

Fremont State Street Center, LLC
c/o SummerHill Homes LLC
3000 Executive Parkway, Suite 450
San Ramon, CA 94583

RECEIVED

By Alameda County Environmental Health 1:59 pm, Sep 02, 2016

September 2, 2016

Alameda County Environmental Health
1131 Harbor Bay Parkway
Alameda, CA 94502
Attention: Mr. Mark Detterman, PG, CEG

Re: Addendum to Human Health Risk Evaluation of Subsurface Data
Vapor Intrusion Model Sensitivity Analysis
39155 and 39183 State Street Center, Fremont, CA

Dear Mr. Detterman:

Submitted herewith for your review is the Addendum to Human Health Risk Evaluation of Subsurface Data- Vapor Intrusion Model Sensitivity Analysis dated September 2, 2016 regarding 39155 and 39183 State Street Center in Fremont, California prepared by Apex Companies, LLC

I declare, under penalty of perjury, that the information and/or recommendations contained in the attached document are true and correct to the best of my knowledge.

Very truly yours,



Katia Kamangar
Executive Vice President
SummerHill Homes LLC

Cc: Carl Michelsen, PES Environmental, Inc.



Apex Companies, LLC
3478 Buskirk Avenue, Suite 100 • Pleasant Hill, CA 94523
P: (925) 944-2856 • F: (925) 944-2859

RECEIVED

By Alameda County Environmental Health 1:57 pm, Sep 02, 2016

September 2, 2016

Ms. Denise Cunningham
SummerHill Homes
3000 Executive Pkwy, Suite 450
San Ramon, CA 94583

**Subject: Addendum to Human Health Risk Evaluation of Subsurface Data –
Vapor Intrusion Model Sensitivity Analysis
39155 and 39183 State Street, Fremont, California**

Dear Ms. Cunningham:

At the request of the Alameda County Environmental Health (ACEH), The Source Group, Inc. (SGI) a division of Apex Companies, LLC, conducted a sensitivity analysis on the soil characteristics used as inputs in the vapor intrusion model. This sensitivity analysis was prepared as an addendum to the *Human Health Risk Evaluation of Subsurface Data* for the property at 39155 and 39183 State Street in Fremont, California (the Site), dated August 12, 2016.

In above referenced report, the Department of Toxic Substances Control (DTSC) modified version of the Johnson and Ettinger (1991; J/E) vapor intrusion model (DTSC, 2014) was used to estimate Site-specific screening levels (SLs). The DTSC vapor intrusion model takes into account Site-specific geotechnical data; such as, soil vapor sampling depth, soil dry bulk density, and porosity (total, air-filled, and water-filled). The model is particularly sensitive to the depth to contamination (soil vapor sampling depth) and soil type of the unsaturated zone, which is used to determine density and moisture content (water-filled porosity). With a few exceptions (elevator shafts and sewer lateral sample locations), there was little variability in the depth of soil vapor samples, which were generally collected at approximately 5 feet below ground surface (bgs) across the Site. However, there is some variability in the soil type in the upper vadose zone from 0 to 5 feet bgs across the Site. Therefore, to conduct a sensitivity analysis, soil boring logs for the Site were reviewed to identify the range of predominate soil types from 0 to 5 feet bgs.

REVIEW OF BORING LOGS

In the *Human Health Risk Evaluation of Subsurface Data* report, Site-specific SLs were estimated using the DTSC J/E model. Based on the geotechnical investigation conducted by Rockridge (2015), sandy clay loam was selected as the predominant soil type for the DTSC J/E model. The DTSC (2014) default values for SCL for total porosity (0.384), and water-filled porosity (0.146) were used as model input parameters. As requested by ACEH, a review of soil boring logs prepared by PES Environmental, Inc. (PES) were reviewed to evaluate the range of predominant soil types from 0 to 5 feet bgs. The soil boring logs are presented in Attachment A. As prepared by PES, geologic cross-section figures illustrate the soil types at the Site (Attachment B). As illustrated on the PES cross-sections, finer-grained soils predominate in the top 5 feet of the site and extend up to approximately



The Source Group, Inc. is a division
of Apex Companies, LLC

www.apexcos.com

20 feet bgs. Coarser-grained soils are locally present and are more commonly found in the southern portion of the site.

Generally, soil boring logs classify soil type based on the U.S. Soil Conservation Service (USCS) soil classification. However, the DTSC J/E model classifies soil type based on the U.S. Department of Agriculture (USDA) soil classification. The following table summarizes the predominant soil type from 0 to 5 feet bgs as indicated in PES' soil boring logs and the corresponding USDA soil classification as suggested in the *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings* by U.S. Environmental Protection Agency (USEPA, 2004).

TABLE 1: SUMMARY OF PES SOIL BORING LOGS						
Boring	Location at Site	Gravel (%)	Sand (%)	Fines (%)	Soil Type	
					USCS PES Boring Log	USDA DTSC Model
B1	Northern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B2	Northern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B3	Southern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B5	Northern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B6	Southern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B7	Northern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B8	Southern portion	40	40	20	Silty Gravel (GM)	Loamy Sand (LS)/ Sandy Loam (SL)
B11	Northern portion	40	40	20	Silty Gravel (GM)	Loamy Sand (LS)/ Sandy Loam (SL)
B12	Southern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B13	Southern portion	0	10	90	Clay (CH)	Silt Loam (SiL)
B14	Offsite-Capitol Ave	0	50	50	Silty Sand (SM)	Sandy Loam (SL)/ Loam (L)
B16	Offsite-Capitol Ave	0	30	70	Sandy Clay (CL)	Loam (L)/ Silt Loam (SiL)
B18	Offsite-Capitol Ave	0	30	70	Sandy Clay (CL)	Loam (L)/ Silt Loam (SiL)
B44	Southern portion	70	10	20	Silty Gravel (GM)	Loamy Sand (LS)/ Sandy Loam (SL)
B45	Southern portion	70	10	20	Silty Gravel (GM)	Loamy Sand (LS)/ Sandy Loam (SL)
B46	Southern portion	70	10	20	Silty Gravel (GM)	Loamy Sand (LS)/ Sandy Loam (SL)
B47	Southern portion	70	10	20	Silty Gravel (GM)	Loamy Sand (LS)/ Sandy Loam (SL)

