INVITATION TO BID #2018-13
Steel Structure Kit for the Public Safety Training Center
ADDENDUM NUMBER 1
February 21, 2018

On February 1, 2018, Clackamas County ("County") published Invitation to Bid #2018-13 ("BID"). The County has found that it is in its interest to amend the BID through the issuance of this Addendum #1. Except as expressly amended below, all other terms and conditions of the original BID shall remain unchanged.

1. **The following has been added to Section 2.6 *Construction Documents* of the Specifications:**
    - Apex Labs Analyses Results – Analytical Report for Samples, dated April 29, 2009, hereby attached and incorporated by reference.
    - Site Specific Seismic Hazard Evaluation, Sunnybrook Office Building, dated April, 2009, hereby attached and incorporated by reference.
    - Sunnybrook Office Building Seismic Upgrade, dated April 30, 2009, hereby attached and incorporated by reference.

Attachments:
Apex Labs Analyses Results – Analytical Report for Samples, dated April 29, 2009.
Site Specific Seismic Hazard Evaluation, Sunnybrook Office Building, dated April, 2009.
Sunnybrook Office Building Seismic Upgrade, dated April 30, 2009.

End of Addendum #1

Addendum #1

Apex Labs

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Wednesday, April 29, 2009

Kevin Schleh
Geocon Northwest Inc.
8283 SW Cirrus Dr
Beaverton, OR 97008-6443

RE: Evidence Processing & Crime Lab / P1671-5-1

Enclosed are the results of analyses for work order A904157, which was received by the laboratory on 4/21/2009 at 1:15:00PM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: AGreiner@Apex-Labs.com, or by phone at 503-718-2323.

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B3@3'	A904157-03	Soil	04/20/09 10:00	04/21/09 13:15
Composite of B1&B2	A904157-04	Soil	04/20/09 16:00	04/21/09 13:15

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

ANALYTICAL SAMPLE RESULTS

Diesel Range (C10-C22) and Oil Range (C22-C40) Hydrocarbons by NWTPH-Dx

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
B3@3' (A904157-03)			**Matrix: Soil**					
Diesel Range Organics	ND	---	611	mg/kg dry	10	04/22/09 18:39	NWTPH-Dx	
Oil Range Organics	**6310**	---	1220	"	"	"	"	
Surrogate: o-Terphenyl (Surr)			*Recovery: 102 %*	*Limits: 50-150 %*	"	"	"	
Composite of B1&B2 (A904157-04)			**Matrix: Soil**					
Diesel Range Organics	**60.1**	---	35.0	mg/kg dry	1	04/22/09 19:22	NWTPH-Dx	F-07
Oil Range Organics	**698**	---	70.0	"	"	"	"	F-03
Surrogate: o-Terphenyl (Surr)			*Recovery: 92 %*	*Limits: 50-150 %*	"	"	"	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Allison Greiner For Philip Nerenberg, Lab Director

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Geocon Northwest Inc.	Project:	**Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number:	P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

ANALYTICAL SAMPLE RESULTS

PAH by EPA 8270C SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
B3@3' (A904157-03RE1)			**Matrix: Soil**					**C-05**
Acenaphthene	ND	---	299	ug/kg dry	2	04/23/09 20:41	EPA 8270C (SIM)	
Acenaphthylene	ND	---	299	"	"	"	"	
Anthracene	ND	---	299	"	"	"	"	
Benz(a)anthracene	**663**	---	598	"	"	"	"	A-02
Benzo(a)pyrene	**595**	---	299	"	"	"	"	
Benzo(b+k)fluoranthene(s)	**784**	---	598	"	"	"	"	Q-26
Benzo(g,h,i)perylene	**607**	---	299	"	"	"	"	
Chrysene	**613**	---	598	"	"	"	"	A-02
Dibenz(a,h)anthracene	ND	---	299	"	"	"	"	
Fluoranthene	ND	---	299	"	"	"	"	
Fluorene	ND	---	299	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	---	299	"	"	"	"	
Naphthalene	ND	---	299	"	"	"	"	
Phenanthrene	ND	---	299	"	"	"	"	
Pyrene	**418**	---	299	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 71 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*79 %*	*Limits: 45-120 %*	"	"	"	
p-Terphenyl-d14 (Surr)			*104 %*	*Limits: 30-120 %*	"	"	"	

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8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

ANALYTICAL SAMPLE RESULTS

PAH by EPA 8270C SIM

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
Composite of B1&B2 (A904157-04RE1)			**Matrix: Soil**					**C-05**
Acenaphthene	ND	---	153	ug/kg dry	2	04/23/09 21:32	EPA 8270C (SIM)	
Acenaphthylene	ND	---	153	"	"	"	"	
Anthracene	ND	---	153	"	"	"	"	
Benz(a)anthracene	ND	---	307	"	"	"	"	A-01
Benzo(a)pyrene	**169**	---	153	"	"	"	"	
Benzo(b+k)fluoranthene(s)	ND	---	307	"	"	"	"	Q-26
Benzo(g,h,i)perylene	**164**	---	153	"	"	"	"	
Chrysene	ND	---	307	"	"	"	"	A-01
Dibenz(a,h)anthracene	ND	---	153	"	"	"	"	
Fluoranthene	ND	---	153	"	"	"	"	
Fluorene	ND	---	153	"	"	"	"	
Indeno(1,2,3-cd)pyrene	ND	---	153	"	"	"	"	
Naphthalene	ND	---	153	"	"	"	"	
Phenanthrene	ND	---	153	"	"	"	"	
Pyrene	ND	---	153	"	"	"	"	
Surrogate: Nitrobenzene-d5 (Surr)			*Recovery: 52 %*	*Limits: 35-120 %*	"	"	"	
2-Fluorobiphenyl (Surr)			*63 %*	*Limits: 45-120 %*	"	"	"	
p-Terphenyl-d14 (Surr)			*93 %*	*Limits: 30-120 %*	"	"	"	

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8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
B3@3' (A904157-03)			**Matrix: Soil**					
Arsenic	**1.29**	---	1.12	mg/kg dry	10	04/22/09 11:18	EPA 6020	
Barium	**42.4**	---	1.12	"	"	"	"	
Cadmium	ND	---	1.12	"	"	"	"	
Chromium	**9.03**	---	2.24	"	"	"	"	
Lead	**11.4**	---	1.12	"	"	"	"	
Mercury	ND	---	0.0895	"	"	"	"	
Selenium	ND	---	1.12	"	"	"	"	
Silver	ND	---	1.12	"	"	"	"	
Composite of B1&B2 (A904157-04)			**Matrix: Soil**					
Arsenic	**3.47**	---	1.19	mg/kg dry	10	04/22/09 11:33	EPA 6020	
Barium	**133**	---	1.19	"	"	"	"	
Cadmium	ND	---	1.19	"	"	"	"	
Chromium	**53.3**	---	2.38	"	"	"	"	
Lead	**320**	---	1.19	"	"	"	"	
Mercury	ND	---	0.0954	"	"	"	"	
Selenium	ND	---	1.19	"	"	"	"	
Silver	ND	---	1.19	"	"	"	"	

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8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

ANALYTICAL SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
B3@3' (A904157-03)			**Matrix: Soil**					
Arsenic	ND	---	0.100	mg/L	5	04/24/09 11:50	EPA 1311/6020	
Barium	ND	---	1.25	"	"	"	"	
Cadmium	ND	---	0.0500	"	"	"	"	
Chromium	ND	---	0.100	"	"	"	"	
Lead	**0.0560**	---	0.0500	"	"	"	"	
Mercury	ND	---	0.00400	"	"	"	"	
Selenium	ND	---	0.0500	"	"	"	"	
Silver	ND	---	0.100	"	"	"	"	
Composite of B1&B2 (A904157-04)			**Matrix: Soil**					
Arsenic	ND	---	0.100	mg/L	5	04/24/09 11:53	EPA 1311/6020	
Barium	ND	---	1.25	"	"	"	"	
Cadmium	ND	---	0.0500	"	"	"	"	
Chromium	ND	---	0.100	"	"	"	"	
Lead	**0.145**	---	0.0500	"	"	"	"	
Mercury	ND	---	0.00400	"	"	"	"	
Selenium	ND	---	0.0500	"	"	"	"	
Silver	ND	---	0.100	"	"	"	"	

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Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

ANALYTICAL SAMPLE RESULTS

Percent Dry Weight by D2216

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
B3@3' (A904157-03)			**Matrix: Soil**					
% Solids	**89.4**	---	1.00	% by Weight	1	04/23/09 08:52	D2216	
Composite of B1&B2 (A904157-04)			**Matrix: Soil**					
% Solids	**81.9**	---	1.00	% by Weight	1	04/23/09 08:52	D2216	

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Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

Diesel Range (C10-C22) and Oil Range (C22-C40) Hydrocarbons by NWTPH-Dx

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040253 - EPA 3546 (Fuels)							**Soil**					
Blank (9040253-BLK1)						Prepared: 04/22/09 13:15	Analyzed: 04/22/09 17:56					
NWTPH-Dx												
Diesel Range Organics	ND	---	20.0	mg/kg wet	1	---	---	---	---	---	---	
Oil Range Organics	ND	---	40.0	"	"	---	---	---	---	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 90 %*	*Limits: 50-150 %*		*Dilution: 1x*						
LCS (9040253-BS1)						Prepared: 04/22/09 13:15	Analyzed: 04/22/09 18:17					
NWTPH-Dx												
Diesel Range Organics	79.5	---	20.0	mg/kg wet	1	83.3	---	95	70-130%	---	---	
Oil Range Organics	85.7	---	40.0	"	"	"	---	103	"	---	---	
Surr: o-Terphenyl (Surr)			*Recovery: 95 %*	*Limits: 50-150 %*		*Dilution: 1x*						
Duplicate (9040253-DUP1)						Prepared: 04/22/09 13:15	Analyzed: 04/22/09 20:06					
QC Source Sample: Composite of B1&B2 (A904157-04)												
NWTPH-Dx												
Diesel Range Organics	**51.2**	---	33.7	mg/kg dry	1	---	60.1	---	---	16	40%	F-07
Oil Range Organics	**571**	---	67.3	"	"	---	698	---	---	20	40%	F-03
Surr: o-Terphenyl (Surr)			*Recovery: 95 %*	*Limits: 50-150 %*		*Dilution: 1x*						

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8283 SW Cirrus Dr	Project Number:	P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

PAH by EPA 8270C SIM

Batch 9040252 - EPA 3546 — **Soil**

Blank (9040252-BLK1) — Prepared: 04/22/09 12:07 Analyzed: 04/22/09 19:42

EPA 8270C (SIM)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Acenaphthene	ND	---	6.67	ug/kg wet	1	---	---	---	---	---	---	
Acenaphthylene	ND	---	6.67	"	"	---	---	---	---	---	---	
Anthracene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benz(a)anthracene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(a)pyrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(b+k)fluoranthene(s)	ND	---	13.3	"	"	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	---	6.67	"	"	---	---	---	---	---	---	
Chrysene	ND	---	6.67	"	"	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	---	6.67	"	"	---	---	---	---	---	---	
Fluoranthene	ND	---	6.67	"	"	---	---	---	---	---	---	
Fluorene	ND	---	6.67	"	"	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Naphthalene	ND	---	6.67	"	"	---	---	---	---	---	---	
Phenanthrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Pyrene	ND	---	6.67	"	"	---	---	---	---	---	---	

Surr: Nitrobenzene-d5 (Surr) Recovery: 100 % Limits: 35-120 % Dilution: 1x
2-Fluorobiphenyl (Surr) 80 % 45-120 % "
p-Terphenyl-d14 (Surr) 89 % 30-120 % "

LCS (9040252-BS1) — Prepared: 04/22/09 12:07 Analyzed: 04/22/09 20:09

EPA 8270C (SIM)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Acenaphthene	304	---	6.67	ug/kg wet	1	333	---	91	45-120%	---	---	
Acenaphthylene	320	---	6.67	"	"	"	---	96	"	---	---	
Anthracene	328	---	6.67	"	"	"	---	98	55-120%	---	---	
Benz(a)anthracene	308	---	6.67	"	"	"	---	93	50-120%	---	---	
Benzo(a)pyrene	340	---	6.67	"	"	"	---	102	"	---	---	
Benzo(b)fluoranthene	346	---	6.67	"	"	"	---	104	45-120%	---	---	
Benzo(k)fluoranthene	343	---	6.67	"	"	"	---	103	45-125%	---	---	
Benzo(b+k)fluoranthene(s)	675	---	13.3	"	"	667	---	101	"	---	---	
Benzo(g,h,i)perylene	339	---	6.67	"	"	333	---	102	40-125%	---	---	
Chrysene	323	---	6.67	"	"	"	---	97	55-120%	---	---	
Dibenz(a,h)anthracene	337	---	6.67	"	"	"	---	101	40-125%	---	---	
Fluoranthene	336	---	6.67	"	"	"	---	101	55-120%	---	---	

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Geocon Northwest Inc.	Project:	**Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number:	P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

PAH by EPA 8270C SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040252 - EPA 3546							**Soil**					
LCS (9040252-BS1)						Prepared: 04/22/09 12:07	Analyzed: 04/22/09 20:09					
Fluorene	320	---	6.67	ug/kg wet	"	"	---	96	50-120%	---	---	
Indeno(1,2,3-cd)pyrene	332	---	6.67	"	"	"	---	100	40-120%	---	---	
Naphthalene	303	---	6.67	"	"	"	---	91	"	---	---	
Phenanthrene	297	---	6.67	"	"	"	---	89	50-120%	---	---	
Pyrene	323	---	6.67	"	"	"	---	97	45-125%	---	---	

Surr: Nitrobenzene-d5 (Surr)	*Recovery: 103 %*	*Limits: 35-120 %*	*Dilution: 1x*
2-Fluorobiphenyl (Surr)	*88 %*	*45-120 %*	*"*
p-Terphenyl-d14 (Surr)	*93 %*	*30-120 %*	*"*

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8283 SW Cirrus Dr	Project Number:	P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

