scoring Summary and Ranking Calculation

CSID: 18434384
Site: Family Fun Center

Human Health Route Scores

Pathway	Score	Quintile
Surface water	29.8	5
Air	0.0	
Groundwater	42.0	4

Quintile	Value
High (H)	5
Middle (M)	4
Low (L)	

$$(H^2 + 2M + L) / 8$$

Human Health Pathway Quintiles - based off August 2018 HSL

Quintile	Surface Water	Air	Groundwater
1	<= 7.9	<= 8.6	<= 24.1
2	8.0 15.1	8.7 16.3	24.2 33.1
3	15.2 21.2	16.4 25.3	33.2 40.4
4	21.3 29.7	25.4 40.1	40.5 49.6
5	>= 29.8	>= 40.2	>= 49.7

Human Health Priority Bin Score: 4.1

Environmental Route Scores

Pathway	Score	Quintile
Surface water	48.3	4
Air	0.0	

Quintile	Value
High (H)	4
Low (L)	

$$(H^2 + 2L) / 7$$

Environmental Pathway Quintiles - based off August 2018 HSL

Quintile	Surface Water	Air
1	<= 11.3	<= 1.2
2	11.4 24.1	1.3 1.5
3	24.2 31.6	1.6 13.8
4	31.7 49.7	13.9 26.5
5	>= 49.8	>= 26.6

Environmental Priority Bin Score: 2.3

FINAL MATRIX RANKING

Human Health Priority	Environmental Priority					
	5	4	3	2	1	n/a
5	1	1	1	1	1	1
4	1	2	2	2	3	2
3	1	2	3	4	4	3
2	2	3	4	4	5	3
1	2	3	4	5	5	5
n/a	3	4	5	5	5	NFA

n/a - not applicable

NFA - no further action

Site Rank: 1