Based on the PES soil boring logs summarized in the table above, the predominant USDA soil types from 0 to 5 feet bgs were silt loam (SiL), loam (L), sandy loam (SL), and loamy sand (LS). As mentioned previously, the geotechnical investigation data collected by Rockridge (2015), indicated sandy clay loam (SCL) was the predominant soil type from 0 to 5 feet bgs. The default geotechnical parameters in the DTSC J/E model for each soil type identified from 0 to 5 feet bgs are summarized in the following table.

TABLE 2: DTSC J/E MODEL – DEFAULT SOIL PROPERTIES					
Soil Type	Abbreviation	Soil Dry Bulk Density (g/cm³)	Porosity Total (cm³/cm³)	Porosity Water-Filled (cm³/cm³)	Porosity Air-Filled (cm³/cm³)
Sandy Clay Loam	SCL	1.63	0.384	0.146	0.238
Silt Loam	SiL	1.49	0.439	0.18	0.259
Loam	L	1.59	0.399	0.148	0.251
Sandy Loam	SL	1.62	0.387	0.103	0.284
Loamy Sand	LS	1.62	0.39	0.076	0.314

A simple sensitivity analysis was conducted with the output results of the DTSC J/E model, providing upper and lower bounds on the estimated indoor air concentrations and corresponding risks based on the default parameters (soil dry bulk density, total porosity, and water-filled porosity) for each identified soil type in the above table. To evaluate the sensitivity of each of the predominant soil types, the maximum detected tetrachloroethene (PCE) concentration in soil gas (8,500 µg/m³) was used in the DTSC J/E model for a residential exposure scenario. The remaining model parameter inputs were consistent with the model inputs used to estimate Site-specific SLs in the *Human Health Risk Evaluation of Subsurface Data* report, and are summarized in the following table.

TABLE 3: MODEL VARIABLES – VAPOR MIGRATION FROM SOIL VAPOR TO INDOOR AIR		
Properties	Symbol	Assumed Value
Depth Below Grade to Bottom of Enclosed Space Floor (default)	L _F	15 centimeters
Soil Vapor Sampling Depth Below Grade (5 feet)	L _S	152 centimeters
Average Soil Temperature (default)	T _s	24°C
Vadose Zone SCS Soil Type (Site-specific)	--	See Table Above
Vadose Zone Soil Dry Bulk Density (Site-specific)	ρ _b	See Table Above
Vadose Zone Soil Total Porosity (Site-specific)	θ _T	See Table Above
Vadose Zone Soil Water-Filled Porosity (Site-specific)	θ _w	See Table Above
Average Vapor Flow Rate into Building (default)	Q _{soil}	See Table Above
Residential Exposure Scenario		
Averaging Time for Carcinogens	AT _C	70 years
Averaging Time for Noncarcinogens	AT _{NC}	26 years
Exposure Duration	ED	26 years
Exposure Frequency	EF	350 days/year
Exposure Time	ET	24 hours/day
Air Exchange Rate	ACH	0.5 hour ⁻¹
Commercial Exposure Scenario		
Averaging Time for Carcinogens	AT _C	70 years
Averaging Time for Noncarcinogens	AT _{NC}	25 years
Exposure Duration	ED	25 years
Exposure Frequency	EF	250 days/year
Exposure Time	ET	8 hours/day
Air Exchange Rate	ACH	1 hour ⁻¹

The spreadsheets containing the input parameters and results of the DTSC J/E model (DTSC, 2014) for subsurface vapor intrusion of PCE into buildings for the different soil types for the residential exposure scenario is provided in Attachment C. The following table summarizes the vapor intrusion model results for PCE for the different soil types for the future onsite resident receptor.

Chemical	Soil Gas Concentration (µg/m ³)	Soil Type	Attenuation Factor (unitless)	Indoor Air Concentration (µg/m ³)	Cancer Risk (unitless)	Noncancer Hazard (unitless)
PCE	8,500	SCL	4.9E-04	4.2E+00	8.8E-06	1.2E-01
		SiL	5.0E-04	4.2E+00	8.9E-06	1.2E-01
		L	5.4E-04	4.5E+00	9.6E-06	1.2E-01
		SL	7.6E-04	6.4E+00	1.4E-05	1.8E-01
		LS	9.4E-04	8.0E+00	1.7E-05	2.2E-01

The larger the attenuation factor produced by the model, the greater the intrusion of vapors into indoor air. As shown in the table above, sandy clay loam soil type results in the lowest soil vapor to indoor air attenuation factor and indoor air concentration of PCE and loamy sand results in the highest attenuation factor and indoor air concentration of PCE. Consequently, estimated cancer risks and noncancer hazards are lowest for sandy clay loam and highest for loamy sand. These two soil types represent the outer limits of the range of appropriate soil types for the Site.

Using DTSC default soil properties for loamy sand and sandy clay loam, Site-specific SLs for VOCs detected at the Site were estimated for the residential and commercial exposure scenarios. The Site-specific SLs based on loamy sand are presented in Attachment D and summarized in the following table. This table also includes the Site-specific SLs based on sandy clay loam and San Francisco Regional Water Quality Control Board (SFRWQCB) soil vapor Environmental Screening Levels (ESLs), as presented in the *Human Health Risk Evaluation of Subsurface Data* report.