PAH by EPA 8270C SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040260 - EPA 3546/3640A (GPC)							**Soil**					
Blank (9040260-BLK1)						Prepared: 04/22/09 12:07	Analyzed: 04/23/09 19:50					C-05
EPA 8270C (SIM)												
Acenaphthene	ND	---	6.67	ug/kg wet	1	---	---	---	---	---	---	
Acenaphthylene	ND	---	6.67	"	"	---	---	---	---	---	---	
Anthracene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benz(a)anthracene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(a)pyrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(b)fluoranthene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(k)fluoranthene	ND	---	6.67	"	"	---	---	---	---	---	---	
Benzo(b+k)fluoranthene(s)	ND	---	13.3	"	"	---	---	---	---	---	---	
Benzo(g,h,i)perylene	ND	---	6.67	"	"	---	---	---	---	---	---	
Chrysene	ND	---	6.67	"	"	---	---	---	---	---	---	
Dibenz(a,h)anthracene	ND	---	6.67	"	"	---	---	---	---	---	---	
Fluoranthene	ND	---	6.67	"	"	---	---	---	---	---	---	
Fluorene	ND	---	6.67	"	"	---	---	---	---	---	---	
Indeno(1,2,3-cd)pyrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Naphthalene	ND	---	6.67	"	"	---	---	---	---	---	---	
Phenanthrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Pyrene	ND	---	6.67	"	"	---	---	---	---	---	---	
Surr: Nitrobenzene-d5 (Surr)		*Recovery:*	*82 %*	*Limits:*	*35-120 %*		*Dilution: 1x*					
2-Fluorobiphenyl (Surr)			*76 %*		*45-120 %*		*"*					
p-Terphenyl-d14 (Surr)			*96 %*		*30-120 %*		*"*					
LCS (9040260-BS1)						Prepared: 04/22/09 12:07	Analyzed: 04/23/09 20:15					C-05
EPA 8270C (SIM)												
Acenaphthene	274	---	6.67	ug/kg wet	1	333	---	82	45-120%	---	---	
Acenaphthylene	284	---	6.67	"	"	"	---	85	"	---	---	
Anthracene	304	---	6.67	"	"	"	---	91	55-120%	---	---	
Benz(a)anthracene	309	---	6.67	"	"	"	---	93	50-120%	---	---	
Benzo(a)pyrene	327	---	6.67	"	"	"	---	98	"	---	---	
Benzo(b)fluoranthene	349	---	6.67	"	"	"	---	105	45-120%	---	---	
Benzo(k)fluoranthene	302	---	6.67	"	"	"	---	91	45-125%	---	---	
Benzo(b+k)fluoranthene(s)	643	---	13.3	"	"	667	---	97	"	---	---	
Benzo(g,h,i)perylene	293	---	6.67	"	"	333	---	88	40-125%	---	---	
Chrysene	312	---	6.67	"	"	"	---	94	55-120%	---	---	
Dibenz(a,h)anthracene	322	---	6.67	"	"	"	---	97	40-125%	---	---	
Fluoranthene	337	---	6.67	"	"	"	---	101	55-120%	---	---	

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Allison Greiner For Philip Nerenberg, Lab Director

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

PAH by EPA 8270C SIM

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040260 - EPA 3546/3640A (GPC)							**Soil**					
LCS (9040260-BS1)						Prepared: 04/22/09 12:07	Analyzed: 04/23/09 20:15					**C-05**
Fluorene	283	---	6.67	ug/kg wet	"	"	---	85	50-120%	---	---	
Indeno(1,2,3-cd)pyrene	355	---	6.67	"	"	"	---	106	40-120%	---	---	
Naphthalene	273	---	6.67	"	"	"	---	82	"	---	---	
Phenanthrene	277	---	6.67	"	"	"	---	83	50-120%	---	---	
Pyrene	318	---	6.67	"	"	"	---	95	45-125%	---	---	
Surr: Nitrobenzene-d5 (Surr)			*Recovery: 84 %*	*Limits: 35-120 %*		*Dilution: 1x*						
2-Fluorobiphenyl (Surr)			*74 %*	*45-120 %*		*"*						
p-Terphenyl-d14 (Surr)			*98 %*	*30-120 %*		*"*						
Duplicate (9040260-DUP1)						Prepared: 04/22/09 12:07	Analyzed: 04/23/09 21:06					**C-05**
QC Source Sample: B3@3' (A904157-03RE1)												
EPA 8270C (SIM)												
Acenaphthene	ND	---	304	ug/kg dry	2	---	ND	---	---	---	30%	
Acenaphthylene	ND	---	304	"	"	---	ND	---	---	---	30%	
Anthracene	ND	---	304	"	"	---	ND	---	---	---	30%	
Benz(a)anthracene	**786**	---	607	"	"	---	663	---	---	17	30%	A-02
Benzo(a)pyrene	**598**	---	304	"	"	---	595	---	---	0.4	30%	
Benzo(b+k)fluoranthene(s)	**863**	---	607	"	"	---	784	---	---	10	30%	Q-26
Benzo(g,h,i)perylene	**619**	---	304	"	"	---	607	---	---	2	30%	
Chrysene	**707**	---	607	"	"	---	613	---	---	14	30%	A-02
Dibenz(a,h)anthracene	ND	---	304	"	"	---	ND	---	---	---	30%	
Fluoranthene	**514**	---	304	"	"	---	289	---	---	56	30%	Q-05
Fluorene	ND	---	304	"	"	---	ND	---	---	---	30%	
Indeno(1,2,3-cd)pyrene	ND	---	304	"	"	---	ND	---	---	---	30%	
Naphthalene	ND	---	304	"	"	---	ND	---	---	---	30%	
Phenanthrene	**315**	---	304	"	"	---	ND	---	---	---	30%	Q-05
Pyrene	**636**	---	304	"	"	---	418	---	---	41	30%	Q-05
Surr: Nitrobenzene-d5 (Surr)			*Recovery: 71 %*	*Limits: 35-120 %*		*Dilution: 2x*						
2-Fluorobiphenyl (Surr)			*79 %*	*45-120 %*		*"*						
p-Terphenyl-d14 (Surr)			*108 %*	*30-120 %*		*"*						

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Geocon Northwest Inc.	Project:	**Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number:	P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040247 - EPA 3051							**Soil**					
Blank (9040247-BLK1)						Prepared: 04/21/09 17:08	Analyzed: 04/22/09 11:12					
EPA 6020												
Arsenic	ND	---	1.00	mg/kg wet	10	---	---	---	---	---	---	
Barium	ND	---	1.00	"	"	---	---	---	---	---	---	
Cadmium	ND	---	1.00	"	"	---	---	---	---	---	---	
Chromium	ND	---	2.00	"	"	---	---	---	---	---	---	
Lead	ND	---	1.00	"	"	---	---	---	---	---	---	
Mercury	ND	---	0.0800	"	"	---	---	---	---	---	---	
Selenium	ND	---	1.00	"	"	---	---	---	---	---	---	
Silver	ND	---	1.00	"	"	---	---	---	---	---	---	
LCS (9040247-BS1)						Prepared: 04/21/09 17:08	Analyzed: 04/22/09 11:15					
EPA 6020												
Arsenic	50.2	---	1.00	mg/kg wet	10	50.0	---	100	80-120%	---	---	
Barium	50.6	---	1.00	"	"	"	---	101	"	---	---	
Cadmium	51.0	---	1.00	"	"	"	---	102	"	---	---	
Chromium	49.2	---	2.00	"	"	"	---	98	"	---	---	
Lead	51.3	---	1.00	"	"	"	---	102	"	---	---	
Mercury	2.03	---	0.0800	"	"	2.00	---	102	"	---	---	
Selenium	25.2	---	1.00	"	"	25.0	---	101	"	---	---	
Silver	25.2	---	1.00	"	"	"	---	101	"	---	---	
Duplicate (9040247-DUP1)						Prepared: 04/21/09 17:08	Analyzed: 04/22/09 11:21					
QC Source Sample: B3@3' (A904157-03)												
EPA 6020												
Arsenic	**1.45**	---	1.22	mg/kg dry	10	---	1.29	---	---	12	40%	
Barium	**48.4**	---	1.22	"	"	---	42.4	---	---	13	40%	
Cadmium	ND	---	1.22	"	"	---	ND	---	---	---	40%	
Chromium	**10.6**	---	2.44	"	"	---	9.03	---	---	16	40%	
Lead	**17.7**	---	1.22	"	"	---	11.4	---	---	43	40%	Q-04
Mercury	ND	---	0.0977	"	"	---	ND	---	---	---	40%	
Selenium	ND	---	1.22	"	"	---	ND	---	---	---	40%	
Silver	ND	---	1.22	"	"	---	ND	---	---	---	40%	
Matrix Spike (9040247-MS1)						Prepared: 04/21/09 17:08	Analyzed: 04/22/09 11:24					
QC Source Sample: B3@3' (A904157-03)												
EPA 6020												

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040247 - EPA 3051							**Soil**					
Matrix Spike (9040247-MS1)						Prepared: 04/21/09 17:08	Analyzed: 04/22/09 11:24					
QC Source Sample: B3@3' (A904157-03)												
Arsenic	56.5	---	1.16	mg/kg dry	10	57.9	1.29	95	75-125%	---	---	
Barium	114	---	1.16	"	"	"	42.4	124	"	---	---	
Cadmium	58.6	---	1.16	"	"	"	ND	101	"	---	---	
Chromium	64.4	---	2.32	"	"	"	9.03	96	"	---	---	
Lead	73.3	---	1.16	"	"	"	11.4	107	"	---	---	
Mercury	2.25	---	0.0926	"	"	2.32	0.0447	95	"	---	---	
Selenium	27.9	---	1.16	"	"	28.9	ND	96	"	---	---	
Silver	28.5	---	1.16	"	"	"	ND	99	"	---	---	

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Geocon Northwest Inc.	Project:	**Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number:	P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager:	Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

TCLP Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 9040281 - EPA 1311/3015							**Solid**					
Blank (9040281-BLK1)						Prepared: 04/24/09 09:26	Analyzed: 04/24/09 11:33					
EPA 1311/6020												
Arsenic	ND	---	0.100	mg/L	5	---	---	---	---	---	---	
Barium	ND	---	1.25	"	"	---	---	---	---	---	---	
Cadmium	ND	---	0.0500	"	"	---	---	---	---	---	---	
Chromium	ND	---	0.100	"	"	---	---	---	---	---	---	
Lead	ND	---	0.0500	"	"	---	---	---	---	---	---	
Mercury	ND	---	0.00400	"	"	---	---	---	---	---	---	
Selenium	ND	---	0.0500	"	"	---	---	---	---	---	---	
Silver	ND	---	0.100	"	"	---	---	---	---	---	---	
LCS (9040281-BS1)						Prepared: 04/24/09 09:26	Analyzed: 04/24/09 11:36					
EPA 1311/6020												
Arsenic	2.52	---	0.100	mg/L	5	2.50	---	101	80-120%	---	---	
Barium	2.72	---	1.25	"	"	"	---	109	"	---	---	
Cadmium	2.58	---	0.0500	"	"	"	---	103	"	---	---	
Chromium	2.44	---	0.100	"	"	"	---	98	"	---	---	
Lead	2.52	---	0.0500	"	"	"	---	101	"	---	---	
Mercury	0.0990	---	0.00400	"	"	0.100	---	99	"	---	---	
Selenium	1.25	---	0.0500	"	"	1.25	---	100	"	---	---	
Silver	1.27	---	0.100	"	"	"	---	101	"	---	---	
Matrix Spike (9040281-MS2)						Prepared: 04/24/09 09:26	Analyzed: 04/24/09 12:01					
QC Source Sample: Composite of B1&B2 (A904157-04)												
EPA 1311/6020												
Arsenic	2.59	---	0.100	mg/L	5	2.50	ND	104	50-150%	---	---	
Barium	3.46	---	1.25	"	"	"	0.982	99	"	---	---	
Cadmium	2.58	---	0.0500	"	"	"	ND	103	"	---	---	
Chromium	2.51	---	0.100	"	"	"	0.00750	100	"	---	---	
Lead	2.70	---	0.0500	"	"	"	0.145	102	"	---	---	
Mercury	0.0995	---	0.00400	"	"	0.100	ND	100	"	---	---	
Selenium	1.31	---	0.0500	"	"	1.25	ND	105	"	---	---	
Silver	1.26	---	0.100	"	"	"	ND	101	"	---	---	

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

QUALITY CONTROL (QC) SAMPLE RESULTS

Percent Dry Weight by D2216

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes

Batch 9040254 - Dry Weight **Soil**

No Client related Batch QC samples analyzed for this batch. See notes page for more information.

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

SAMPLE PREPARATION INFORMATION

Diesel Range (C10-C22) and Oil Range (C22-C40) Hydrocarbons by NWTPH-Dx

Prep: EPA 3546 (Fuels)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9040253							
A904157-03	Soil	NWTPH-Dx	04/20/09 10:00	04/22/09 13:15	10.99g/10mL	15g/5mL	2.73
A904157-04	Soil	NWTPH-Dx	04/20/09 16:00	04/22/09 13:15	10.46g/5mL	15g/5mL	1.43

PAH by EPA 8270C SIM

Prep: EPA 3546/3640A (GPC)

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9040260							
A904157-03RE1	Soil	EPA 8270C (SIM)	04/20/09 10:00	04/22/09 12:07	14.96g/100mL	15g/5mL	20.10
A904157-04RE1	Soil	EPA 8270C (SIM)	04/20/09 16:00	04/22/09 12:07	15.94g/50mL	15g/5mL	9.41

Total Metals by EPA 6020 (ICPMS)

Prep: EPA 3051

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9040247							
A904157-03	Soil	EPA 6020	04/20/09 10:00	04/21/09 17:08	0.5g/50mL	0.5g/50mL	1.00
A904157-04	Soil	EPA 6020	04/20/09 16:00	04/21/09 17:08	0.512g/50mL	0.5g/50mL	0.98

TCLP Metals by EPA 6020 (ICPMS)

Prep: EPA 1311/3015

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 9040281							
A904157-03	Soil	EPA 1311/6020	04/20/09 10:00	04/24/09 09:26	5mL/50mL	5mL/50mL	1.00
A904157-04	Soil	EPA 1311/6020	04/20/09 16:00	04/24/09 09:26	5mL/50mL	5mL/50mL	1.00

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Allison Greiner For Philip Nerenberg, Lab Director

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

Notes and Definitions

Qualifiers:

A-01	Reporting Limit raised due to coelution of Benz(a)Antracene with Chrysene. Insufficient separation to report individually.
A-02	Insufficient separation to report Benz(a)antracene and Chrycene as individual peaks. Combined integration may bias results high.
C-05	Extract has undergone a GPC (Gel-Permeation Chromotography) cleanup per EPA 3640A.
F-03	The result for this hydrocarbon range is elevated due to the presence of individual analyte peaks in the quantitation range that are not representative of the fuel pattern reported.
F-07	Results in the diesel organics range are primarily due to overlap from a heavy oil range product.
Q-04	The RPD and/or Percent Recovery for this QC sample is outside control limits due to a non-homogeneous sample matrix.
Q-05	Analyses are not controlled on RPD values from sample or duplicate concentrations near or below the reporting level.
Q-26	Peak separation for Benzo(b) and Benzo(k)fluoranthenes does not meet method specified criteria. Reported result includes the combined area of the two isomers and should be considered the total of Benzo(b+k)Fluoranthenes.

