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November 21, 2016

Michael R. Warfel
NWRO Toxics Cleanup Program
Washington State Department of Ecology
3190 160th Avenue SE
Bellevue, Washington 98008-5452

Subject: KCHA Response to Ecology's June 2016 Further Action Letter
Former Park Lake Homes Maintenance Shop Site
9800 8th Avenue SW
Seattle, Washington 98106
VCP Project No. NW3033
GeoEngineers File No. 1329-003-20

INTRODUCTION AND PURPOSE

GeoEngineers prepared this letter on behalf of the King County Housing Authority (KCHA) to respond to Ecology's Further Action (FA) opinion letter dated June 6, 2016 for the former KCHA maintenance center facility ("Site") (Figure 1). Cleanup at the Site was completed in 2005, more than 10 years ago, and the Site was substantially redeveloped beginning in 2006 with infrastructure, housing, parking and common areas associated with KCHA's Greenbridge project https://www.kcha.org/development/greenbridge/. KCHA intends to own and manage the areas within the Site for the foreseeable future. Please see the attached Figure 2 which shows the current layout of the Site relative to the footprint of the Maintenance Center building, 2005 remedial excavations and post-cleanup excavations completed during redevelopment for the purposes of KCHA infrastructure (i.e., temporary stormwater pond and permanent water quality vault).

This letter summarizes Ecology's comments from the June 6, 2016 letter and provides KCHA's responses. Responses to Ecology provide information to support GeoEngineers' opinion that further assessment of groundwater at the Site is not necessary and that a No Further Action determination is warranted for the cleanup action completed by KCHA at the Site in 2005. The rationale for our opinion is presented in this letter.

HISTORY REGARDING ECOLOGY'S FILE FOR SITE

For background, we would like to mention that for the past 11 years KCHA believed that Ecology considered the Site cleanup to be complete. KCHA understood at the time the independent cleanup report was

submitted in 2005[1], that Ecology would complete a MTCA Initial Investigation within 90 days of receiving the report (WAC 173-340-300 (5)). Based on the success of the 2005 cleanup action, KCHA believed that Ecology's Initial Investigation would determine the site status as "cleanup completed." In June 2015, however, we were surprised to discover for the first time that the Initial Investigation Field Report (dated January 2011) in Ecology's database record and hard copy file for the Park Lake Homes maintenance center was for a ***different*** site (placed in the wrong file). Therefore, we only recently learned that KCHA's 2005 independent MTCA cleanup had never been reviewed by Ecology. We appreciate that Ecology corrected the erroneous information in the Park Lake Homes maintenance facility file in September 2015 and removed the erroneous January 2011 Initial Investigation Field Report (which was for a service station). However, KCHA had expected Ecology to have reviewed this file years ago as described above, and were it not for the erroneous 2011 Initial Investigation Field Report, Ecology likely would have determined years ago that this was a "cleanup completed." The KCHA cleanup was completed more than a decade before the new VCP checklists were developed. We would like to note that fulfilling all the requirements of the new checklists more than a decade after the cleanup would be costly for the housing authority.

SUMMARY OF JUNE 6, 2016 ECOLOGY OPINION

Ecology's June 2016 opinion letter states that Ecology has determined that further remedial action is necessary to clean up contamination at the Site, and you present the analysis upon which your opinion is based. Specifically, your letter states that KCHA's characterization of the Site is not sufficient to establish cleanup standards and select a cleanup action. Your letter requests the following additional information/activities to address Site characterization needs:

1. Paper and electronic copies of the Phase I Environmental Site Assessment (ESA) report for KCHA's Park Lake Homes project dated January 15, 2003.
2. Further characterization of Site groundwater conditions (i.e., installation of at least four groundwater monitoring wells, and quarterly sampling and comprehensive chemical analysis of groundwater) to assess groundwater elevations, hydraulic gradients, groundwater flow directions, and chemical quality.
3. Development of a conceptual site model (CSM) incorporating the updated characterization of groundwater conditions, in accordance with applicable Ecology guidance.
4. Quantitative documentation that the vapor intrusion exposure pathway was assessed.
5. A Terrestrial Ecological Evaluation (TEE), per the substantive requirements of the Model Toxics Control Act (MTCA) and applicable Ecology guidance.
6. Preparation of an updated Site base map, quarterly groundwater elevation contour maps, and hydrogeologic cross sections.

[1] KCHA submitted site assessment reports to Ecology in 1998, 1999, 2004 and submitted the "Final Cleanup Report" (GeoEngineers 2005) to Ecology in September 2005 (see Integrated Site Information System database report attached).

7. Preparation of a Remedial Investigation (RI) report that incorporates the updated site characterization data and consolidates all pertinent Site historical information, collected soil and groundwater data, and completed soil cleanup data.
8. Preparation of a Feasibility Study (FS) that meets MTCA requirements for establishment of cleanup standards and selection of a cleanup action.
9. Electronic submittal of all sampling data into Ecology's Environmental Information Management (EIM) database.

KCHA RESPONSES

Items 1, 4, 5 and 9:

KCHA can provide Ecology with copies of the 2003 Phase I ESA report, as well as TEE documentation per WAC 173-340-7490 and electronic data for Ecology's EIM database. Based on the successful removal of contaminated soil, there is no rationale or need for evaluating the soil vapor to indoor air pathway.