Chemical	SFRWQCB Modified Soil Vapor ESL		Site-Specific SLs Loamy Sand		Site-Specific SLs Sandy Clay Loam	
	Residential (µg/m ³)	Commercial (µg/m ³)	Residential (µg/m ³)	Commercial (µg/m ³)	Residential (µg/m ³)	Commercial (µg/m ³)
Tetrachloroethene (PCE)	480	4,200	500	4,400	960	8,400
Benzene	97	840	76	660	130	1,100
Toluene	310,000	2,600,000	260,000	2,200,000	460,000	3,800,000
Ethylbenzene	1,100	9,800	1,000	8,800	1,800	16,000
m,p-Xylene	100,000	880,000	93,000	780,000	170,000	1,400,000
o-Xylene	100,000	880,000	93,000	780,000	170,000	1,400,000
Trichlorofluoromethane (Freon 11)	Not available	Not available	670,000	5,600,000	1,200,000	10,000,000
Dichlorodifluoromethane (Freon 12)	Not available	Not available	88,000	740,000	150,000	1,300,000
Chloroform	120	1,060	100	900	180	1,600


The spreadsheets containing the input parameters and results of the DTSC J/E model (DTSC, 2014) for subsurface vapor intrusion of VOCs into buildings for loamy sand for the residential and commercial exposure scenarios is provided in Attachment E. The spreadsheets containing the input parameters and results of the DTSC J/E model (DTSC, 2014) for subsurface vapor intrusion of VOCs into buildings for sandy clay loam for the residential and commercial exposure scenarios is provided in Attachment C of the *Human Health Risk Evaluation of Subsurface Data* report. The methods used to develop the Site-specific SLs are described in Attachment B of the *Human Health Risk Evaluation of Subsurface Data* report.

The SFRWQCB ESLs and the more conservative Site-specific SLs based on loamy sand soil properties were essentially similar values. For some chemicals, the Site-specific SLs based on loamy sand were slightly lower than the ESLs. Based on Table 1, the soil from 0 to 5 feet bgs reflects loamy sand in only 6 of 17 soil boring logs. In general, the loamy sand is limited to the southern portion of the Site. At the 11 remaining locations across the Site, the soil 0 to 5 feet bgs reflects a loam to silt loam. As mentioned previously, the geotechnical investigation conducted by Rockridge (2015), indicated sandy clay loam was the predominant soil type from 0 to 5 feet bgs. Based on the Rockridge geotechnical investigation results and a majority of the PES soil borings for the Site, the predominant soil type from 0 to 5 feet bgs reflects sandy clay loam or silt loam. Therefore, for this Site, it would not be appropriate to use screening levels lower than the SFRWQCB ESLs. Based on Site-specific geotechnical data and soil boring logs, the Site-specific SLs based on sandy clay loam are appropriate the majority of the Site.

SUMMARY AND CONCLUSIONS

This sensitivity analysis for the soil characteristics used as inputs in the vapor intrusion model, indicates that sandy clay loam soil type results in the lowest soil vapor to indoor air attenuation factor and indoor air concentration and loamy sand results in the highest attenuation factor and indoor air concentration. Based on Site-specific geotechnical data and soil boring logs, the Site-specific SLs based on sandy clay loam are appropriate for the majority of the Site. Regardless of which soil vapor SLs are appropriate for the Site, the site remedy for the PCE, benzene, and chloroform impacted areas of the Site does not change. The remedy, which has been proposed to ACEH (i.e., soil excavation in the southern portion of the site; installation of a Geoseal membrane at elevator shafts at Building A; and a membrane/passive venting system for the at-grade townhomes near State Street; PES, 2016a,b), will reduce any potential risks to future onsite resident and commercial receptors.

Sincerely,
The Source Group, Inc.



Ivy Inouye
Senior Toxicologist

cc: Mr. Tom Graf, GrafCon
Mr. Carl J. Michelsen, PES Environmental, Inc.

Attachments

Attachment A – PES Soil Boring Logs

Attachment B – PES Geologic Cross-Sections

Plate 1 - Site Plan and Cross-Section Locations

Plate 2 - Geologic Cross Section A-A'

Plate 3 - Geologic Cross Section B-B'

Attachment C – DTSC J/E Model for Subsurface Vapor Intrusion of PCE into Buildings for the Different Soil Types for the Residential Exposure Scenario

Attachment D - Exposure Point Concentrations and Site-Specific Screening Levels for Volatile Organic Compounds in Soil Vapor and Indoor Air for Future Onsite Residential and Commercial Exposure Scenarios – Soil Classification as Loamy Sand

Attachment E – DTSC J/E Model for Subsurface Vapor Intrusion into Buildings for Loamy Sand

Attachment E1 - DTSC J/E Model for Subsurface Vapor Intrusion into Buildings for the Residential Exposure Scenario

Attachment E2 - DTSC J/E Model for Subsurface Vapor Intrusion into Buildings for the Commercial Exposure Scenario

References

Department of Toxic Substances Control (DTSC). 2014. DTSC Screening-Level Model for Soil Gas Contamination. California Environmental Protection Agency. Last Modified December.

Johnson, P.C. and R.A. Ettinger. 1991. Heuristic Model for Predicting the Intrusion Rate of Contaminant Vapors into Buildings. Environmental Science and Technology. Vol. 25, No. 8, pp. 1445-52.

PES Environmental, Inc. (PES). 2016a. Work Plan for Soil Excavation and Well Destruction, 39155 and 39183 State Street, Fremont, California. January 29.