Notes and Conventions:

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry'designation are not dry weight corrected.
RPD	Relative Percent Difference
MDL	If MDL is not listed, data has been evaluated to the Method Reporting Limit only.
WMSC	Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.
Batch QC	Unless specifically requested, this report contains only results for Batch QC derived from client samples included in this report. All analyses were performed with the appropriate Batch QC (including Sample Duplicates, Matrix Spikes and/or Matrix Spike Duplicates) in order to meet or exceed method and regulatory requirements. Any exceptions to this will be qualified in this report. Complete Batch QC results are available upon request. In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.

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Geocon Northwest Inc.	Project: **Evidence Processing & Crime Lab**	
8283 SW Cirrus Dr	Project Number: P1671-5-1	**Reported:**
Beaverton, OR 97008-6443	Project Manager: Kevin Schleh	04/29/09 15:07

APEX LABS — **CHAIN OF CUSTODY**

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Lab # A904157 COC 1 of 1

Company: GeoCon NorthWest | Project Mgr: Kevin Schleh | Project Name: Evidence Processing & Crime Lab | Project # P1671-5-1

Address: 8283 SW Cirrus Dr, Beaverton, OR | Phone: 5036269889 | Fax: | Email: kevin@geoconnw.com

Sampled by: Kevin Schleh

Site Location: OR WA Other:

ANALYSIS REQUEST

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-Dx	NWTPH-Gx	BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Metals (8)	Priority Metals (13)	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Hg, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Tl, V, Zn	TCLP Metals (8)	1280-COLS	1280-Z
B1@ 4.5'		4/16/9	930	S	1		/						/			/			/		
B2@ 6'		4/16/9	1600	↓	↓		/						/			/			/		
B3@ 3'		4/16/9	1030	↓	↓		/						/			/			/		

Normal Turn Around Time (TAT) = 5-10 Business Days

TAT Requested (circle): 24 HR 48 HR 72 HR 4 DAY 5 DAY Other: ______

SAMPLES ARE HELD FOR 30 DAYS

SPECIAL INSTRUCTIONS: Composite B1 + B2 prior to analysis

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date: 4/21/9	Signature: [signature]	Signature: Date:	Signature:
Printed Name: Kevin Schleh Time: 1315	Printed Name: M. Zirk	Printed Name: Time:	Printed Name:
Company: GeoCon NorthWest	Company: APEX	Company:	Company:

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Allison Greiner For Philip Nerenberg, Lab Director

Addendum #1

GEOTECHNICAL INVESTIGATION

SITE SPECIFIC SEISMIC HAZARD EVALUATION

SUNNYBROOK OFFICE BUILDING

CLACKAMAS COUNTY, OREGON

GEOCON
NORTHWEST, INC.
GEOTECHNICAL &
ENVIRONMENTAL
CONSULTANTS

PREPARED FOR

SERA ARCHITECTS
PORTLAND, OREGON

APRIL 2009

Project No. P1672-05-01
April 17, 2009

Mr. Don Eggleston
SERA Architects
338 NW 5th Avenue
Portland, Oregon 97209

Subject: SUNNYBROOK OFFICE BUILDING SEISMIC UPGRADE
CLACKAMAS COUNTY, OREGON
GEOTECHNICAL INVESTIGATION AND
SITE-SPECIFIC SEISMIC HAZARD EVALUATION

Dear Mr. Eggleston:

In accordance with our proposal number P09-05-37, dated March 30, 2009, and your authorization, we have performed a geotechnical investigation and site-specific seismic hazard investigation for the proposed seismic upgrade of the Sunnybrook Office Building in Clackamas County, Oregon. The accompanying report presents the findings of the geotechnical investigation and site-specific seismic hazard evaluation and conclusions and recommendations regarding the geotechnical aspects of the proposed project. Based on the results of this investigation, it is our opinion that the proposed seismic upgrade of the building to an essential facility is geotechnically feasible as proposed, provided the recommendations of this report are followed. Important geotechnical topics addressed herein include grading with near-surface moisture sensitive soils and ultimate foundation bearing capacity during a seismic event.

If you have questions regarding this report, or if we may be of further service, please contact the undersigned at your convenience.

Sincerely,

GEOCON NORTHWEST, INCORPORATED

Bryan Wavra

Bryan Wavra, P.E.
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
58088PE
Bryan J Wavra
OREGON
JULY 13, 2004
BRYAN JOHN WAVRA
EXPIRATION DATE: 6/30/10

Wesley Spang

Wesley Spang, Ph.D., P.E.
President

TABLE OF CONTENTS

GEOTECHNICAL INVESTIGATION

1 PURPOSE AND SCOPE

This report presents the results of the geotechnical investigation and site-specific seismic hazard evaluation for the proposed seismic upgrade of the Sunnybrook Office Building. The existing structure is located on SE Sunnybrook Boulevard just west of SE 93rd Avenue in Clackamas County, Oregon, as depicted on the Vicinity Map, Figure 1. The purpose of the geotechnical investigation was to evaluate subsurface soil and geologic conditions at the site and, based on the conditions encountered, provide conclusions and recommendations pertaining to the geotechnical aspects of the seismic upgrade of the existing structure.

The scope of the field investigation consisted of a site reconnaissance, review of published geological literature, three mud-rotary and two hand auger soil borings. A detailed discussion of the field investigation is presented in Section 4 of this report.

Laboratory tests were performed on selected soil samples obtained during the investigation to evaluate pertinent physical properties. Appendix B presents a summary of the laboratory test results, exclusive of the moisture test results. The results of laboratory moisture content tests are presented on the exploratory boring logs, located in Appendix A.

The recommendations presented herein are based on an analysis of the data obtained during the investigation, laboratory test results and our experience with similar soil and geologic conditions. This report has been prepared for the exclusive use of SERA Architects and their agents, for specific application to this project, in accordance with generally accepted geotechnical engineering practice. This report may not contain sufficient information for purposes of other parties or other uses.

2 SITE AND PROJECT DESCRIPTION

The existing Sunnybrook Office Building is located at SE Sunnybrook Boulevard just west of SE 93rd Avenue in Clackamas County, Oregon, as depicted on the Vicinity Map, Figure 1. The existing building has recently been used by several Clackamas County agencies. It is understood that the vacant building will be seismically upgraded to meet essential facility requirements according to ASCE 41-06. New on-grade asphalt parking is also planned for the vacant lot west of the existing building.

Discussions with KPFF Consulting Engineers indicate that existing maximum column loads are approximately 625 kips while maximum wall loads are approximately 18 kips per foot. The structural drawings developed for the construction of the Sunnybrook Office Building indicate that the spread footing dimensions range from 4 to 12.5-feet square. The bottoms of the footings were founded a minimum of 4 feet below the existing ground surface prior to construction and, due to the sloping topography of the site, ranged in elevation from 142 to 156.7 feet. The footings were proportioned using an allowable bearing pressure of 4,000 psf.

3 GEOLOGY

3.1 Regional Geology

The near-surface geology of the project area consists of Late Pleistocene Age alluvial deposits of silt, fine-grained sand, and gravel. The alluvial materials are underlain by Boring Lava volcanic rock. The volcanic rock ranges from highly weathered soil composition to hard, intact rock. Previous experience in the near vicinity suggests that hard rock can be encountered at shallow depth.

The USDA Soil Conservation Service "Soil Survey of Clackamas County, Oregon" (1982) maps the project site as Powell Silt loam and Cascade Silt Loam. Both soil series are characterized as poorly drained soil with reported permeability rates of 0.6 to 2.0 inches per hour near the surface and 0.06 to 0.2 inches per hour at depth.

4 SUBSURFACE EXPLORATION AND CONDITIONS

4.1 Site Exploration

The subsurface soil conditions at the site were determined based on the literature review, field exploration, and laboratory investigation. The field exploration was completed on March 27 and April 6, 2009, and consisted of three exploratory mud rotary borings, and two hand auger borings. The exploratory borings were completed to a maximum depth of 26 feet below the ground surface (bgs). The standard penetration test blowcount values provided in the boring logs are field measured values using an automatic hammer.

Two hand auger soil borings were completed in future proposed pavement areas for the project. The hand auger borings were each advanced to a depth of approximately 5-feet bgs.

The approximate exploratory boring and hand auger boring locations are depicted on the Site Plan, Figure 2.

4.2 Subsurface Conditions

The subsurface exploration is assumed to be representative of the subsurface conditions across the site; however, it is possible that some local variations and possible unanticipated subsurface conditions exist. Based on the conditions observed during the reconnaissance and field exploration, the subsurface conditions, in general, consisted of the following:

> **ASPHALT PAVEMENT AND LANDSCAPE GRASS**– The surface of the site, in the proposed locations of the future pavement areas, primarily consists of maintained grass. The grassy areas contain approximately 4-inches of topsoil and is underlain by 8 to 12 inches of undocumented fill soil. The mud rotary borings were all completed within existing pavement

areas throughout the site and encountered a pavement section consisting of 4 inches of asphalt that is underlain by 14 to 18 inches of base rock.

CLAYEY SILT TO SILTY CLAY – Beneath the surface layer in each exploration, moist, brown, clayey silt was encountered. The consistency of the layer varied from medium stiff to very stiff and extended to an average depth of approximately 15 feet bgs. Perched water was observed within the mud rotary borings at an approximate depth of 10 feet bgs and was as shallow as 4 feet in the hand auger borings.

WEATHERED BASALT – Below the clayey silt to silty clay, a formation of basalt rock at various stages of weathering was encountered to the maximum depths explored. The rock was drillable using a tricone bit to an approximate depth of 20 feet in each boring. A rock core run was completed in boring B-3 between depths of 20.5 and 26.5 feet and resulted in a Rock Quality Designation (RQD) of 80%. An RQD of 80 is characterized as "good" rock according to the rock mass quality scale.

GROUNDWATER – Static groundwater was not measured during the subsurface investigation. However, saturated soil representative of perched water conditions was observed at a depth of 10 feet in the mud rotary borings and 4 feet in the hand augers. Perched groundwater may occur during wet periods in variable and unpredictable locations. Typical locations may be within interbedded sand and silt layers, the soil/rock interface, or where there are variations in soil permeability.

5 SITE SPECIFIC SEISMIC HAZARD EVALUATION - ASCE 41-06 SEISMIC REHABILIATION OF EXISTING BUILDINGS

Per the recommendation of project structural engineer, KPFF Consulting Engineers, the site-specific seismic hazard evaluation was completed in accordance with ASCE 41-06 "Seismic Rehabilitation of Existing Buildings".

5.1 Seismic Setting

5.1.1 Earthquake Sources

The seismicity of the Clackamas area is controlled by three separate fault mechanisms. These include the Cascadia Subduction Zone (CSZ), the mid-depth intraplate zone, and relatively shallow crustal faults. The Cascadia Subduction Zone is located offshore and extends from Northern California to British Columbia. Within this zone the oceanic Juan De Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers. The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes. Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Oregon coast (Peterson et al. 1993). Sequences of interlayered peat and sands have been interpreted to be the result of large subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A study completed by Geomatrix (1995) for the Oregon Department of Transportation suggests that the maximum earthquake associated with the CSZ is moment magnitude (M_W) 8 to 9, and is supported by recent studies published by the United States Geologic Survey (USGS, 2008). This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes which have occurred within subduction zones in other parts of the world.

The intraplate or intraslab zone encompasses the portion of the subducting Juan De Fuca Plate located at a depth of approximately 20 to 40 km below Western Oregon. Very low levels of seismicity have been observed within the intraplate zone in Oregon. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence in Oregon were suggested in the Geomatrix (1995) study and include changes in the direction of subduction between Oregon and British Columbia as well as the effects of volcanic activity along the Cascade Range. Historical activity associated with the intraplate zone includes the 1949 Olympia (magnitude 7.1), the 1965 Puget Sound (magnitude 6.5), and the 2001 Nisqually (magnitude 6.8) earthquakes. Both Geomatrix (1995) and Wong et al (2000) present estimates of M_W 7.0 to 7.2 for the maximum moment magnitude of the intraslab zone.

The third source of seismicity that can result in ground shaking at the subject property is near-surface crustal earthquakes occurring within the North American Plate. The historical seismicity of crustal earthquakes in western Oregon is higher than the seismicity associated with the CSZ and the intraplate zone. The 1993 Scotts Mills (magnitude 5.6) and Klamath Falls (magnitude 6.0) were crustal earthquakes. Individual faults or fault zones, which have been mapped by the Oregon Department of Geology and Mineral Industries (1991), Geomatrix (1995) and Wong et al (2000) within the near-vicinity of the site, are indicated below in Table 1: Crustal Faults. As discussed within Wong et al (2000), the estimated maximum moment magnitude for each crustal fault was determined using empirical relationships developed by Wells and Coppersmith (1994) between rupture length, rupture area, and earthquake magnitude.

Seismic and geologic parameters such as slip rate, horizontal and vertical offset, rupture length, and geologic age have not been determined for the majority of the faults in Table 1. This is primarily due to the lack of surface expressions or exposures of faulting because of urban development and the presence of late Quaternary soil deposits that overlie the faults. The low level of historical seismicity (particularly for earthquakes greater than magnitude 5) and lack of paleo-seismic data results in large uncertainties when evaluating individual crustal fault maximum magnitude earthquakes and recurrence intervals, and limits the available knowledge of characteristic motions of estimated maximum moment earthquakes.

Table 1: Crustal Faults

Mapped Fault or Fault Zone	*Probability of Activity (Wong, 2000)*	*Fault Type (USGS, 2008)*	*Maximum Moment Magnitude (USGS, 2008)*	*Approx. Horizontal Distance From Site to Surface Fault Trace (miles)*
Portland Hills Fault	0.8	Reverse	7.0	3
Oatfield Fault	0.8	Reverse	7.0	3
East Bank Fault	0.8	Reverse	7.0	3
Bolton Fault	0.2	Reverse	6.2	5
Grant Butte, Damascus-Tickle Creek Fault Zone	0.5	Normal	6.2	3
Helvetia Fault	0.2	Reverse	6.4	19
Lacamas Lake Fault	0.5	Strike-slip,	6.7	15
Sandy River Fault	0.1	Dip-slip, Strike-slip	6.4	17
Mount Angel Fault	0.9	Strike-slip	6.8	25
Newberg Fault	0.7	Strike-slip	6.9	22
Gales Creek Fault	0.7	Strike-slip	6.8	25

5.1.2 Historical Seismicity

The historical seismicity of the site and the vicinity was determined based upon the review of the September 1993 and November 1995 issues of Oregon Geology and on the analysis of the 150 year Oregon earthquake catalog, DOGAMI Open-File Report O-94-4. OFR O-94-4 is a database of 15,000 Oregon earthquakes that occurred between 1833 and October 25, 1993. In order to establish an estimated Richter Magnitude for those seismic events that do not have such a recording, the Gutenberg and Richter, 1965 relationship, $M = (2/3)\ MMI + 1$, was applied to those earthquakes that only had a reported Modified Mercalli Intensity (MMI). The MMI scale is a means of estimating the size of an earthquake using human observations and reactions to the earthquake. The MMI scale ranges from I to XII, with XII representing the highest intensity. A search of the database was conducted to determine the number and estimated magnitude of earthquakes that have taken place within 50 kilometers of the site. The information derived from the Oregon earthquake catalog indicates that 10 M5.0 or greater earthquakes occurred within the search zone. M5.7 was the largest recorded magnitude within the 50-km search area.