Items 2, 3, 6, 7 and 8:

KCHA and GeoEngineers believe that completing additional groundwater characterization, followed by development of a CSM and preparation of an updated Site map, groundwater elevation maps, hydrogeologic cross sections, and RI and FS reports, is not necessary because groundwater confirmation is demonstrated by the following:

- **Soil cleanup confirmation sampling at the limits of the Maintenance Center remedial excavations complied with MTCA cleanup levels.** Based on GeoEngineers' 2005 field observations, field screening data, and verification sampling results, the contaminated soil was successfully removed. Furthermore, there is no evidence of contamination in areas beyond those originally characterized as contaminated. Specifically, none of the past geotechnical explorations completed in the vicinity of the former Maintenance Center between 2003 and 2004 (B-9, B-19, B-24, B-25 see attached logs) indicated evidence of contaminated soil. It is also relevant to note that an excavation completed in Summer 2016 for a water line tie-in directly east of the easternmost 2005 remedial excavation EX-3 was completed to approximately 8 feet below-grade did not show evidence of contaminated soil (Figure 2).
- After the 2005 cleanup action, the majority of **soil underlying the former Maintenance Center was subsequently removed to depths up to 16 feet below original grade** for the temporary CV4 construction stormwater pond (later backfilled, area shown in orange shading in Figure 2) and for the permanent CV3 water quality vault (area shown in yellow shading in Figure 2). No evidence of contaminated soil was reported by KCHA representatives or contractors, or by GeoEngineers during geotechnical construction observation, during soil removal in both of these large areas. The significant quantity of soil removed should eliminate Ecology concerns that there are unexplored areas or possible remaining soil contamination associated with the former Maintenance Center.
- Pre-redevelopment geotechnical explorations in the vicinity of the former Maintenance Center between 2002 and 2004 indicated that this portion of the KCHA property, known as the CV3 and CV4 blocks, was underlain by 5 to 12 feet (CV3 area) and 4 to 8 feet (CV4 area) of artificial fill, which is underlain by Ice Contact Deposits and very dense glacial till (GeoEngineers 2004 and 2007; see Figure 3 and Figure 5 Cross Section B-B' from GeoEngineers 2004). Isolated areas of perched groundwater were observed on top of the glacial till unit, which slopes steeply downward to the southwest and to the

northeast in the Site vicinity (see Figure 5 from GeoEngineers' 2007). Consistent with these findings of isolated shallow perched groundwater, only very limited quantities of groundwater were encountered in the 2005 remedial excavations at the Site, which extended to a maximum depth up to 18 feet below grade. Where limited evidence of groundwater was encountered, groundwater was observed by GeoEngineers' field representatives to seep slowly into the excavations from small, isolated areas on the excavation sidewalls, and the seepage always ceased within 24 hours. It is important to note that no petroleum sheens were observed on the limited groundwater seepage in 2005. The slow/finite seepage and limited evidence of groundwater in the remedial excavations confirm that where present, shallow groundwater at the Site occurs in isolated perched zones. If groundwater is present in significant quantities beneath the Site, our field observations suggest that it occurs at depths greater than the maximum depth of the completed remedial excavation (i.e., greater than 18 feet below grade).

- Following the cleanup, areas underlying most of the maintenance center building footprint and beyond were excavated for KCHA infrastructure, specifically for the CV4 construction stormwater pond excavation and the CV3 water quality vault excavation. Each involved soil excavation to depths of approximately 16 feet below original ground surface (see Figure 2 orange- and yellow-shaded areas, respectively). Field observations at each of these post-cleanup KCHA infrastructure excavations noted only **minor and isolated seepage of perched groundwater in the excavations.** These observations support a conclusion that groundwater in this area of the Site is deeper than the base of the completed excavations.

- A groundwater assessment at the Site was conducted by KCHA in 2015 (GeoEngineers 2015), specifically for the purpose of documenting post-cleanup groundwater quality. It is important to note that the locations available and accessible for exploration drilling at the Site are severely limited due to the presence of structures and obstructions including: buildings, common areas, decorative concrete, the water quality vault beneath the CV3 Plaza, and coarse material at the base of the backfilled CV4 construction stormwater pond. Recognizing these limitations, **the assessment focused on collecting groundwater samples from borings completed in the nearest accessible areas downgradient of the former Maintenance Center remedial excavations**. Groundwater was not encountered in the two direct-push borings (B-2 and B-3; see Figure 2) completed in the (backfilled) CV4 construction stormwater pond present beneath and south of the former maintenance center footprint. These borings were advanced to approximately the same depths (12 to 13 feet below grade) at which the limited/finite groundwater seepage was observed in two of the remedial excavations. If groundwater were present at these depths at the B-2 and B-3 locations, then groundwater would have been encountered in those borings because the base of the CV4 construction stormwater pond was backfilled with relatively coarse materials. The absence of groundwater in these borings provides further evidence that if groundwater is present other than isolated perched water, it occurs at depths greater than the remedial excavation depths.

- **Favorable groundwater quality** was represented by the 2015 groundwater samples (GeoEngineers 2015) obtained from locations proximate to the former maintenance center (B-4, B-7 and B-8, Figure 2). Gasoline-, diesel- and heavy oil-range petroleum hydrocarbons and volatile organic compounds (VOCs) were not detected except for one detection of diesel-range hydrocarbons in B-8 at a concentration less than the MTCA Method A cleanup level. Consequently, there is no reason to suspect that deeper groundwater beneath the Site (if present) might be contaminated.

SUMMARY AND CLOSING

KCHA believes it has met the substantive requirements of MTCA, and that further characterization and documentation of Site conditions is unnecessary.

REFERENCES:

Ecology Integrated Site Information System 2016 "Cleanup Site Details, Park Lake Homes Maintenance Shop, Cleanup Site ID 8417, FS ID: 24359391"

https://fortress.wa.gov/ecy/tcpwebreporting/tcpreportviewer.aspx?id=csd&format=pdf&csid=8417 (attached)

GeoEngineers 2003. Preliminary Engineering Geologic and Geotechnical Engineering Services, Park Lake Community Center Redevelopment, Unincorporated White Center, King County Washington, March 21, 2003, for Tonkin-Hoyne-Lokan. GEI File 1329-003-02.