PES. 2016b. Vapor Mitigation System, Basis of Design Report, State Street Center, Fremont, California. March 24.

Rockridge Geotechnical (Rockridge). 2015. Geotechnical Investigation, Proposed Residential Development, State Street and Capitol Avenue, Fremont, California. August 30.

U.S. Environmental Protection Agency (USEPA). 2004. User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. Office of Emergency and Remedial Response. February.

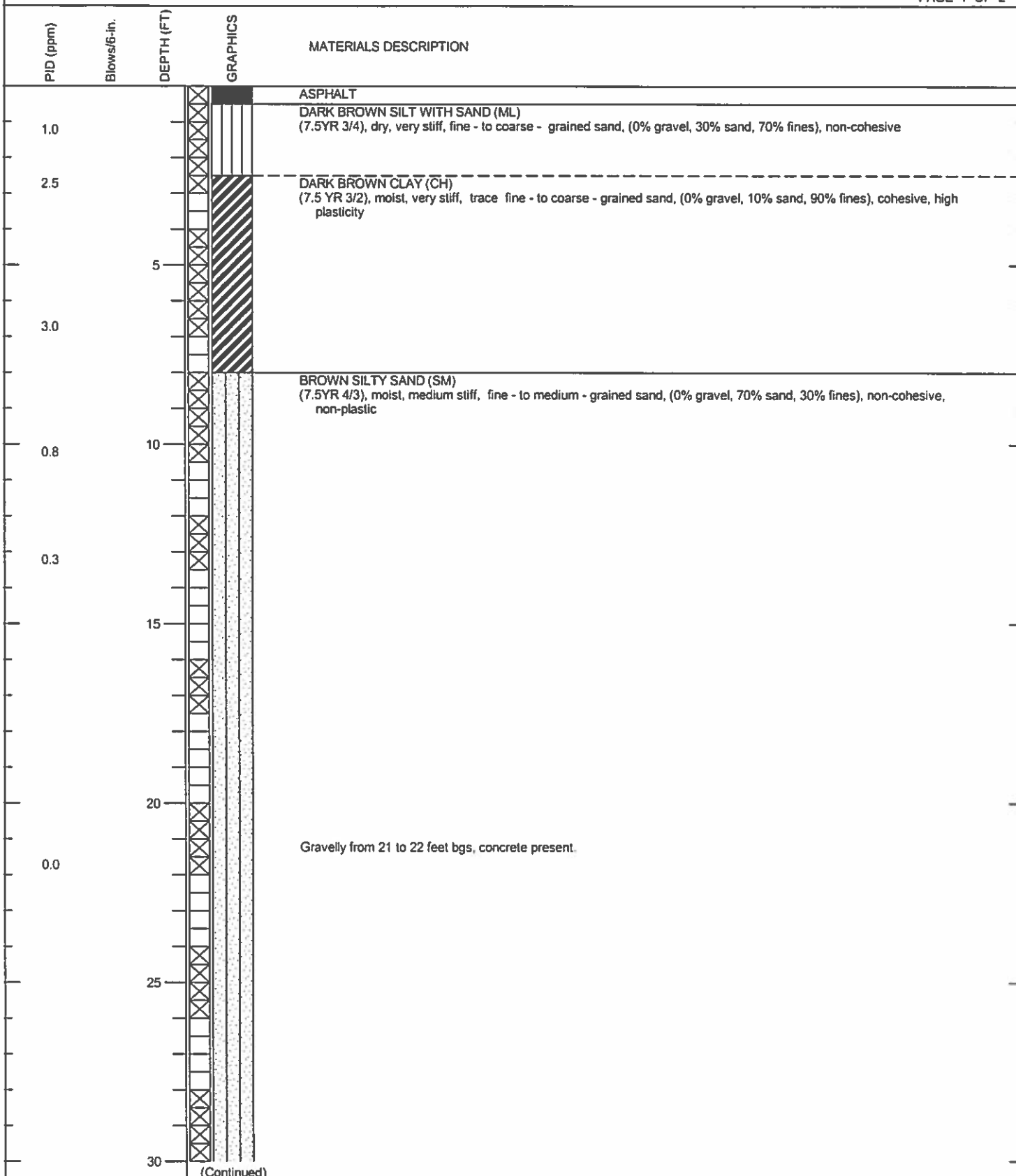
ATTACHMENT A
PES SOIL BORING LOGS



PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
0.9				ASPHALT
				DARK BROWN CLAY (CH) (7.5YR 3/2), moist, very stiff, trace fine sand, (0% gravel, 10% sand, 90% fines), high plasticity, cohesive B1-1.0-2.0
0.7				B1-3.0-4.0
		5		Bottom of boring at 5 feet bgs. Backfilled with neat cement grout.
		10		
		15		
		20		
		25		
		30		

PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
1



PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	40 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