5.2 Crustal Faults

Based on the literature review, there are no identified tectonic faults mapped within the boundaries of the site or within adjacent properties. Evidence was not encountered during the field investigation to suggest the presence of faults within the property. The potential for fault displacement and associated ground subsidence at the site is considered remote.

5.3 Ground Shaking Characteristics

The peak bedrock acceleration for the 2% chance of exceedance in 50-year event (2475-year return period) was evaluated using the 2002 United States Geological Survey's National Seismic Hazard Project. This probabilistic uniform hazard study incorporates the relative contributions of the Cascadia Subduction Zone, intraplate earthquakes within the Juan de Fuca plate, and crustal earthquakes from the North American Plate. Deaggregation of the uniform hazard data provides the relative contributions of the individual earthquake sources. The results of the probabilistic analysis indicate an estimated peak bedrock acceleration of 0.41g for a 2475-year return period. The deaggregation of the probabilistic uniform hazard indicates approximately 85% of the overall hazard is attributed to shallow crustal faults and random gridded seismicity with the remaining hazard contributed by the Cascadia Subduction Zone. There is a negligible contribution to the seismic hazard at the site from the intraslab source.

The characteristic earthquake associated with an interslab event within the CSZ was determined to be a M9 event at a distance of 100 km. The crustal fault contribution is primarily attributed to random gridded seismicity, and the Grant Butte and Portland Hills Fault Zones. A M6.8 earthquake at a distance of 5 kilometers on the Portland Hills Fault was estimated as the characteristic earthquake associated with the crustal source when considering a 2475-year return period.

5.4 General Procedure for Hazard Due to Ground Shaking-ASCE 41-06 Section 1.6.1

Provisions within the ASCE 41-06 document require that earthquake ground motions be developed for two levels of earthquake hazard. Basic Safety Earthquake Level 1 (BSE-1) consists of the earthquake hazard associated with a probability of exceedance of 10% in a time period of 50 years (475-year return period but typically referred to as 500-year return period). Basic Safety Earthquake Level 2 (BSE-2) is designated as the Maximum Considered Earthquake (MCE) and in most regions of the country, corresponds to a probability of exceedance of 2% in a time period of 50 years (2475-return period but commonly referred to as 2500-year return period).

National probabilistic hazard maps were developed by the National Earthquake Hazards Reduction Program (NEHRP) in 2003 for both levels of earthquake hazard (BSE-1 and BSE-2). The maps have both peak ground acceleration values and spectral acceleration values at 5% structural damping. Map parameters are for a generic rock site corresponding to site class B which is defined as rock with shear wave velocity ranging from 2,500 feet per second to 5,000 feet per second. The ground motion parameters were determined for the Sunnybrook Office Building site for both levels of earthquake hazard in accordance with Section 1.6.1 of ASCE 41-06. The values obtained from the NEHRP maps were adjusted for the soil conditions within the site as detailed in Section 1.6.1.4. The results of the standard penetration testing and geologic literature reviewed for the site indicate that the average N value of the underlying material to a depth of 100 feet ranges from 15 to 50, as calculated per

Equation 1-6 of ASCE 41-06. This results in the site being classified as Class D per Section 1.6.1.4.1.

The adjusted ground motion parameters, designated S_{XS} for the short spectral period (0.2 second) and S_{x1} for the one-second spectral period, were used to construct the General Horizontal Response Spectrum per Section 1.6.1.5 of ASCE 41-06. Two response spectra were determined. One response spectrum was developed for the 500-year (BSE 1) event and one for the 2500-year (BSE 2). Both spectra were developed for 5% structural damping. The General Horizontal Response Spectra are presented in Figures 3 and 4. Ground motion parameters used for development of the General Horizontal Response Spectra are provided in Table 2.

Table 2: ASCE 41-06 General Spectral Response Acceleration Parameters

BSE-2	*BSE-1*
$S_S = 0.97g$	$S_S = 0.44g$
$S_1 = 0.33g$	$S_1 = 0.15g$
$F_a = 1.11$	$F_a = 1.45$
$F_v = 1.74$	$F_v = 2.20$
$S_{XS} = 1.08$	$S_{XS} = 0.63$
$S_{X1} = 0.58$	$S_{X1} = 0.33$
$T_S = 0.53$	$T_S = 0.52$

5.5 Site Specific Procedure for Hazard Due to Ground Shaking-ASCE 41-06 Section 1.6.2

By definition in ASCE 41-06, probabilistic site-specific spectra that represent the BSE-1 and BSE-2 shall be mean spectra at the 10% in 50-year and 2% in 50-year probabilities of exceedance, respectively. The BSE-2 site-specific deterministic spectra shall be taken as 150% of the median spectra for the characteristic event on the controlling fault. The 5% damped site-specific spectral amplitudes in the period range of interest to the structural response shall not be less than 70% of the spectral amplitudes of the General Response Spectrum (ASCE 41-06 Section 1.6.2.1.2). The following discussion presents the means and methods used to develop the site-specific response spectra for the Sunnybrook Office Building.

5.6 Site-Specific BSE-2 Spectral Response Acceleration Parameters – ASCE 41-06 Section 1.6.2.1.4

The 2500-year probabilistic BSE-2 level response spectrum was developed using the National probabilistic hazard maps developed by the National Earthquake Hazards Reduction Program (NEHRP). This uniform hazard spectrum was developed for a rock site and was adjusted for site class D soil conditions using site amplification factors F_a and F_v. These values are the same as presented in 5.4 for the development of the BSE-2 General Response Spectrum.

The deterministic BSE-2 level response spectrum was developed using the Next Generation Attenuation (NGA) equations developed by Abrahamson and Silva, Atkinson and Boore, Campbell and Bozorgnia, and Chiou and Youngs for the crustal source while the subduction zone was evaluated by attenuation equations from Youngs et. al. and Atkinson and Boore. Each attenuation equation includes a soil input variable to account for the potential amplification or damping effect of the soil column subjected to seismic shaking. As discussed within Section 5.3, the hazard associated with the crustal source was determined to be represented by a M6.8 earthquake at a distance of approximately 5 kilometers. The interslab source associated with the CSZ is expected to be represented by a M9 earthquake at a distance of approximately 100 kilometers. These magnitude and distance relationships were used as input parameters for the respective attenuation equations. The results of the individual response spectrum developed from each equation were averaged into a mean spectrum and multiplied by 150% for the BSE-2 level response spectrum.

Per Section 1.6.2.1.4, the site-specific response acceleration parameters for the BSE-2 Earthquake Hazard Level shall be taken as the smaller of the two aforementioned spectra. Figure 5 shows a comparison of the probabilistic BSE-2 (2500-year) and 150% of the deterministic mean. The 2500-year probabilistic site-specific spectrum is smaller between periods of 0.25 and 0.75 seconds, while the 150% deterministic spectrum is smaller throughout the remaining periods. A combination of the two spectra with the smaller values throughout the entire period range was used as the basis for determining the BSE-2 site-specific response acceleration parameters.

5.7 Site-Specific BSE-1 Spectral Response Acceleration Parameters – ASCE 41-06 Section 1.6.2.1.5

The 500-year probabilistic BSE-1 level response spectrum was developed using the National probabilistic hazard maps developed by the National Earthquake Hazards Reduction Program (NEHRP). This uniform hazard spectrum was developed for a rock site and was adjusted for site class D soil conditions using site amplification factors F_a and F_v. These values are the same as presented in 5.4 for the development of the BSE-1 General Response Spectrum.

The response spectrum from the 500-year probabilistic determination and two-thirds of the BSE-2 Earthquake Hazard response spectrum are shown in Figure 6. Per Section 1.6.2.1.5, the site-specific response acceleration parameters for the BSE-1 Earthquake Hazard Level shall be taken as the smaller of the two aforementioned spectra. Therefore, the 500-year probabilistic site-specific spectrum was used as the basis for determining the BSE-1 site-specific response acceleration parameters.

5.8 Site-Specific Response Acceleration Parameters – ASCE 41-06 Section 1.6.2.1.6

Site-specific response spectra having the prescribed "three-leg" format (idealized spectra) were developed from the BSE-2 and BSE-1 spectra in accordance with Section 1.6.2.1.6 of ASCE 41-06. The design response parameter S_{XS} was obtained at a period of 0.2 seconds, but checked to ensure that that it was not less than 90% of the peak response acceleration at any period. The design response parameter S_{X1} was determined by overlying a curve of the form $S_a = S_{X1}/T$ on the site-specific spectrum such that at any period the value of S_a obtained from the curve was not less than 90% of that which would be obtained directly from the spectrum. Both parameters were selected such that the spectral acceleration values at any period were greater than 70% of the General Response Spectra of Figures 3 and 4. Table 2 provides the site specific response acceleration parameters for the BSE-2 and BSE-1 earthquake levels. Figure 7 illustrates the idealized site-specific response spectra recommended for each earthquake level.

Table 3: ASCE 41-06 Site-Specific Spectral Response Acceleration Parameters

BSE-2	***BSE-1***
S_{XS} =1.06	S_{XS} = 0.63
S_{X1} = 0.50	S_{X1} = 0.33
T_S = 0.47	T_S = 0.52

5.9 Soil Liquefaction Potential

Liquefaction can cause aerial and differential settlement, lateral spreading, loss of bearing capacity, and sudden loss in soil strength. Soils prone to liquefaction are typically loose, saturated sands and, to a lesser degree, silt. Cyclic failure can result in similar hazards to those of liquefaction, but is a phenomena related to low-strength, fine-grained silt and clay soils. When ground shaking commences, the low-strength saturated soils tend to generate excess pore water pressures. The degree of excess pore water pressure generation is largely a function of the magnitude and duration of the ground shaking, as well as the density or consistency of the soil.

The cyclic failure potential of the fine grained deposits was assessed using procedures outlined by Boulanger and Idriss, 2008. The undrained shear strength of the soils was evaluate using methods based on the SPT blow counts and grain size distribution data obtained during the geotechnical field and laboratory investigation. The seismically induced shear stresses at the site were assessed through the use of a standard-of-practice simplified empirical procedure. The analyses were conducted using the 2007 Oregon Structural Specialty Code design level earthquakes which consisted of a moment magnitude 6.2 for the crustal source and moment magnitude 8.5 for a subduction zone event. Peak ground surface acceleration values of 30% and 16% gravity (0.30g and 0.16g) were used for the crustal and subduction zone earthquakes, respectively. The peak ground acceleration values for each earthquake were estimated using attenuation relationships for stiff soil sites independently associated with individual crustal faults as well as the Cascadia Subduction Zone. Based on the results of our analyses, cyclic failure potential at the site is considered remote. There is not a liquefaction hazard at the site due to lack of sandy soil within the subsurface profile

5.10 Landslide Hazard

The site, in the location of proposed development, is flat and not susceptible to slope instability. Therefore, it is Geocon Northwest's opinion the landslide hazard at the site is negligible.

5.11 Lateral Spreading

Lateral spreading is a liquefaction related seismic hazard that may adversely impact some sites. Areas subject to lateral spreading are underlain by liquefiable sediments and are sloping sites or flat sites adjacent to an open face. The lateral spreading potential at the site is considered negligible due to absence of liquefiable material and the flat topography of the site.

5.12 Seiche and Tsunami Inundation

There is not a potential for seiche- and tsunami-related damage at the site due to the distance of the site from lakes and coastal areas.

5.13 Seismic Lateral Earth Pressures on Retaining Walls

Seismic activity can generate increased lateral earth pressures acting on retaining walls, including basement walls. The increase is influenced by the horizontal ground acceleration and the allowable movement of the wall. A horizontal acceleration of 0.15g and an allowable wall movement greater than 0.001 times the wall height to produce active pressures was used to determine seismically induced wall pressures. Based on Mononobe-Okabe procedures for a vertical wall with horizontal backfill, the *additional* lateral pressures due to earthquake motions should be based on an equivalent fluid weight of 15 pcf. The results of the additional dynamic earth pressure should be applied at a height of 0.6H above the wall base.

6 LABORATORY TESTING

Laboratory testing was performed on selected soil samples to evaluate moisture content, plasticity, and gradation. Visual soil classification was performed both in the field and laboratory, in general accordance with the Unified Soil Classification System. Moisture content determinations (ASTM D2216) were performed on soil samples to aid in classifying the soil. Grain size analyses were performed on selected samples using procedures ASTM D1140 and ASTM D422. The plasticity index was determined in general accordance with ASTM D4318. Moisture contents are indicated on the boring logs and are located in Appendix A of this report. Other laboratory test results for this project are summarized in Appendix B.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 General

7.1.1 It is our opinion that the proposed seismic upgrade to the Sunnybrook Office Building and associated parking improvements are geotechnically feasible, provided the recommendations of this report are followed. The primary geotechnical concerns associated with the proposed projects are the presence of moisture sensitive, very near-surface fine-grained soils and ultimate foundation bearing capacity during a seismic event.

7.1.2 Moisture contents of the very near-surface silty and clayey soils were wet of optimum at the time of the investigation. Recommendations for both dry- and wet-weather construction in moisture-sensitive soils are provided, however, Geocon Northwest does recommend that grading be preferably completed during the dry weather season.

7.1.3 Discussions with project structural engineers, KPFF Consulting Engineers, indicate that the existing footings may be enlarged to accommodate additional seismic loading. Recommended ultimate bearing capacity values for use in calculating the required footing dimensions are provided hereinafter.

7.2 Site Preparation

7.2.1 Prior to new construction, the areas of the site to receive fill, footings, or pavement should be stripped of vegetation, topsoil, unsuitable undocumented fill, previous subsurface improvements, debris, and otherwise unsuitable material, down to firm soil. The grass covered portions of the site (future parking) are anticipated to be underlain by approximately 3 to 6 inches of organic topsoil which will require stripping prior to construction. Overexcavation in areas where trees, shrubs, and/or unsuitable undocumented fill soils are removed should be expected and may locally extend to a depth of 2 feet or more. Excavations made to remove previous subsurface improvements should be backfilled with structural fill per Section 7.4 of this report.