GeoEngineers 2004, Final Revised Report, Preliminary Engineering Geologic and Geotechnical Engineering Services, Greenbridge Redevelopment, Unincorporated White Center, King County Washington, January 26, 2004, for Huckell/Weinman & Associates Inc. GEI File 1329-003-00

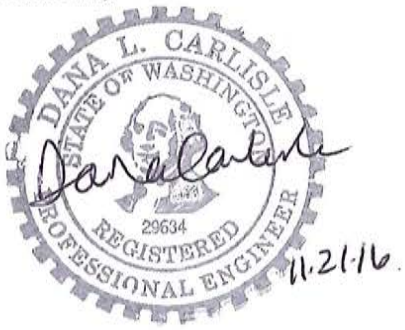
GeoEngineers 2005, "Final Cleanup Report, KCHA Maintenance Facility, Former Park Lake Homes, 9900 8th Avenue SW, Seattle, Washington," dated September 7, 2005 for King County Housing Authority, GEI File 1329-003-04

GeoEngineers 2007. Update Report, Geotechnical Engineering Services, Greenbridge Hope VI Redevelopment Project, King County, Washington, January 12, 2007, for King County Housing Authority, GEI File 1329-003-06.

GeoEngineers 2015. Post-Cleanup Groundwater Confirmation Sampling Event, King County Housing Authority, Former Park Lake Homes Maintenance Center, 9800 8th Avenue Southwest, Seattle, Washington, October 27, 2015 for KCHA, GEI File 1329-003-20.

We will contact you soon to inquire about your availability to meet with us to discuss the topics addressed in this letter. Should you have any questions, please contact Dana Carlisle (425-861-6040; dcarlisle@geoengineers.com).

Sincerely,
GeoEngineers, Inc.

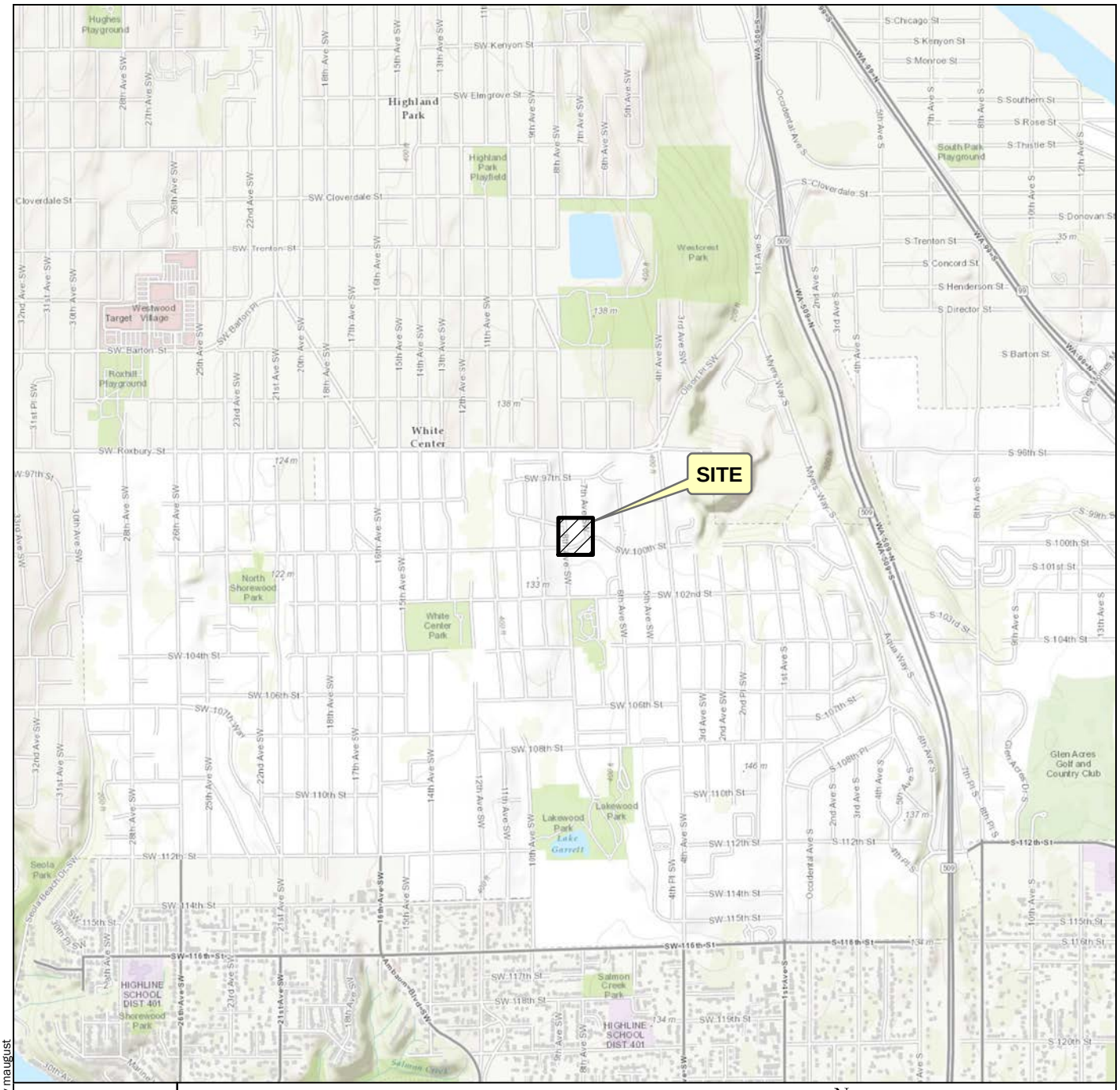


Dana Carlisle, PE
Principal

DLC:lw

cc: John Eliason, KCHA

Attachments:
Figure 1 Vicinity Map
Figure 2 Site Plan, Current Layout
Appendix A. Ecology Database and Excerpts from Prior Reports:
Ecology 2016 Cleanup Site Details
Geotechnical Boring Logs B-9, B-19, B-24 and B-25
Figure 3 Geologic Map
Figure 5 Cross Section B-B'
Figure 5 Central Valley Area Estimated Depth to Suitable Bearing Layer



Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2015

Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Former Park Lake Homes Maintenance Center
Seattle, Washington

GeoEngineers

Figure 1

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Legend

- Direct Push Boring
  No Groundwater Encountered
  (GeoEngineers, 2015)
- Direct Push Temporary Groundwater
  Monitoring Well (GeoEngineers, 2015)
- Geotechnical Boring by GeoEngineers, 2004
- Geotechnical Boring by GeoEngineers, 2003
- Approximate Footprint of Former Park Lake
  Homes Maintenance Center Building
- Approximate Location of
  Removed UST
- Approximate Location of 2005
  Remedial Excavations - MTCA
  Cleanup at Maintenance Center
- Approximate Boundary of Backfilled
  CV4 Stormwater Pond Excavation
- Excavation for Water Quality Vault

N
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50 0 50
FEET

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source:

- Aerial from Microsoft Bing dated September 2013
- Stormwater Vault and Excavation from "Lake Garrett Sub-Basin Water Quality Vault Plan and Section", Sheet DF-3 by Goldsmith & Associates dated 10/25/2004
- Location of 2005 Remedial Excavations from "Final Cleanup Report, KCHA Maintenance Facility, Former Park Lake Homes, 9900 8th Avenue SW, Seattle, Washington," dated September 7, 2005 for King County Housing Authority, GEI File 1329-003-04
- CV4 Stormwater Pond Excavation Boundary and 2003/2004 Borings from "Geotechnical Engineering Services Greenbridge Hope VI Redevelopment Update Report" by GeoEngineers dated 1/12/2007
- Waterline Connection Location from "BDR Greenbridge Park Water Plan and Profile", Sheet WA-02 by ESM Consulting Engineers dated 4/26/2016

Site Plan
Current Layout

Former Park Lake Homes Maintenance Center
Seattle, Washington

GeoEngineers | **Figure 2**

P:\1\1329003\20\CAD\Further Action Rebuttal letter\1329003320_F02_Site Plan.dwg TAB:Figure 2 Site Plan Date Exported: 11/07/16 - 14:19 by tmichaud

KING COUNTY

SITE ID:	**Park Lake Homes Maintenance Shop**	Cleanup Site ID: 8417	FS ID: 24359391
	Alternate Name(s):	Park Lake Homes, Park Lake Homes Maint Shop, Park Lake Homes Maintenance Shop	

LOCATION:		WRIA: 9	Lat/Long:	47.515	-122.345	View Vicinity Map
Address:	9800 8TH AVE SW		Township	Range	Section	Legislative District: 34
	SEATTLE 98106		23N	4E	6	Congressional District: 7

STATUS:	**Cleanup Started**	Rank:	View Site Web Page	View Site Documents
	Responsible Unit: Northwest	Site Manager: Warfel, Michael	Statute: MTCA	
	Is Brownfield?	Has Environmental Covenant?	Is PSI Site?	
	NFA Received?	NFA Date:	NFA Reason:	

ASSOCIATED CLEANUP UNIT(s)

cuID	Cleanup Unit Name	Unit Type	Process Type	Unit Status	Size (Acres)	ERTS ID
8109	Park Lake Homes Maintenance Shop	Upland	Voluntary Cleanup Program	Cleanup Started		501664

SITE ACTIVITIES:

Applies to:	Related ID (Unit-LUST-VCP)	Activity Display Name	Status	Start Date	End Date	Legal Mechanism	Performed By	Project Manager
CleanupSite		Site Discovery/Release Report Received	Completed	12/23/1998	12/23/1998			Northwest Region
CleanupSite		Initial Investigation / Federal Preliminary Assessment	Completed					Northwest Region
CleanupSite		Early Notice Letter(s)	Completed	2/24/2016	2/24/2016			Escobedo, Diane
LUST		LUST - Notification	Completed	12/23/1998	12/23/1998			Musa, Donna
LUST		LUST - Report Received	Completed	7/8/2004	7/8/2004			
LUST		LUST - Report Received	Completed	1/8/1999	1/8/1999			
LUST		LUST - Report Received	Completed	9/12/2005	9/12/2005			
LUST		LUST - Report Received	Completed	12/21/2015	12/21/2015			
VcpProject	NW3033	VCP Opinion on Site Cleanup	Completed	2/23/2016	6/6/2016			Warfel, Michael

AFFECTED MEDIA & CONTAMINANTS:

Media:

Contaminant:	Ground Water	Surface Water	Soil	Sediment	Air	Bedrock
Benzene	C		C			
Petroleum-Diesel	C		C			