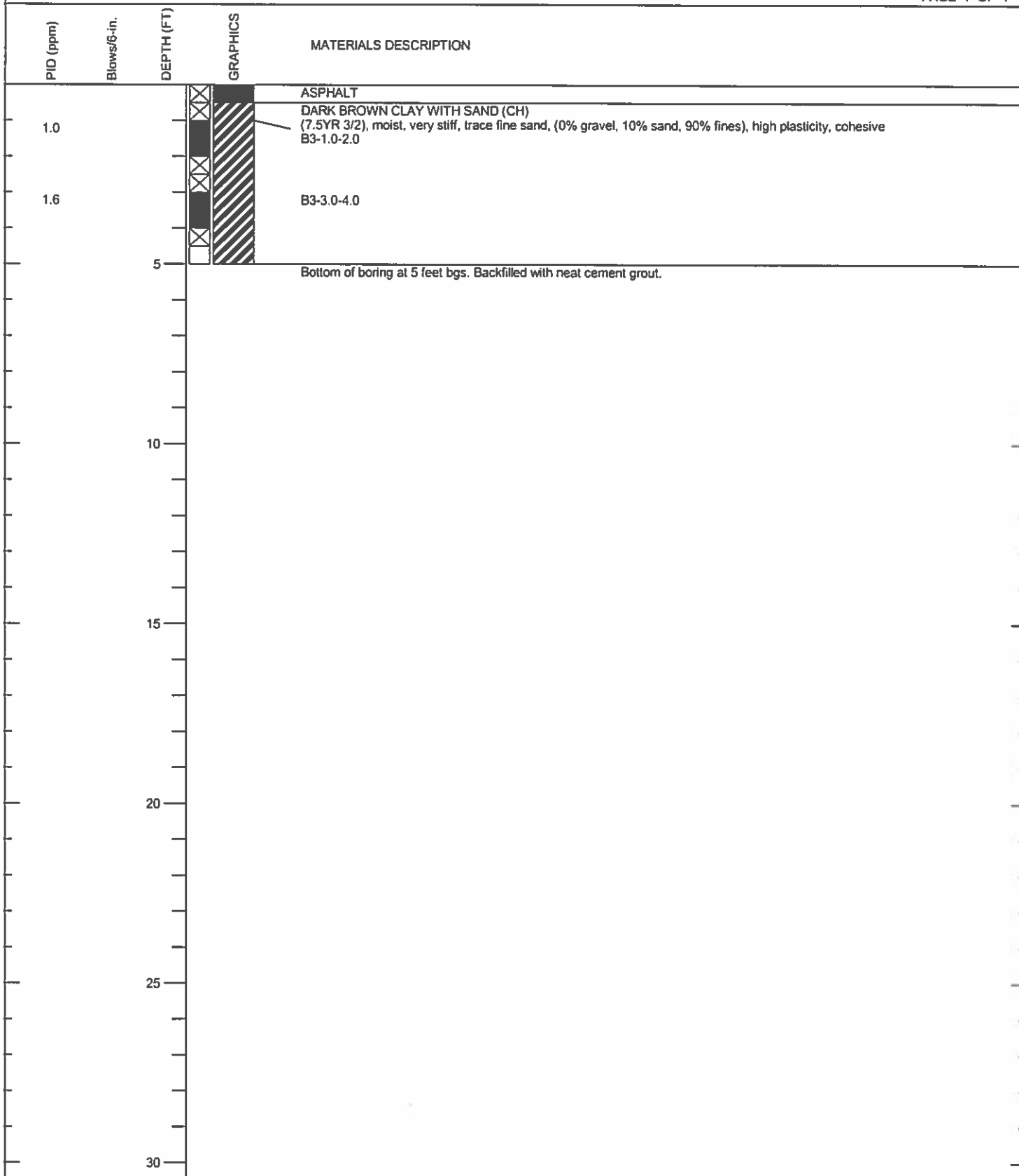
PLATE
2



PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
		35		
				Wet at 37 feet bgs.
		40		Bottom of boring at 40 feet bgs. Backfilled with neat cement grout.
		45		
		50		
		55		
		60		

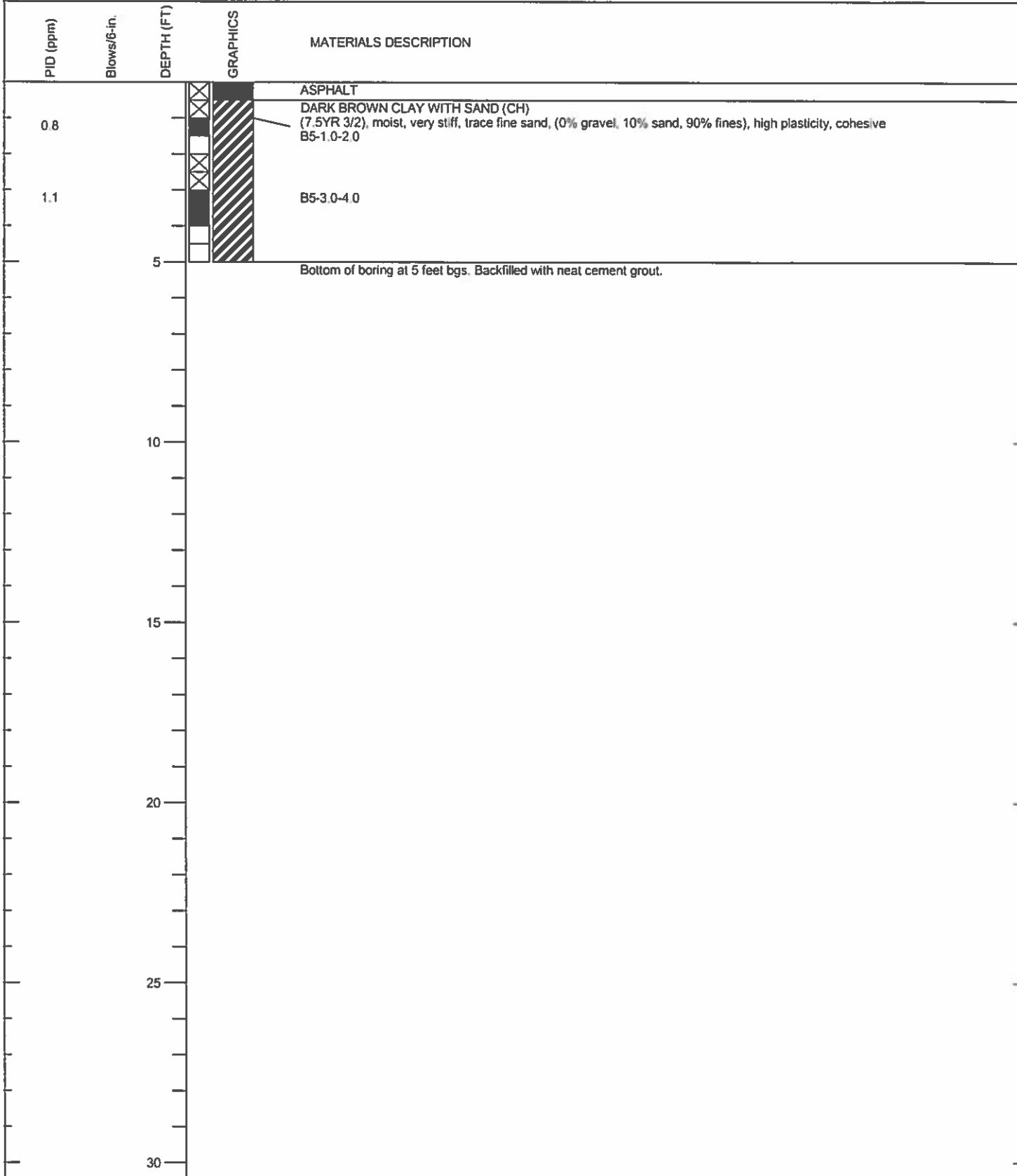
PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	40 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
2