7.2.2 **Staging areas and haul roads should be considered to accommodate anticipated construction traffic.** The near surface silty and clayey soil may degrade when subjected to repeated loading from construction traffic. The pavement recommendations presented in the following sections of this report do not include an allowance for construction traffic. Past experience suggests that 18 inches of rock underlain by a geotextile separator fabric typically provides adequate work pad/haul road thickness. The recommended design section may be "overbuilt" to obtain the necessary working thickness and subsequently reduced to the design section for possible cost savings in lieu of overexcavation of suitable subgrade soil. Recommendations for wet weather haul roads and working pads should be implemented in areas of the site that will experience significant construction traffic.

7.2.3 Moisture contents of very near-surface soils were wet of optimum at the time of the field investigation. Due to the moisture sensitive nature of the near surface soils, it is recommended that earthwork-related construction take place during dry weather. Recommendations for both dry weather and wet weather site preparation are provided in the following sections. Wet weather is defined as any time of year that adequate moisture control cannot be obtained. Increased costs, associated with subgrade stabilization, should be anticipated if construction occurs during wet weather.

7.2.4 Dry Weather Construction

Native soil subgrades in structural areas that have been disturbed during stripping, cutting, or demolition operations should be scarified to a depth of at least 8-inches. The scarified soil should be moisture conditioned as necessary to achieve the proper moisture content, then compacted to at least 92% of the maximum dry density as determined by ASTM D 1557. Minimum compaction for the eight inches immediately underlying pavement sections should be 95%. Even during dry weather it is possible that some areas of the subgrade will become soft or may "pump," particularly in poorly drained areas. Saturated subsurface conditions may be encountered in irrigated or cut areas regardless of the time of year construction occurs. Soft or wet areas that cannot be effectively dried and compacted should be prepared in accordance with Section 7.2.5.

7.2.5 Wet Weather Construction

During wet weather, defined as whenever adequate soil moisture control is not possible, it may be necessary to install a granular working blanket to support construction equipment and provide a firm base on which to place subsequent fills and pavements. Commonly, the working blanket consists of a bank run gravel or pit run quarry rock (six to eight inch maximum size with no more than 5% by weight passing a No. 200 sieve). A member of Geocon Northwest's engineering staff should be contacted to evaluate the suitability of the material before installation.

The working blanket should be installed on a stripped subgrade in a single lift with trucks end-dumping off an advancing pad of granular fill. It should be possible to strip most of the site with careful operation of track-mounted equipment. However, during prolonged wet weather, or in particularly wet locations, operation of this type of equipment may cause excessive subgrade disturbance. In some areas final stripping and/or cutting may need to be accomplished with a smooth-bucket trackhoe, or similar equipment, working from an advancing pad of granular fill. After installation, the working blanket should be compacted by a minimum of four complete passes with a moderately heavy static steel drum or grid roller. It is recommended that Geocon Northwest be retained to observe granular working blanket installation and compaction.

The working blanket must provide a firm base for subsequent fill installation and compaction. Past experience indicates that about 18 inches of working pad is normally required. This assumes that the material is placed on a relatively undisturbed subgrade prepared in accordance with the preceding recommendations. Areas used as haul routes for heavy construction equipment or construction staging areas may require a work pad thickness of two feet or more. The thickness of working pad may be reduced if the upper silty soils are removed down to the underlying gravels and cobbles.

In particularly soft areas, a heavy-grade, non-degradable geotextile fabric installed on the subgrade may reduce the thickness of working blanket required. The fabric should have a minimum puncture resistance of 80 pounds and a minimum Mullen Burst strength of 300 psi.

Cement treatment may be a suitable alternative wet-weather construction technique for the subgrade conditions encountered at this site. Successful cement treatment is dependent upon the moisture content of the subgrade soils, weather conditions at the time of treatment, percentage of cement used, and adequate mixing of the soil and cement. Past experience indicates that approximately 5 to 8% cement by weight, tilled to a depth of 12 inches, is typically sufficient to produce an acceptable subgrade. Treatment procedures should be completed within an elapsed time of approximately four-hours, and should be protected from all traffic for a minimum of five days. Cement treatment design is typically the responsibility of the contractor.

Construction practices can affect the amount of work pad necessary. By using tracked equipment and special haul roads, the work pad area can be minimized. The routing of dump trucks and rubber tired construction equipment across the site can require extensive areas and thicknesses of work pad. Normally, the design, installation and maintenance of a work pad are the responsibility of the contractor.

7.3 Proof Rolling

7.3.1 Regardless of which method of subgrade preparation is used (i.e., wet weather or dry weather), it is recommended that, prior to on-grade slab construction, the subgrade or granular working blanket be proof-rolled with a fully-loaded 10- to 12-yard dump truck. Areas of the subgrade that pump, weave, or appear soft or muddy should be scarified, dried and compacted, or overexcavated and backfilled with structural granular fill per Section 7.4. If a significant length of time passes between fill placement and commencement of construction operations, or if significant traffic has been routed over these areas, the subgrade should be similarly proof-rolled before slab construction. It is recommended that a member of our geotechnical engineering staff observe the proof-roll operation.

7.4 Fills

7.4.1 Structural fills should be constructed on a subgrade that has been prepared in accordance with the recommendations in Section 7.2 of this report. Structural fills should be installed in horizontal lifts not exceeding approximately 8 inches in thickness and should be compacted to at least 92% of the maximum dry density for the native soils, 95% for imported granular material, and should be within 2% of the optimum moisture content. Compaction should be referenced to ASTM D-1557 (Modified Proctor). The compaction criteria may be reduced to 85% in landscape, planter, or other non-structural areas.

7.4.2 During dry weather when moisture control is possible, structural fills may consist of native material, free of topsoil, debris and organic matter, which can be compacted to the preceding specifications. However, if excess moisture causes the fill to pump or weave, those areas should be scarified and allowed to dry. The soil should then be recompacted, or removed and backfilled with compacted granular fill as discussed in Section 7.2 of this report. Past experience suggests that the very near surface native silty and clayey soil has a maximum dry density ranging from 105 to 115 lbs/ft^3 at an optimum moisture content between 15 and 20 percent. Moisture contents of the near surface native soil were typically between 25 and 40 percent at the time of the field investigation. Extensive drying of the near surface native should be expected if used as structural fill during construction.

7.4.3 During wet-weather grading operations, Geocon Northwest recommends that fills consist of well-graded, angular, granular soils (sand or sand and gravel) that do not contain more than 5% material by weight passing the No. 200 sieve. In addition, it is usually desirable to limit this material to a maximum of 6 inches in diameter for future ease in the installation of utilities.

7.5 Foundations

7.5.1 Discussions with KPFF indicate that existing maximum column loads are approximately 625 kips while maximum wall loads are approximately 18 kips per foot. The structural drawings developed for the construction of the Sunnybrook Office Building indicate that the spread footing dimensions range from 4 to 12.5-feet square. The bottoms of the footings were founded a minimum of 4 feet below the existing ground surface prior to construction and, due to the sloping topography of the site, ranged in elevation from 142 to 156.7 feet. The footings were proportioned using an allowable bearing pressure of 4,000 psf.

7.5.2 The seismic upgrade of the existing building to essential facility status is anticipated to result in additional earthquake loading to the existing footings. We understand that the proposed retrofit scheme is to increase the size of the existing footings to accommodate the additional loading. The results of our geotechnical engineering analysis indicate that the ultimate bearing capacity of foundations under seismic loading may be 8,000 psf for footings that have a minimum width of 6 feet. Footings with a minimum width of 2 feet, but less than 6 feet, may be designed for an ultimate (seismic) bearing capacity of 6,000 psf.

7.5.3 Lateral loads may be resisted by sliding friction and passive pressures. A base friction of 40% of the vertical load may be used against sliding. An equivalent fluid weight of 300 pcf may be used to evaluate passive resistance to lateral loads.

7.5.4 Geocon Northwest should be consulted to evaluate foundation underpinning options (i.e., micropiles) if enlarging the existing footings is not determined to be a feasible option to resist the anticipated seismic loading.

7.6 Surface and Subsurface Drainage

7.6.1 During site contouring, positive surface drainage should be maintained away from foundation and pavement areas. Additional drainage or dewatering provisions may be necessary if soft spots, springs, or seeps are encountered in subgrades or cut slopes. Where possible, surface runoff should be routed independently to a storm water collection system. Surface water should not be allowed to enter subsurface drainage systems.

7.6.2 Drainage systems should be sloped to drain by gravity to a storm sewer or other positive outlet.

7.6.3 Drainage and dewatering systems are typically designed and constructed by the contractor. Failure to install necessary subsurface drainage provisions may result in premature foundation or pavement failure.

7.7 Pavement Design

7.7.1 Near surface soil samples were evaluated to determine pavement design parameters. A CBR of 3 at 95% compaction and a resilient modulus of 4,500 psi were used for pavement design based on our experience with similar soils.

7.7.2 Alternate pavement designs for both portland cement concrete (pcc) and asphalt are presented in Tables 3 and 4. Pavement designs have been prepared in accordance with accepted AASHTO design methods. A range of pavement designs for various traffic conditions is provided in the tables. The designs assume that the top eight inches of pavement subgrade will be compacted to 95% of ASTM D-1557. Specifications for pavement and base course should conform to current Oregon State Department of Transportation specifications.

Additionally, the base rock should contain no more than 5% by weight passing a No. 200 Sieve, and the asphaltic concrete should be compacted to a minimum of 91% of ASTM D2041.

7.7.3 Pavement sections were designed using AASHTO design methods, with an assumed reliability level (R) of 90%. Terminal serviceability of 2.0 for asphaltic concrete, and 2.5 for portland cement concrete were assumed. The 18 kip design axle loads are estimated from the number of trucks per day using State of Oregon typical axle distributions for truck traffic and AASHTO load equivalency factors, and assuming a 20 year design life. The concrete designs were based on a modulus of rupture equal to 550 psi, and a compressive strength of 4000 psi. The concrete sections assume plain jointed or jointed reinforced sections with no load transfer devices at the shoulder.

Table 3: Portland Cement Concrete Pavement Design

Approximate Number of Trucks per Day (each way)	*Approximate Number of 18 Kip Design Axle Load (1000)*	*P.C.C. Thickness (inches)*	*Crushed Rock Base Thickness (inches)*
25	110	6.0	6
50	220	7.0	6
100	440	8.0	6
150	660	8.5	6
200	880	8.5	6
250	1100	9.0	6

Table 4: Asphalt Concrete Pavement Design

Approximate Number of Trucks per Day (each way)	*Approximate Number of 18 Kip Design Axle Load (1000)*	*Asphalt Concrete Thickness (inches)*	*Crushed Rock Base Thickness (inches)*
Auto Parking	10	2.5	8
5	22	3.0	8
10	44	3.0	10
15	66	3.5	10
25	110	4.0	10
50	220	4.0	12
100	440	4.5	12
150	660	5.0	13

7.7.4 If possible, construction traffic should be limited to unpaved and untreated roadways, or specially constructed haul roads. If this is not possible, the pavement design should include an allowance for construction traffic.

7.8 Utility Excavation

7.8.1 Based on the subsurface explorations, difficult excavation characteristics should be anticipated below a depth of 15 feet within the underlying weathered rock.

7.8.2 Excavations deeper than four feet, or those that encounter groundwater, should be sloped or shored in conformance with OSHA regulations. Shoring systems are typically contractor designed.

7.8.3 It is possible that perched water could be encountered within the trench excavation, depending on the time of year construction occurs. Therefore, local excavation dewatering may be necessary if substantial flow of groundwater is encountered. Dewatering systems are typically designed and installed by the contractor.

7.8.4 Utilities should be bedded in sand within one conduit diameter in all directions, prior to the placement of coarser backfill. Trench backfill should be lightly compacted within two diameters or 18 inches, whichever is greater, above breakable conduits. The remaining backfill, to within 12 inches of finished grade, should be compacted to 92% of the maximum dry density as determined by ASTM D 1557. In structural areas, the upper foot of backfill should be compacted to 95% of the maximum dry density.

8 FUTURE GEOTECHNICAL SERVICES

The analyses, conclusions and recommendations contained in this report are based on site conditions as they presently exist, and on the assumption that the subsurface investigation locations are representative of the subsurface conditions throughout the site. It is the nature of geotechnical work for soil conditions to vary from the conditions encountered during a normally acceptable geotechnical investigation. While some variations may appear slight, their impact on the performance of structures and other improvements can be significant. Therefore, it is recommended that Geocon Northwest be retained to observe portions of this project relating to geotechnical engineering, including site excavation, underpinning, shoring system installation, foundation construction and other soils related aspects of construction. This will allow correlation of observations and findings to actual soil conditions encountered during construction and evaluation of construction conformance to the recommendations put forth in this report.

A copy of the plans and specifications should be forwarded to Geocon Northwest so that they may be evaluated for specific conceptual, design, or construction details that may affect the validity of the recommendations of this report. The review of the plans and specifications will also provide the opportunity for Geocon Northwest to evaluate whether the recommendations of this report have been appropriately interpreted.

9 LIMITATIONS

Unanticipated soil conditions are commonly encountered during construction and cannot always be determined by a normally acceptable subsurface exploration program. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Northwest should be notified so that supplemental recommendations can be given.

This report is issued with the understanding that the owner, or his agents, will ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review should such changes occur.