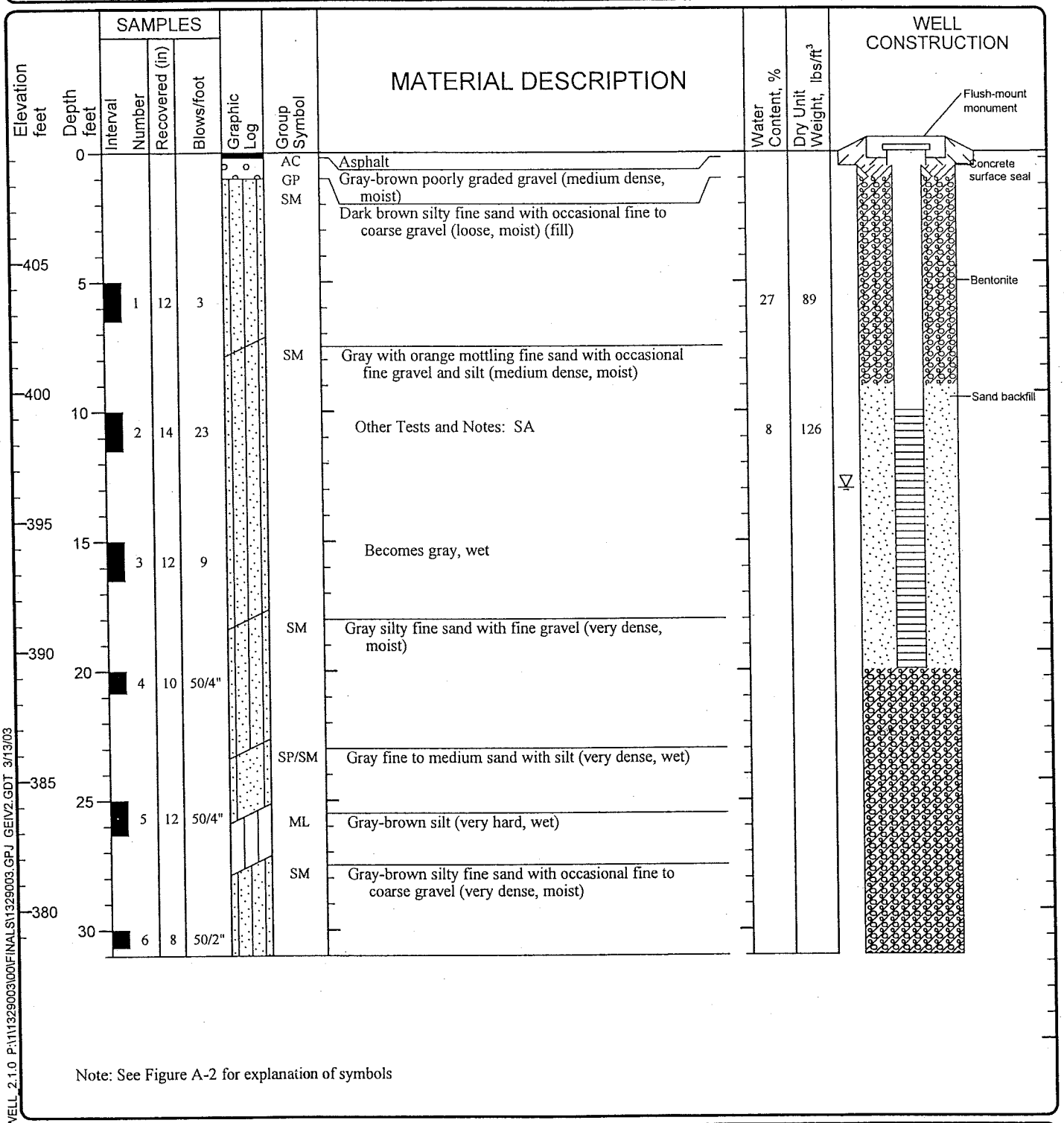
Key:
B - Below Cleanup Level
C - Confirmed Above Cleanup Level
S - Suspected
R - Remediated
RA - Remediated-Above
RB - Remediated-Below

Petroleum-Gasoline	C		C			
Petroleum-Other	C		C			

CleanupSiteDetails2014

APPENDIX A
Excerpts from Prior Reports

Date(s) Drilled	12/05/02	Logged By	Jason Gaffney	Checked By	Craig Erdman
Drilling Contractor	Gregory Drilling	Drilling Method	Hollow Stem Auger	Sampling Methods	Dames & Moore
Total Boring Depth (ft)	31	Hammer Data	300 (lb) hammer/ 30 (in) drop	Drilling Equipment	CME 85 Truck-mounted Rig
Well Depth (ft)		Top of Well Elevation (ft)	409.25	Ground Water Level (ft. bgs)	Approximately 13 to 18
System/ Datum					



Note: See Figure A-2 for explanation of symbols

LOG OF BORING B-9

Geo Engineers

Project: Park Lake Homes Redevelopment
Project Location: Seattle, Washington
Project Number: 1329-003-00

Figure: A-5
Sheet 1 of 1

Date(s) Drilled	12/19/02	Logged By	Chip Barnett	Checked By	Craig Erdman
Drilling Contractor	Gregory Drilling	Drilling Method	Hollow Stem Auger	Sampling Methods	Dames & Moore
Auger Data	4.25-inch ID	Hammer Data	300 (lb) hammer/ 30 (in) drop	Drilling Equipment	CME-85 Truck-mounted Rig
Total Depth (ft)	21.5	Surface Elevation (ft)	406	Groundwater Level (ft. bgs)	10.0
Datum/ System					

Elevation feet	Depth feet	Interval	Number	Recovered (in)	Blows/foot	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0							SOD	Sod			
405								SM	Brown silty sand (loose, moist)			
									Occasional cobbles			
	5								Becomes gray and brown			
400			1	6	5					15		MC
								SM	Brownish-gray silty fine to coarse sand with gravel, silt (medium dense, moist)			
	10					▽						
395			2	5	15			ML	Becomes wet Brown gray and orange mottled silt (stiff, moist)	13		MC
								SM/ML	Gray brown silty fine sand to sandy silt with gravel (very dense/very hard, moist)			
390	15		3	10	50/5"							
								SM	Brown silty fine to coarse sand with gravel (very dense, moist to wet)			
385	20		4	15	50/3"							

Note: See Figure A-2 for explanation of symbols

LOG OF BORING B-19

GeoEngineers

Project: Park Lake Homes Redevelopment
Project Location: Seattle, Washington
Project Number: 1329-003-02