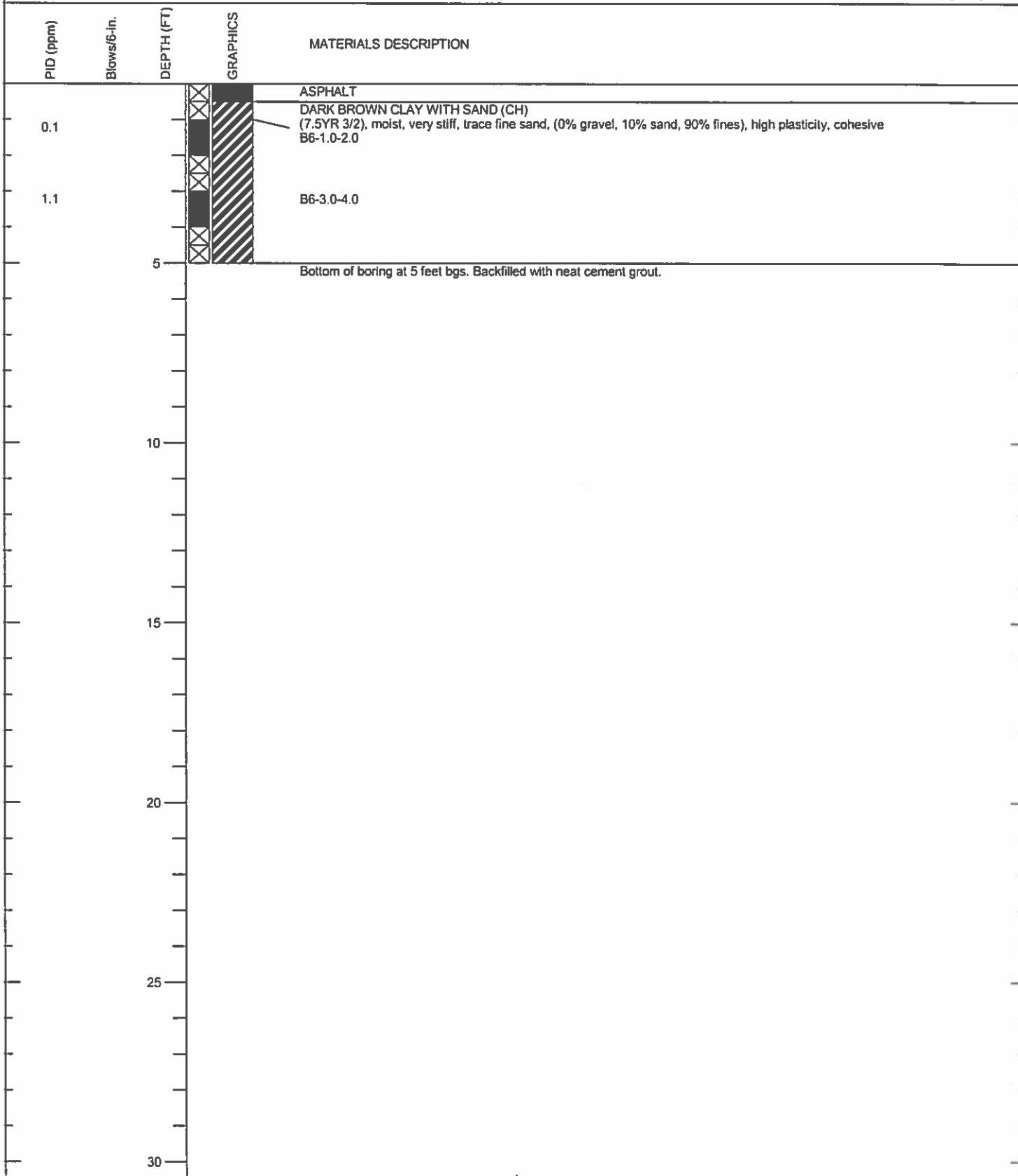
PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
3