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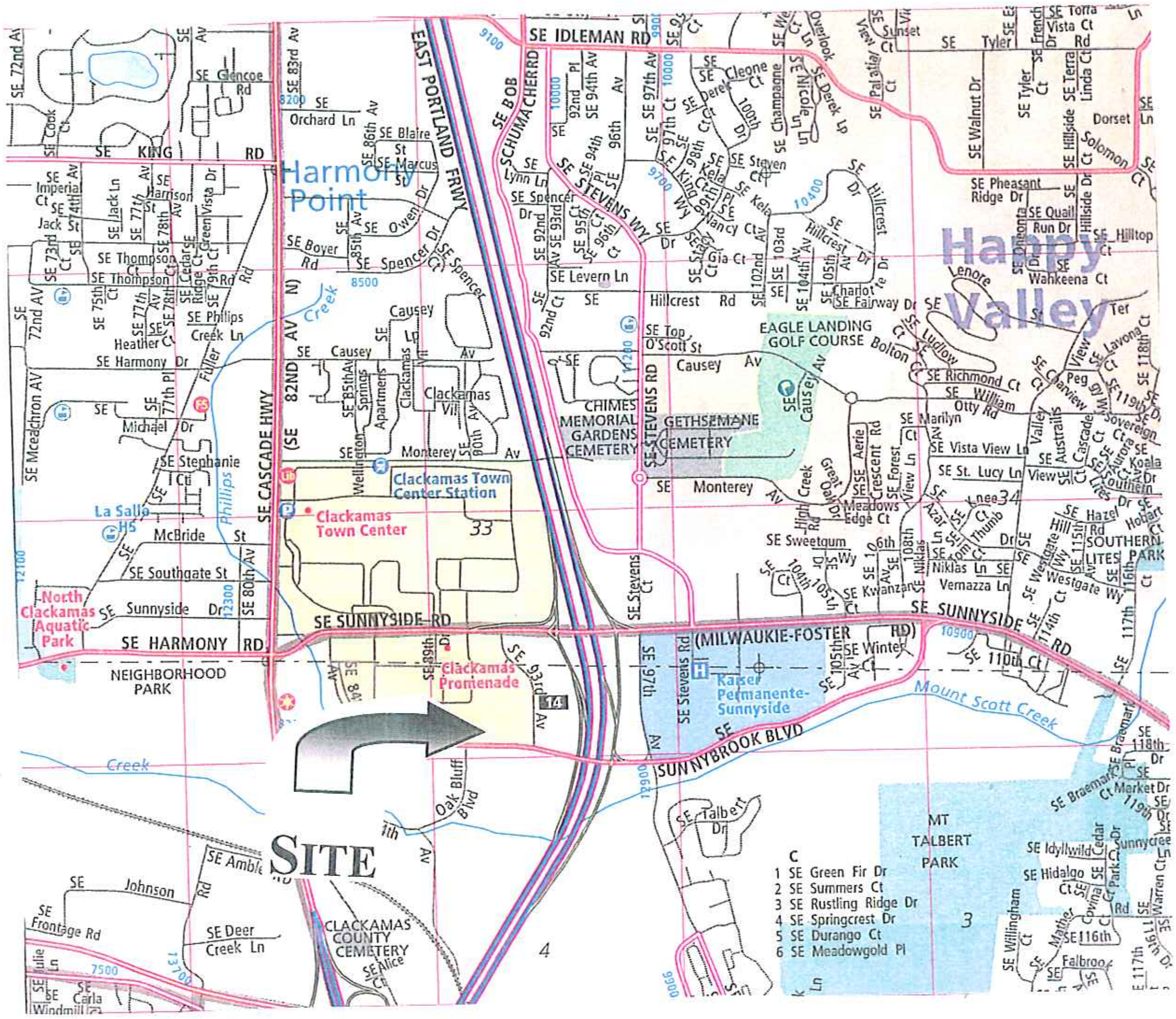

**SOURCE: 2008 THOMAS BROTHERS MAP
PORTLAND METROPOLITAN AREA**

N

NO SCALE

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N O R T H W E S T
GEOTECHNICAL CONSULTANTS
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BJW / RSS		DSK / D000D

SITE VICINITY

**Sunnybrook Office Building Seismic Upgrade
Clackamas, Oregon**

April 2009	P1672-05-01	FIG. 1

LEGEND

B-1 ⊕ .....APPROX. LOCATION OF BORING

HA-1⊕ .....APPROX. LOCATION OF HAND AUGER BORING

N

NO SCALE

GEOCON
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PHONE 503 626-9889 - FAX 503 626-8611

BW / RSS		DSK / D000D

SITE PLAN

SUNNYBROOK OFFICE BUILDING
SEISMIC UPGRADE
CLACKAMAS COUNTY, OREGON

DATE APRIL - 2009	PROJECT NO. P1672 - 05 - 01	FIG. 2

P1672-05-01_SITEPLAN_BW

Sunnybrook Office Building
ASCE 41-06 BSE-1 Site Class D General Response Spectrum

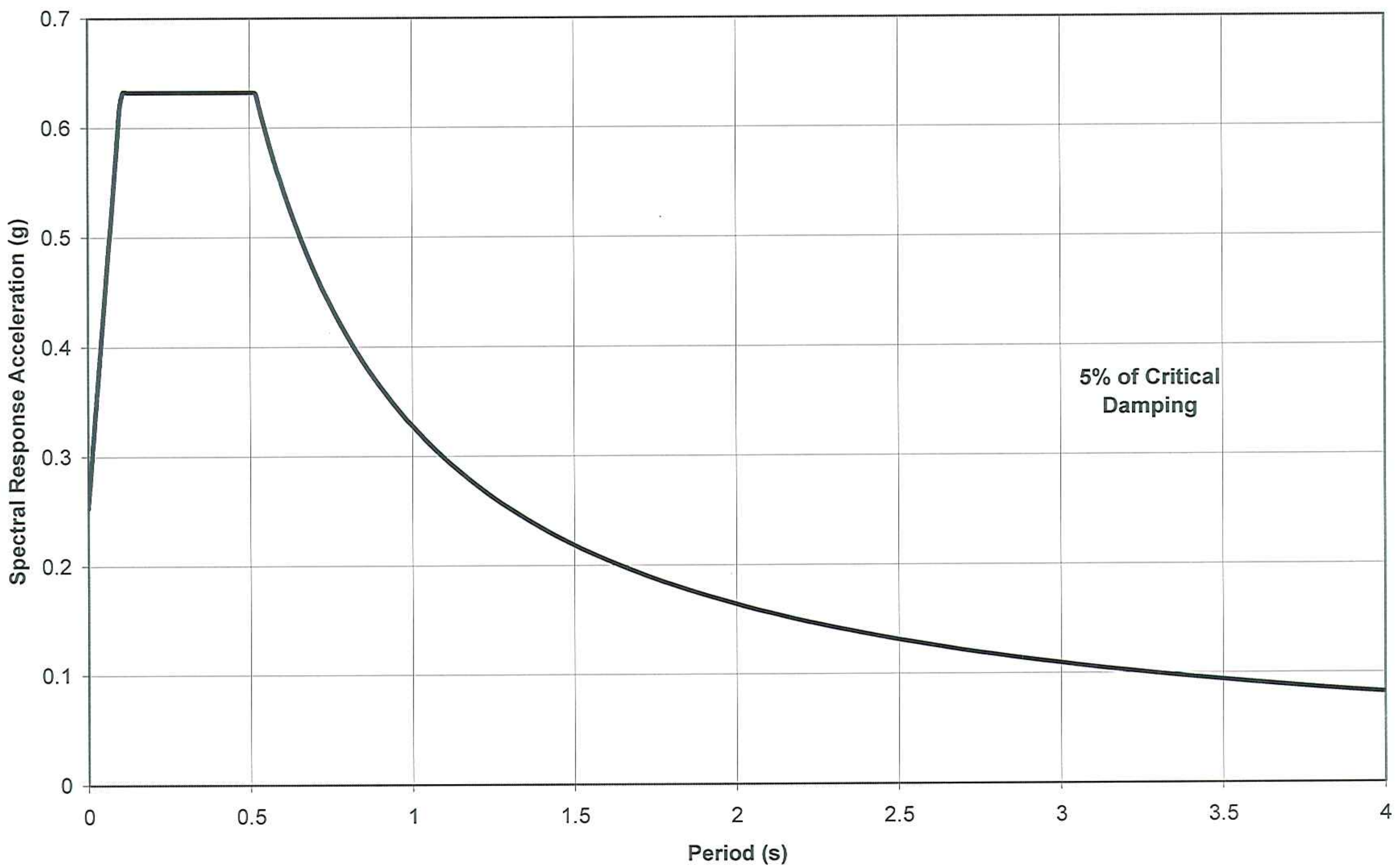


Figure 3

Sunnybrook Office Building
ASCE 41-06 BSE-2 Site Class D General Response Spectrum