Figure: A-9
Sheet 1 of 1

Date(s) Drilled	02/19/04	Logged By	MET	Checked By	RCM
Drilling Contractor	Boretec	Drilling Method	Hollow-stem Auger	Sampling Methods	SPT
Auger Data	3-1/4" ID, 8" OD	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	Volvo EC55 Track-mounted rig
Total Depth (ft)	21.3	Surface Elevation (ft)	408.5	Groundwater Level (ft. bgs)	Not observed
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval	Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0							AC	2.5 inches of asphalt			
								GP	Brown fine gravel with fine to coarse sand and silt (loose, moist)			
								SM	Brown silty fine to medium sand with gravel, trace charcoal (medium dense, moist) (fill)			
405			10	30	1					10		
	5		6	34	2				Becomes dense	7		
			10	40	3					7		
400								SP	Gray fine to coarse sand with gravel (dense, moist)			
	10		8	30	4			SM	Brown silty fine to medium sand with gravel (medium dense to dense, moist to wet) (till)	14		
395												
	15		0	92/11"	5				Becomes very dense			
			10	50/5"	6							Harder drilling at 17.5 feet
390												
	20		10	97/11"	7				Becomes gray-brown, one thin zone of fine to medium sand (wet)			
385												
	25											
380												
	30											

Notes: See Figure A-1 for explanation of symbols.

LOG OF BORING B-24

GeoEngineers

Project: KCHA Greenbridge Development Phase I
Project Location: King County, Washington
Project Number: 1329-003-04

Figure A-5
Sheet 1 of 1

V6_GTBORING P:\1\1329003\06\TASK40~1\FINAL\1329003O4A1.GPJ GEIV6_1.GDT 10/19/06

Date(s) Drilled	02/19/04	Logged By	MET	Checked By	RCM
Drilling Contractor	Boretec	Drilling Method	Hollow-stem Auger	Sampling Methods	SPT
Auger Data	3-1/4" ID, 8" OD	Hammer Data	140 lb hammer/30 in drop	Drilling Equipment	Volvo EC55 Track-mounted rig
Total Depth (ft)	16.5	Surface Elevation (ft)	409.5	Groundwater Level (ft. bgs)	6.5
Vertical Datum		Datum/ System		Easting(x): Northing(y):	

Elevation feet	Depth feet	SAMPLES: Interval Recovered (in)	Blows/foot	Sub-Sample Sample Number	Water Level	Graphic Log	Group Symbol	MATERIAL DESCRIPTION	Moisture Content %	Dry Unit Weight, lbs/ft³	OTHER TESTS AND NOTES
	0						TS	3 inches of grass and root zone/topsoil			
							SM	Brown silty fine to medium sand with occasional gravel; trace organics, rootlets (loose, moist) (fill)			
		12	5	1					14		
405	5	18	8	2			SP-SM	Orange-brown fine to medium sand with silt and gravel (loose, wet)	14		%F=13
		15	42	3	▽				11		
							SM	Gray-brown silty fine to coarse sand with gravel (dense, moist)			
400	10	6	42	4				Iron oxide staining	12		
395	15	12	67/11"	5				Becomes very dense			
390	20										
385	25										
380	30										

Notes: See Figure A-1 for explanation of symbols.