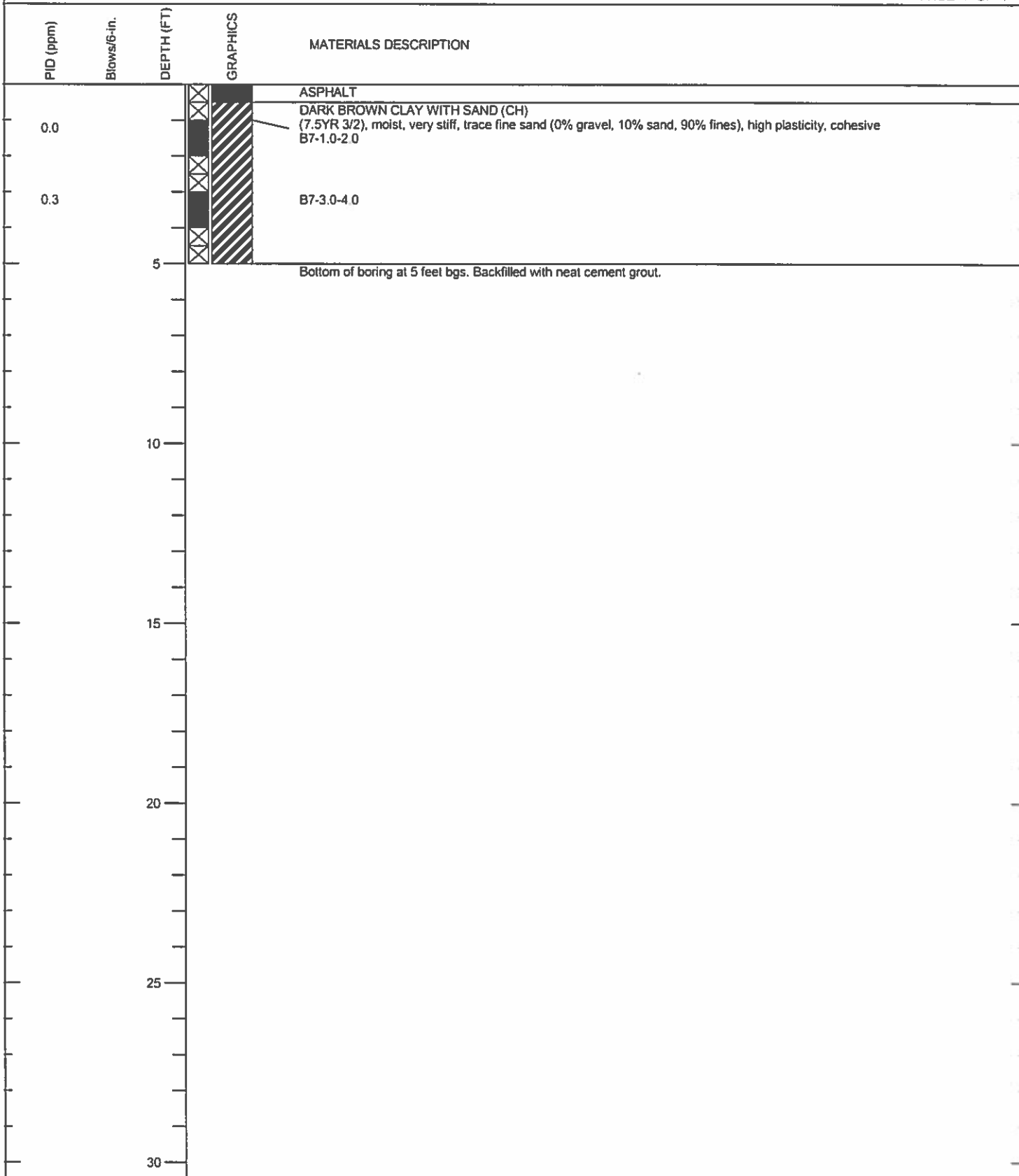
PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
4



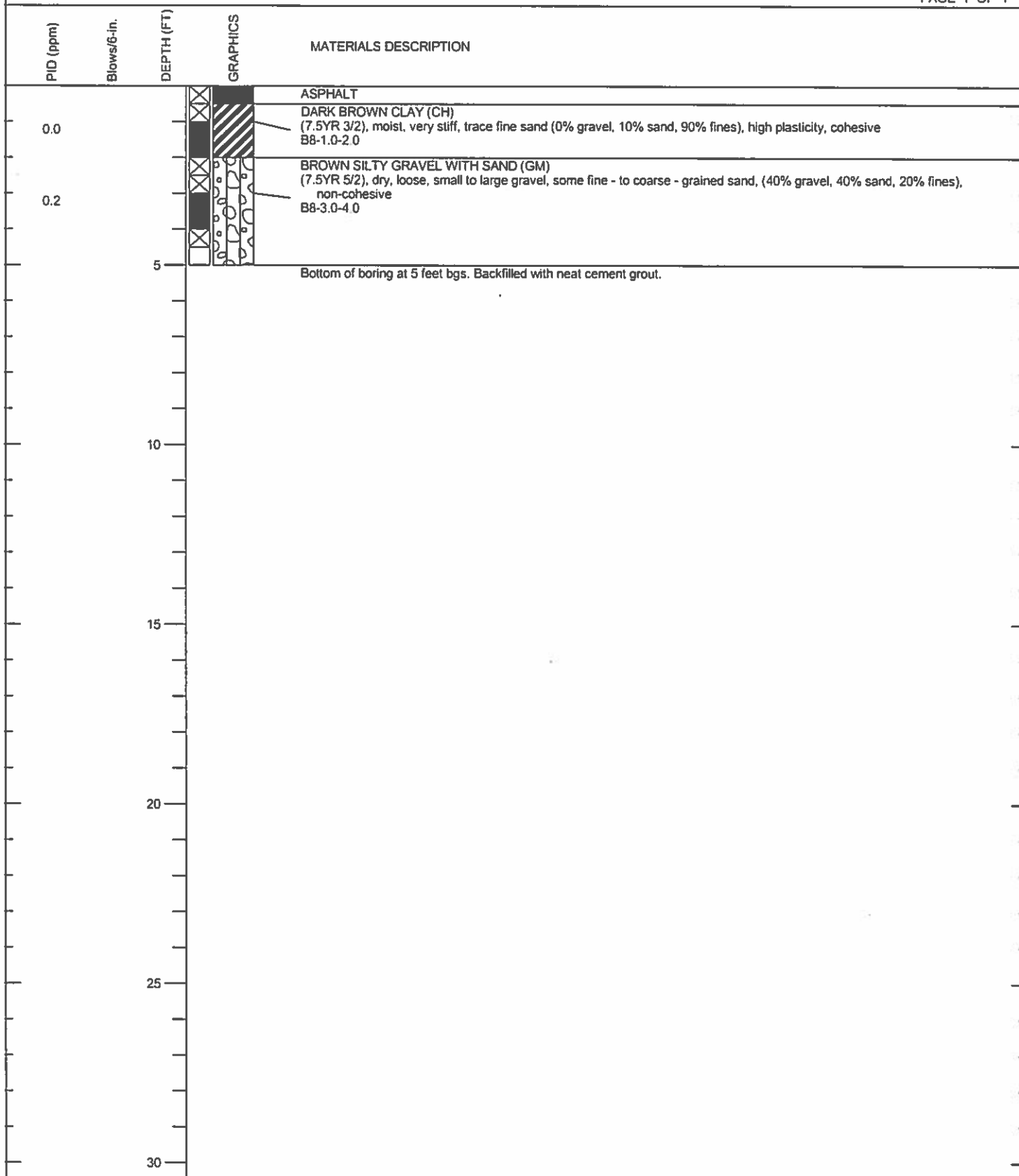
PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
5