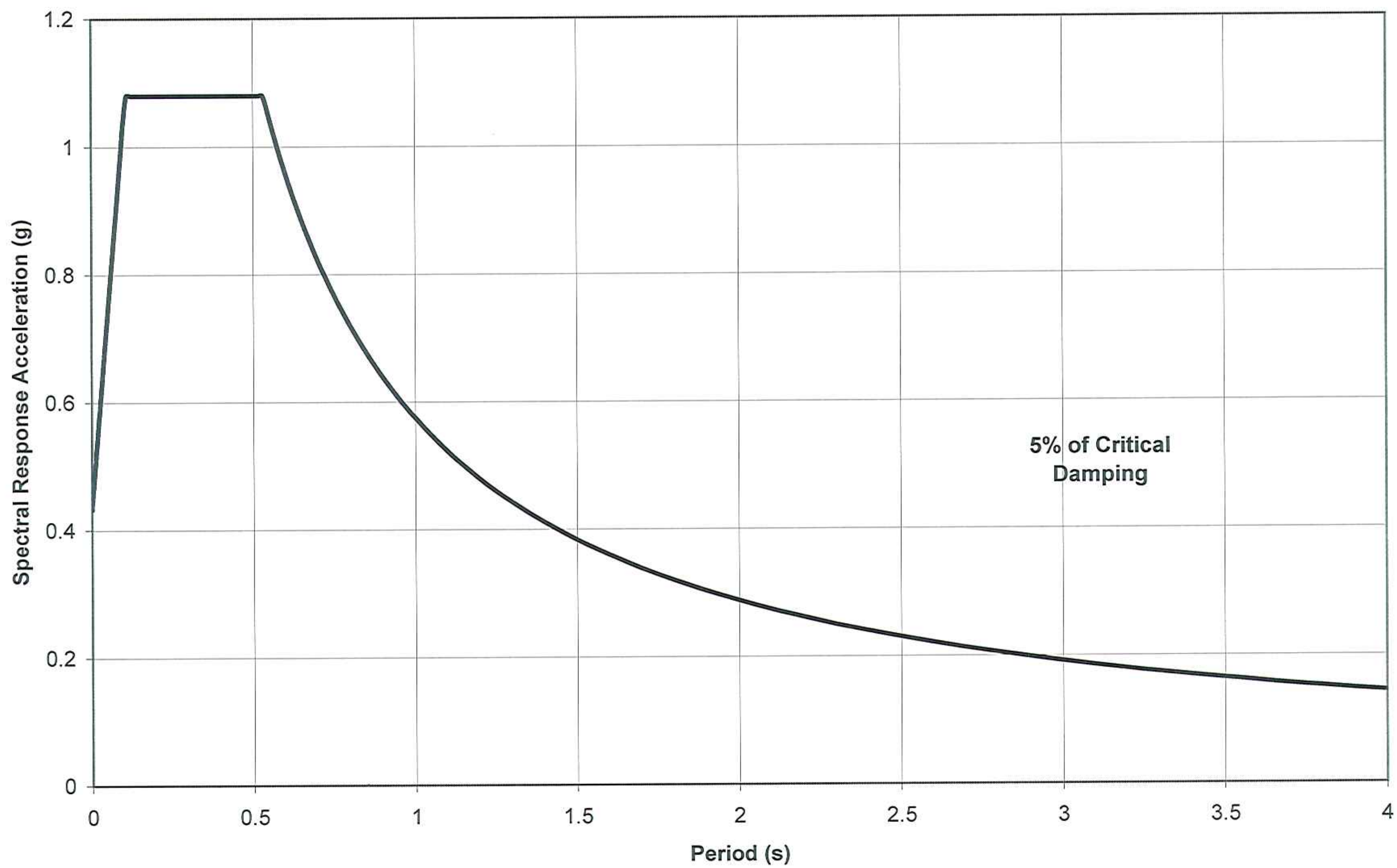


Figure 4

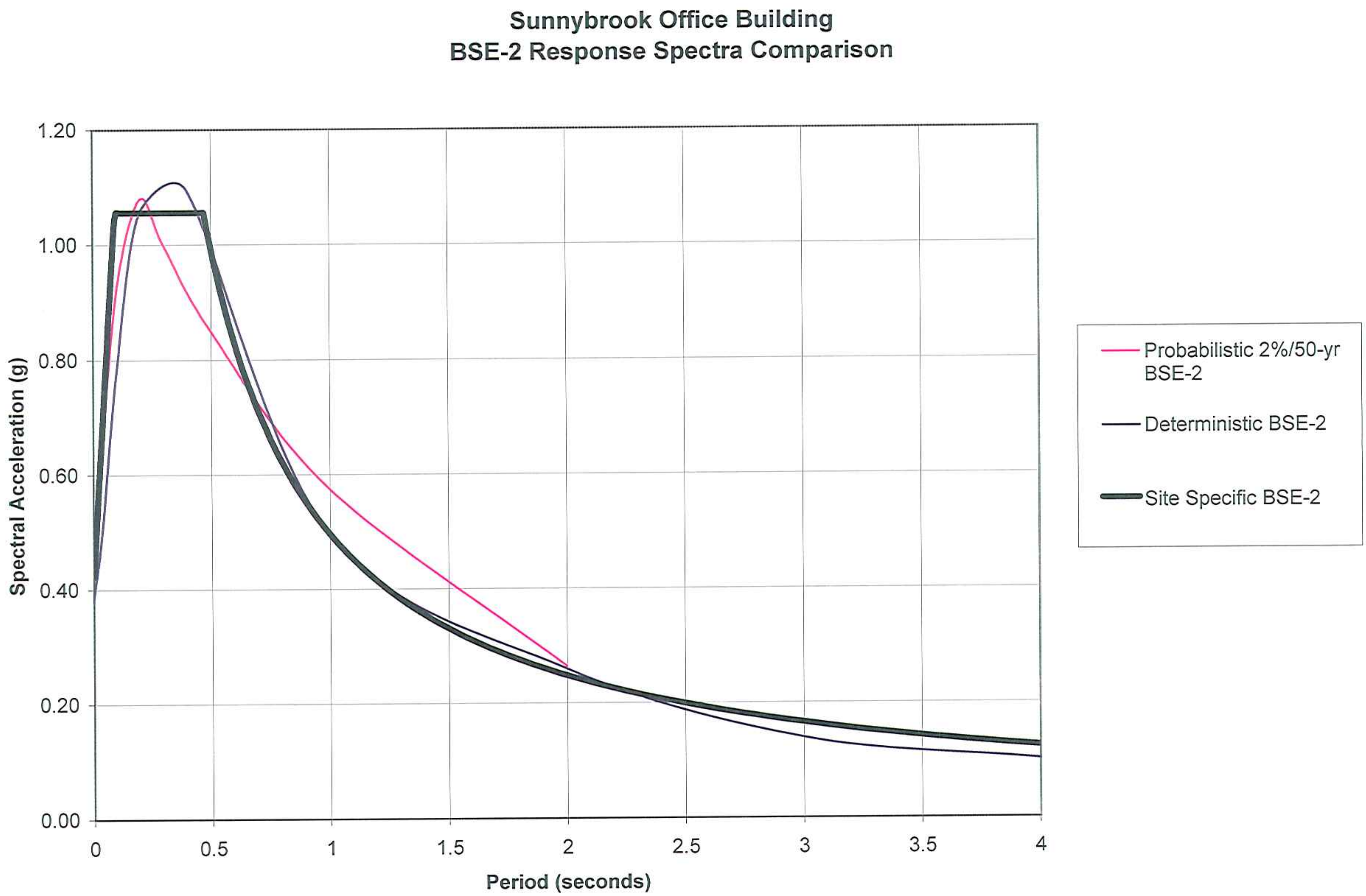
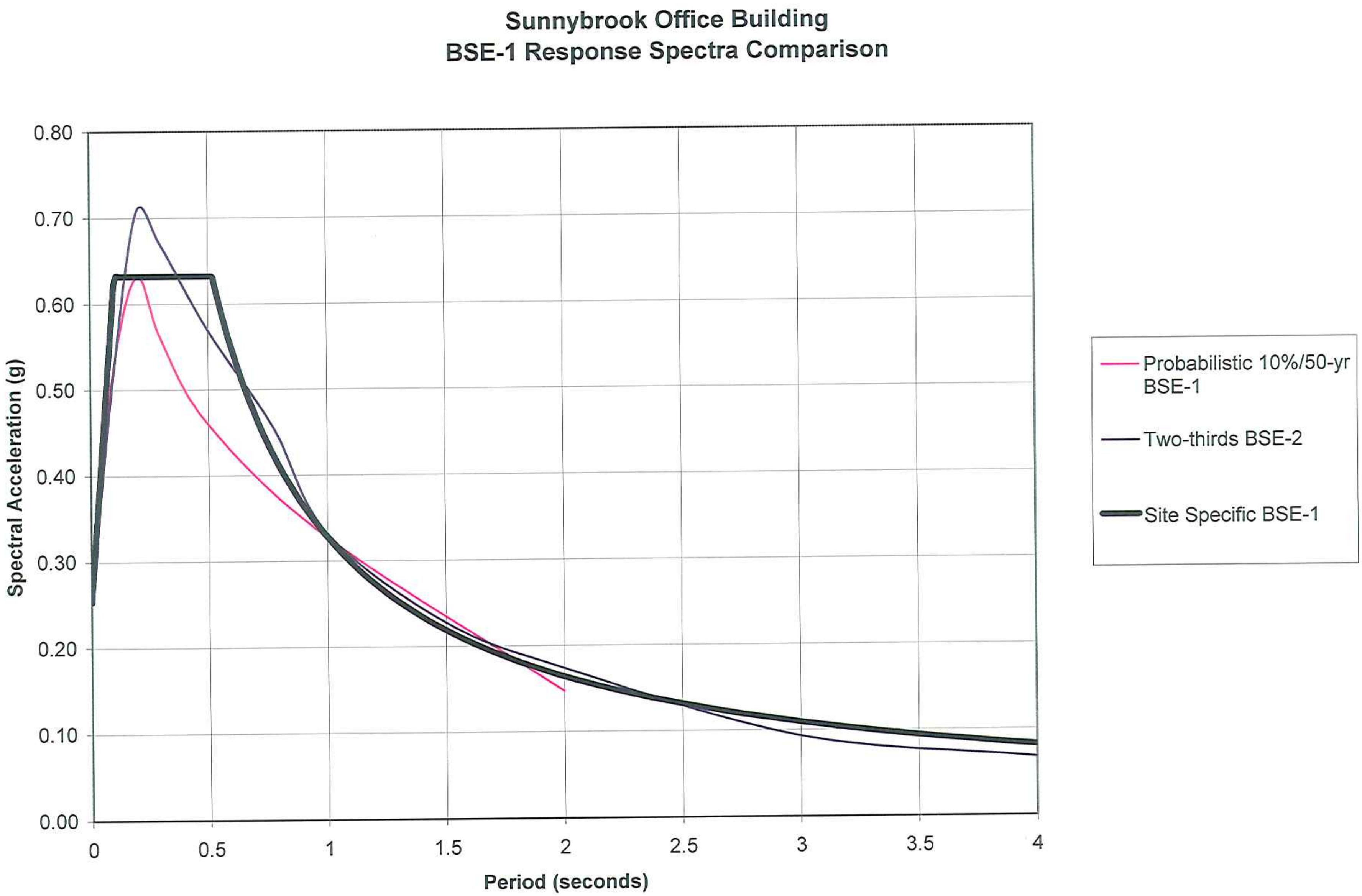

Sunnybrook Office Building
BSE-2 Response Spectra Comparison
Spectral Acceleration (g)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
Period (seconds)
Probabilistic 2%/50-yr BSE-2
Deterministic BSE-2
Site Specific BSE-2

Figure 5



Sunnybrook Office Building
BSE-1 Response Spectra Comparison
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Spectral Acceleration (g)
0
0.5
1
1.5
2
2.5
3
3.5
4
Period (seconds)
Probabilistic 10%/50-yr BSE-1
Two-thirds BSE-2
Site Specific BSE-1

Figure 6

Sunnybrook Office Building
ASCE 41-06 BSE-1 and BSE-2 Recommended Response Spectra

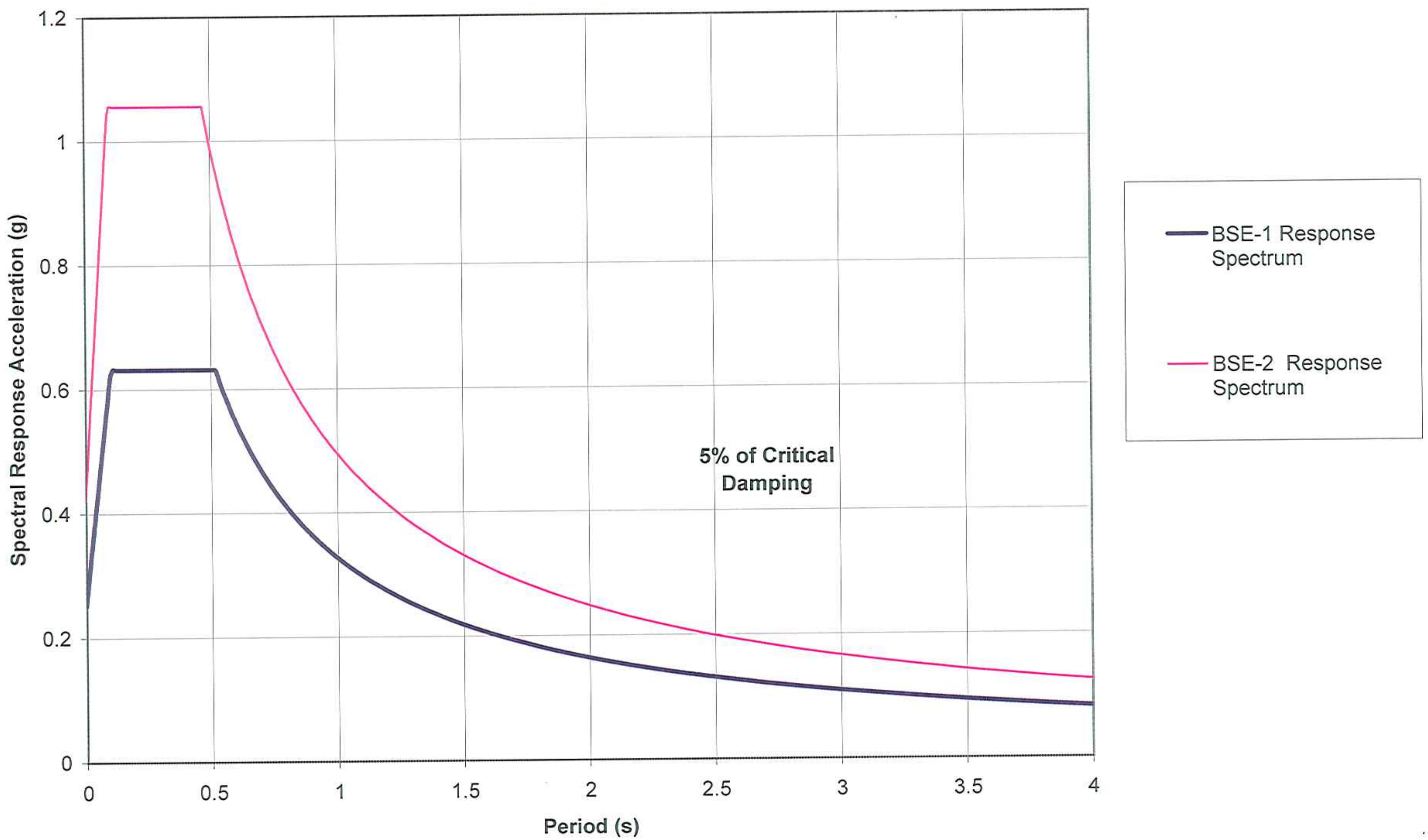


Figure 7

APPENDIX A
FIELD INVESTIGATION

The subsurface soil conditions at the site were determined based on the literature review, field exploration, and laboratory investigation. The field exploration was completed on March 27 and April 6, 2009, and consisted of three exploratory mud rotary borings, and two hand auger borings. The exploratory borings were completed to a maximum depth of 26 feet below the ground surface (bgs). Two hand auger soil borings were completed in future proposed pavement areas for the project. The hand auger borings were each advanced to a depth of approximately 5-feet bgs. The standard penetration test blowcount values provided in the boring logs are field measured values using an automatic hammer.

The approximate exploratory boring and hand auger boring locations are depicted on the Site Plan, Figure 2. Subsurface logs of the conditions encountered are presented in the following pages. Both solid and dashed contact lines indicated on the logs are inferred from soil samples and drilling characteristics and should be considered approximate.

PROJECT NO. P1672-05-01

BORING B 1

ELEV. (MSL.) ________ DATE COMPLETED 03-27-2009

EQUIPMENT CME 75 - MUD ROTARY BY: S. DIXON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					4" ASPHALT - BASE ROCK to 2 feet			
2								
	B1-1			CL/ML	Stiff, moist, brown, Silty CLAY to Clayey SILT	9		40.7
4				ML	Stiff, wet, brown, Clayey SILT			
	B1-2					7		36.2
6								
8	B1-3					9		37.6
					-Little recovery			
10	B1-4		▽	ML-MH	Stiff, wet, brown and gray, SILT with weathered basalt gravel	14		37.8
12								
	B1-5					80+		50.3
					WEATHERED BASALT Hard, moist, gray and brown, SILT to CLAY with sand and gravel			
14								
	B1-6					60/6"		28.7
16								
18					-Becomes harder, less weathered			
					-No recovery			
20	B1-7				BORING TERMINATED AT 20 FEET Perched groundwater at 10 feet	50/2"		

P1672-05-01.GPJ

Figure A-1,
Log of Boring B 1, Page 1 of 1

SAMPLE SYMBOLS		
... CORE SAMPLE	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. P1672-05-01

BORING B 2

ELEV. (MSL.) ________ DATE COMPLETED 03-27-2009

EQUIPMENT CME 75 - MUD ROTARY BY: S. DIXON

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					4" ASPHALT - BASE ROCK to 1.5 feet			
2					Stiff, moist, brown, Silty CLAY to Clayey SILT			
	B2-1			CL/ML		13		32.8
4								
	B2-2			ML	Stiff, moist, brown, Clayey SILT	10		37.6
6								
8	B2-3					15		36.3
10	B2-4		▽			6		41.0
					-Becomes medium stiff			
12	B2-5					8		44.7
14								
	B2-6			MH	With sparse weathered GRAVEL	7		35.8
16								
18								
20	B2-7				-Becomes harder, less weathered	50+		51.0

BORING TERMINATED AT 21 FEET
Perched groundwater at 10 feet

Figure A-2,
Log of Boring B 2, Page 1 of 1

P1672-05-01.GPJ

SAMPLE SYMBOLS			
	... CORE SAMPLE	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	▽ ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. P1672-05-01

BORING B 3

ELEV. (MSL.) ________ DATE COMPLETED **03-27-2009**

EQUIPMENT **CME 75 - MUD ROTARY** BY: **S. DIXON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0					4" ASPHALT - 14" BASE ROCK			
2	B3-1					11		40.6
					Stiff, moist, brown, Clayey SILT to Silty CLAY			
4								
6	B3-2			CL/ML		13		
8	B3-3					22		36.3
10	B3-4		▽			7		
12				MH-CH	**WEATHERED BASALT SOIL** Stiff, moist, gray CLAY with some weathered gravel			
	B3-5					15		45.6
14								
16	B3-6				-Becomes harder, less weathered	50/4"		57.5
18								
20	B3-7				-Core 20.5 feet to 26 feet, 80% RQD			
22								
24								
26					BORING TERMINATED AT 26 FEET Perched groundwater at 10 feet			

P1672-05-01.GPJ

Figure A-3,
Log of Boring B 3, Page 1 of 1

SAMPLE SYMBOLS			
	... CORE SAMPLE	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. P1672-05-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING HA 1 ELEV. (MSL.) ______ DATE COMPLETED **04-06-2009** EQUIPMENT **HAND AUGER** BY: **S. DIXON**	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0	HA1-1			ML/CL	GRASS SURFACE / **FILL** Medium stiff, moist, brown, Silty CLAY to Clayey SILT			26.0
2				ML/CL	**NATIVE** Medium stiff, moist, brown and gray, mottled, Clayey SILT to Silty CLAY			
4	HA1-2		∇		-Becomes stiff, with perched water at 4 feet			39.6
					BORING TERMINATED AT 5 FEET Perched groundwater at 4 feet			

P1672-05-01.GPJ

Figure A-4,
Log of Boring HA 1, Page 1 of 1

SAMPLE SYMBOLS			
	... CORE SAMPLE	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. P1672-05-01

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING HA 2 ELEV. (MSL.) ________ DATE COMPLETED 04-06-2009 EQUIPMENT HAND AUGER BY: S. DIXON	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					MATERIAL DESCRIPTION			
0				ML	GRASS SURFACE / **FILL**			
	HA2-1			ML/CL	Soft, wet, dark brown, Silty CLAY to Clayey SILT			32.8
2					**NATIVE** Medium stiff to stiff, moist, brown with gray, mottling, Clayey SILT to Silty CLAY			
4					-Becomes stiff			
	HA2-2							31.8
					BORING TERMINATED AT 5 FEET Groundwater was not encountered			

Figure A-5,
Log of Boring HA 2, Page 1 of 1

P1672-05-01.GPJ

SAMPLE SYMBOLS	... CORE SAMPLE	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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APPENDIX B