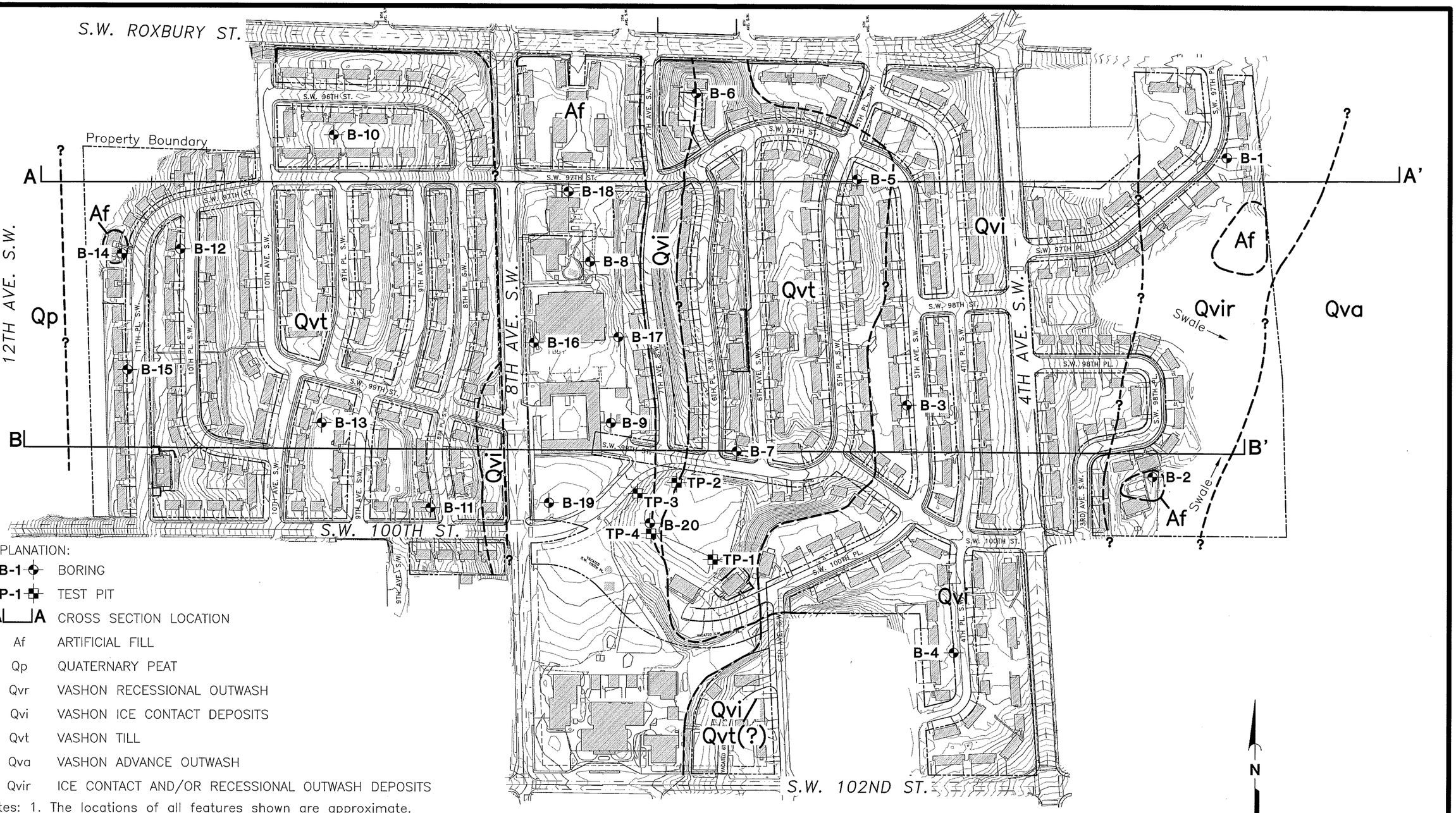
LOG OF BORING B-25

GeoEngineers

Project: KCHA Greenbridge Development Phase I
Project Location: King County, Washington
Project Number: 1329-003-04

Figure A-6
Sheet 1 of 1

V6_GTBORING P:\1\1329003\06\TASK40~1\FINAL\1329003O4A1.GPJ GEIV6_1.GDT 10/19/06



EXPLANATION:

B-1 ⊕	BORING
TP-1 ⊞	TEST PIT
A A'	CROSS SECTION LOCATION
Af	ARTIFICIAL FILL
Qp	QUATERNARY PEAT
Qvr	VASHON RECESSIONAL OUTWASH
Qvi	VASHON ICE CONTACT DEPOSITS
Qvt	VASHON TILL
Qva	VASHON ADVANCE OUTWASH
Qvir	ICE CONTACT AND/OR RECESSIONAL OUTWASH DEPOSITS

Notes:
1. The locations of all features shown are approximate.
2. Only those areas with five or more feet of artificial fill have been mapped as AF.
3. 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.

References: Drawing entitled "KING COUNTY HOUSING AUTHORITY, VIC. SW ROXBURY & 8TH AVE SW" by Bush, Roed & Hitchings, Inc, dated Nov. 2002 and "Geology and Ground–Water Resources of Northwestern King County, Washington" by B.A. Liesch, C.E. Price and K.L. Walters; Water Supply Bulletin No. 20, dated 1963.

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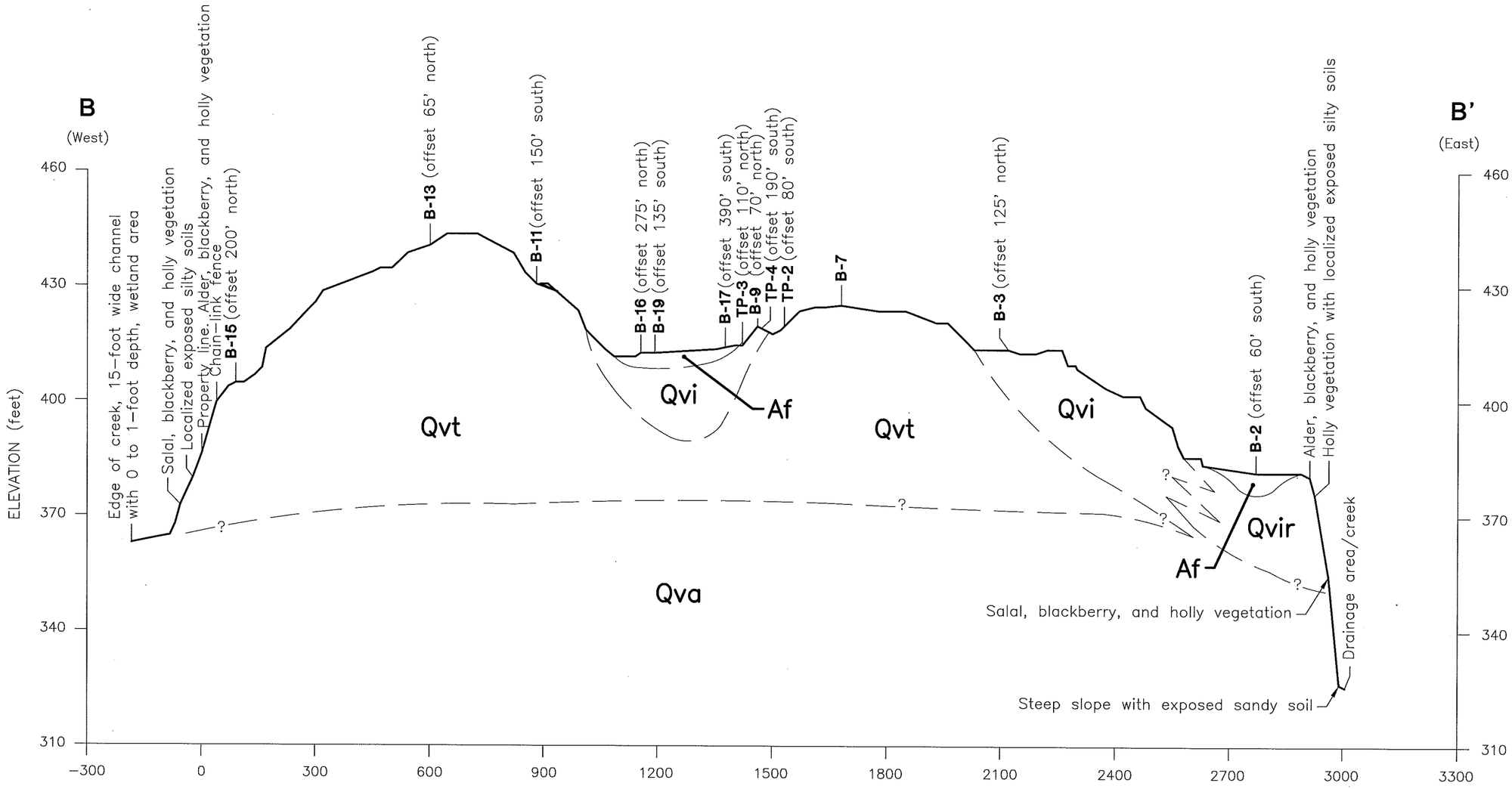
GEOLOGIC MAP

FIGURE 3



EXPLANATION:

Af	ARTIFICIAL FILL	Qvi	VASHON ICE CONTACT DEPOSITS
Qvir	ICE CONTACT AND/OR RECESSIONAL OUTWASH DEPOSITS	Qvt	VASHON TILL
		Qva	VASHON ADVANCE OUTWASH

Notes:
1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
2. Refer to Figure 2 for location of Section B-B'.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record.

EXPLANATION:
B-2 Boring
TP-2 Test Pit

HORIZONTAL SCALE: 1" = 300'
VERTICAL SCALE: 1" = 30'
VERTICAL EXAGGERATION: 10X

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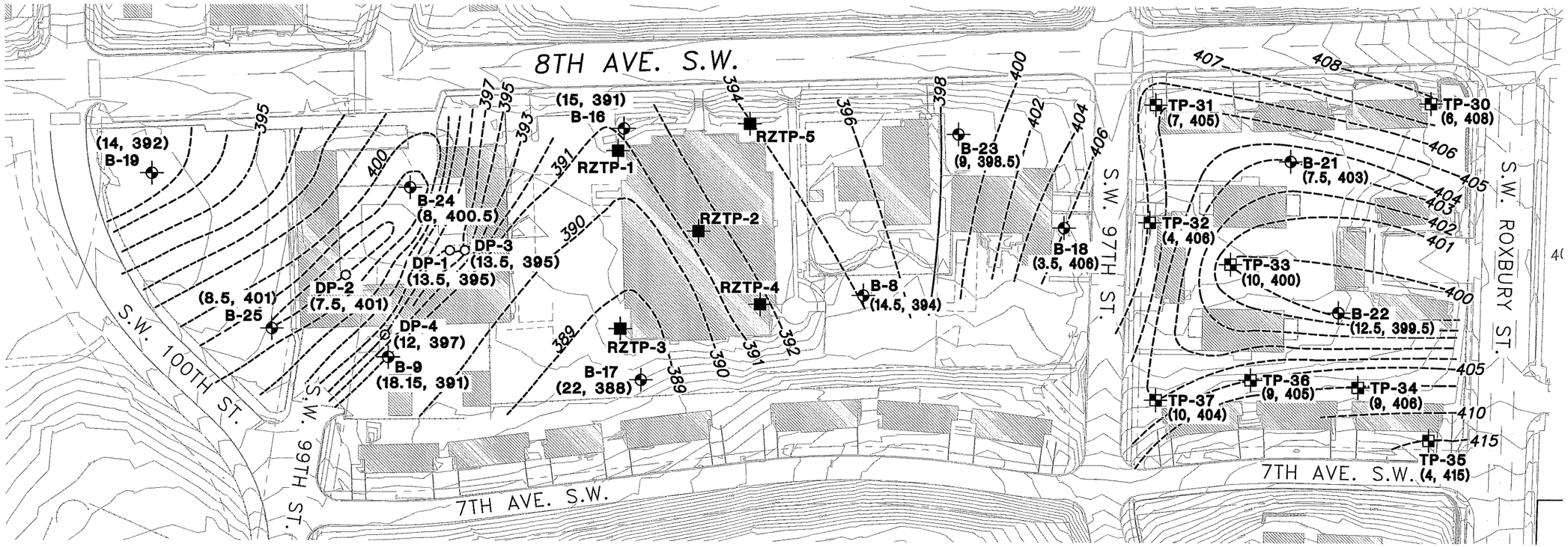
CROSS SECTION B-B'

FIGURE 5

01/15/03 CFE:SYF
REDM\P:\1329003\00\CAD\T220\1329003OOT220F.DWG



EXPLANATION:

B-8 **(14.5, 394)**	APPROXIMATE BORING LOCATION, GEOENGINEERS, 2003 & 2004 DEPTH TO AND ELEVATION OF SUITABLE BEARING LAYER
TP-33 **(10, 400)**	APPROXIMATE TEST PIT LOCATION, GEOENGINEERS, 2004 DEPTH TO AND ELEVATION OF SUITABLE BEARING LAYER
DP-1 **(13.5, 395)**	APPROXIMATE DIRECT PUSH PROBE LOCATION, GEOENGINEERS, 2004 DEPTH TO AND ELEVATION OF SUITABLE BEARING LAYER
RZTP-1	APPROXIMATE TEST PIT LOCATION, RZA, 1978
395	APPROXIMATE DEPTH TO SUITABLE BEARING CONTOUR

100 0 100
Feet

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 "KING COUNTY HOUSING AUTHORITY, VIC. SW ROXBURY & 8TH AVE SW" by Bush, Roed & Hitchings, Inc, dated Nov. 2002.

Central Valley Area - Estimated Depth to Suitable Bering Layer

Greenbridge Hope VI Redevelopment
King County, Washington

GeoEngineers | **Figure 5**