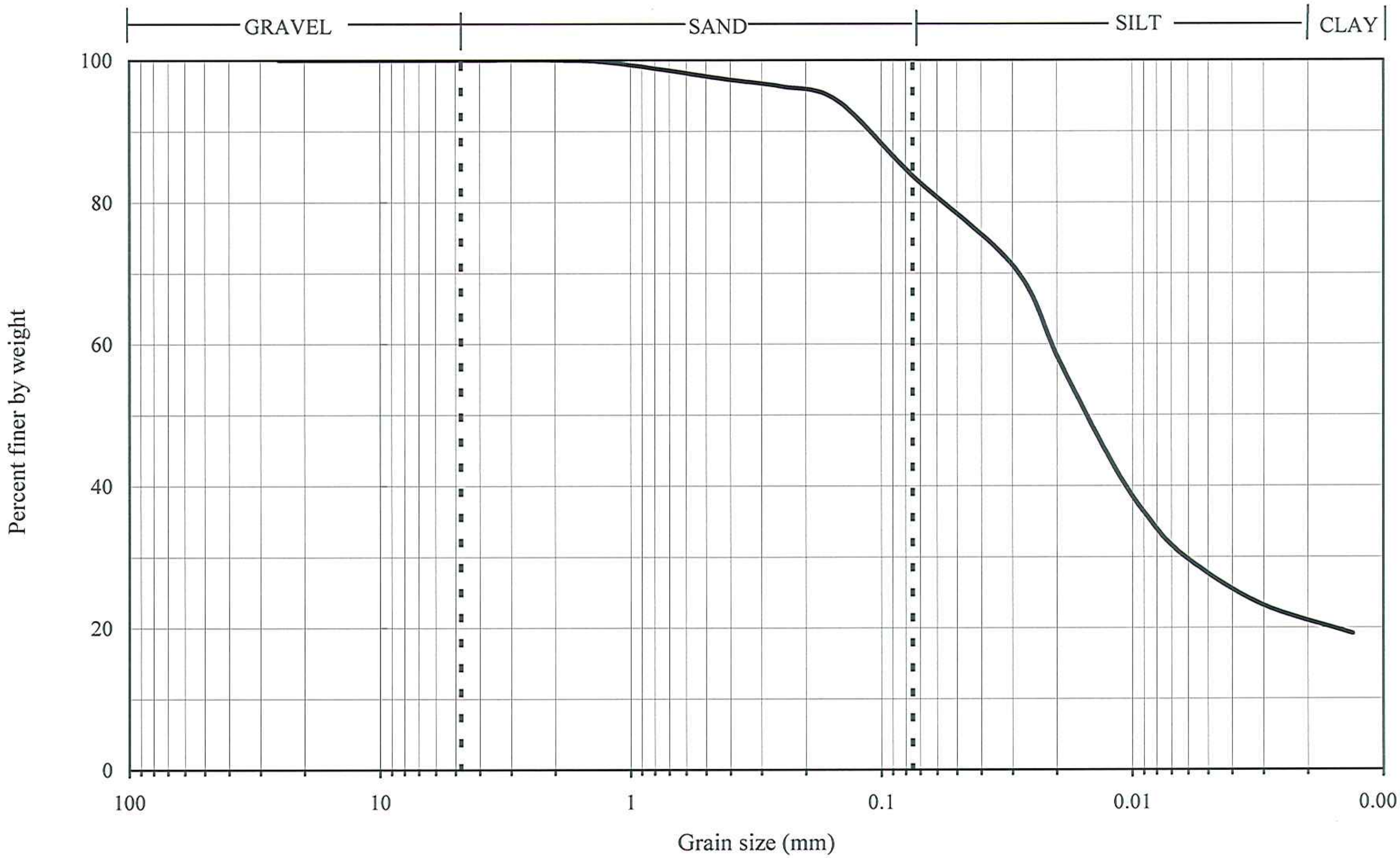
LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their in situ moisture content, grain size distribution, and plasticity index. Moisture contents are indicated on the boring logs in Appendix A. The results of the remaining laboratory tests performed are summarized in the following graphs.

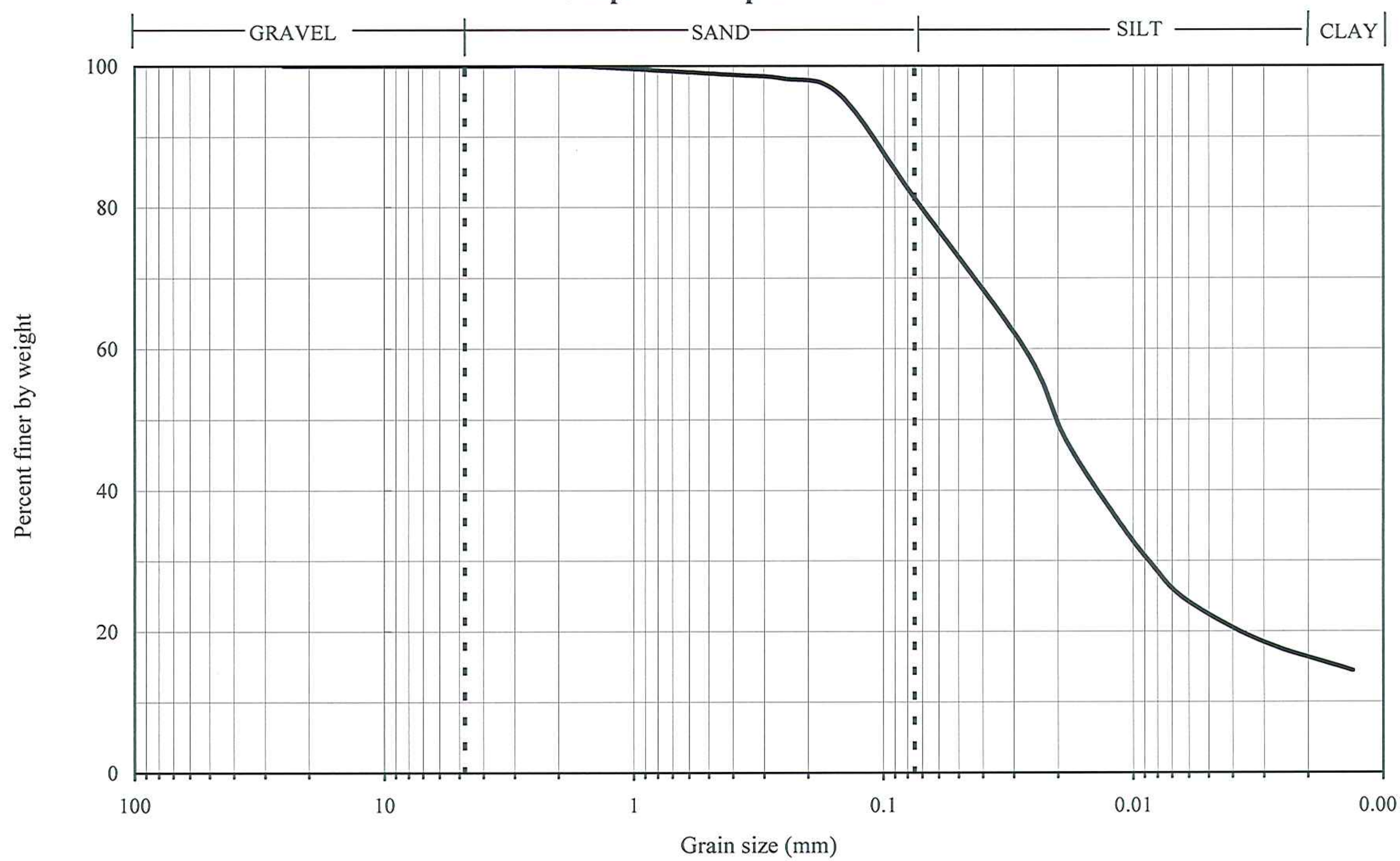
TABLE B-1
SUMMARY OF PLASTICITY INDEX TEST RESULTS
ASTM D4318

Sample Number	Depth (ft)	Liquid Limit	Plastic Limit	Plasticity Index	USCS Classification
B1-1	2.5-4	39	30	9	ML
B3-1	1.5-3.0	48	31	17	ML

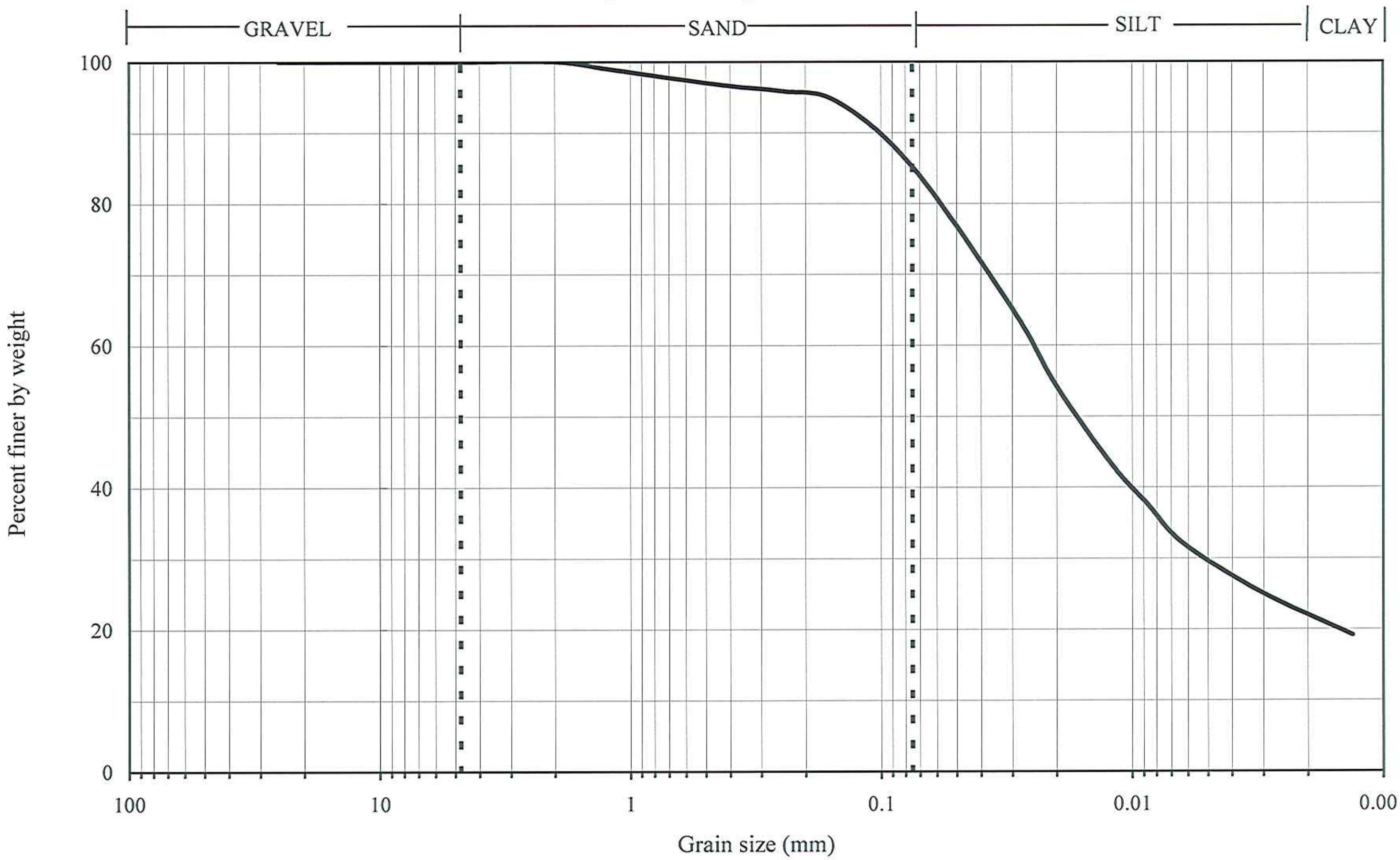
Grain Size Distribution (ASTM D1140 and D 422)
Sunnybrook Office Building
Sample B1-1   Depth = 2.5-4 feet



Grain Size Distribution (ASTM D1140 and D 422)
Sunnybrook Office Building
Sample B2-2 Depth = 5-6.5 feet



Grain Size Distribution (ASTM D1140 and D 422)
Sunnybrook Office Building
Sample B3-1 Depth = 1-2.5 feet



Addendum #1

GEOCON
NORTHWEST, INC.

GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS

File No. P1672-05-01
April 30, 2009

Mr. Keith Fugate
SERA Architects
338 NW 5th Avenue
Portland, Oregon 97209

SUBJECT: SUNNYBROOK OFFICE BUILDING SEISMIC UPGRADE
CLACKAMAS COUNTY, OREGON
CONSULTATION

Dear Mr. Fugate:

This letter has been prepared to present additional geotechnical recommendations for the subject project.

We understand that a retaining wall will be constructed as part of the new parking lot within the vacant lot west of the existing building. The retaining wall will be constructed along the north and west perimeter where the grade slopes up to adjacent properties.

We anticipate that the retaining walls will be designed as non-restrained, cantilever walls. The following earth pressures should be used for the design of cantilever retaining walls:

Non-Restrained Wall Design Criteria

Backfill Slope H:V	Equivalent Fluid Weight lb/ft^3
Level	40
3H:1V	50
2H:1V	60

When backfill is in direct contact with the wall, pressures against the back of the wall can be assumed to act at a downward inclination of 20 degrees from the horizontal. If friction is prevented by drainage membranes or water proofing membranes, the pressures should be assumed to act horizontally.

Retaining wall backfill should consist of free-draining granular material. To minimize pressures on retaining walls, the use of open-graded crushed rock backfill with less than 5% by weight passing the No. 200 Sieve is recommended. Retaining wall backfill should be compacted to a minimum of 92% of ASTM D-1557.

Retaining walls should be provided with drainage to reduce lateral hydrostatic pressures that may accumulate behind the wall. Retaining wall drains should be positioned near the base of the retaining wall and should be protected by a geotextile filter fabric to prevent internal soil erosion and potential clogging. The perforated drain pipe should have a minimum diameter of 4 inches.

Temporary excavation slopes and/or shoring may be required along the north and west perimeters depending on the retaining wall locations and finish grades. Temporary excavation slopes should have a maximum inclination of 1H:1V. An existing parking lot borders the western property margin. The retaining wall will need to be designed for vehicle surcharge loading unless the retaining wall foundation is located beyond a 1:1 plane extending from the property line to the retaining wall foundation. Surcharge pressures from pavement loading should be assumed equivalent to two feet of soil. Finish grade behind the retaining wall should have a maximum slope inclination of 2H:1V.

Discussions with the project architect indicate that several areas will receive concrete flatwork and/or sidewalks. These hardscape features will be primarily subject to pedestrian traffic. It is recommended that concrete sidewalks and flatwork have a minimum concrete thickness of 4 inches and be underlain by 4 inches of crushed base rock. The base rock should be compacted to a minimum relative compaction of 95% per ASTM D-1557.

Please contact the undersigned if you have any questions regarding this letter.

Sincerely,
Geocon Northwest, Inc.

Wesley Spang, Ph.D., P.E.
Principal Engineer

REGISTERED PROFESSIONAL
ENGINEER
18281
OREGON
JAN 16, 1996
WESLEY SPANG
EXPIRATION DATE: 6/30/2009