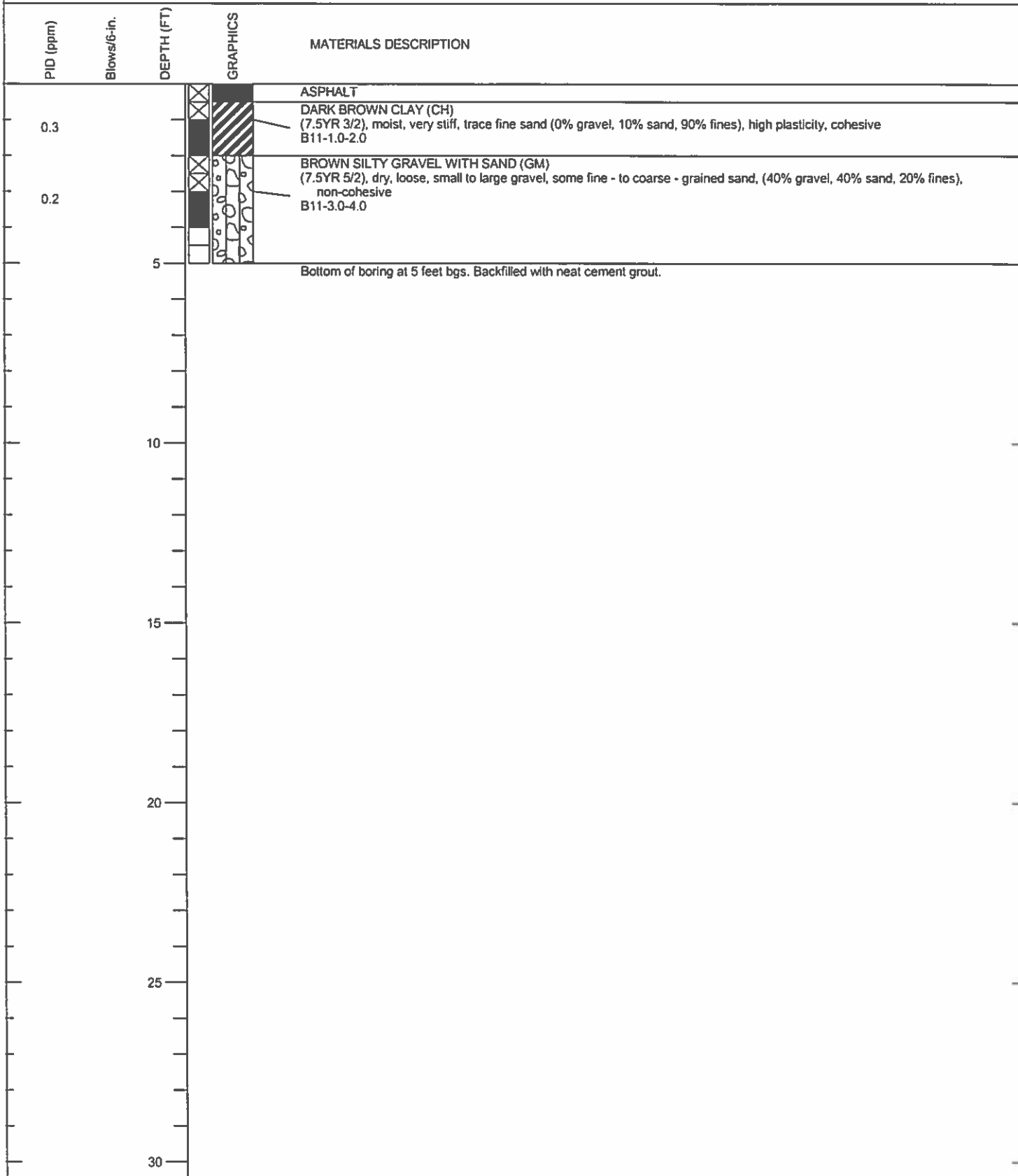
PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
6



PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14




PLATE
7



PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

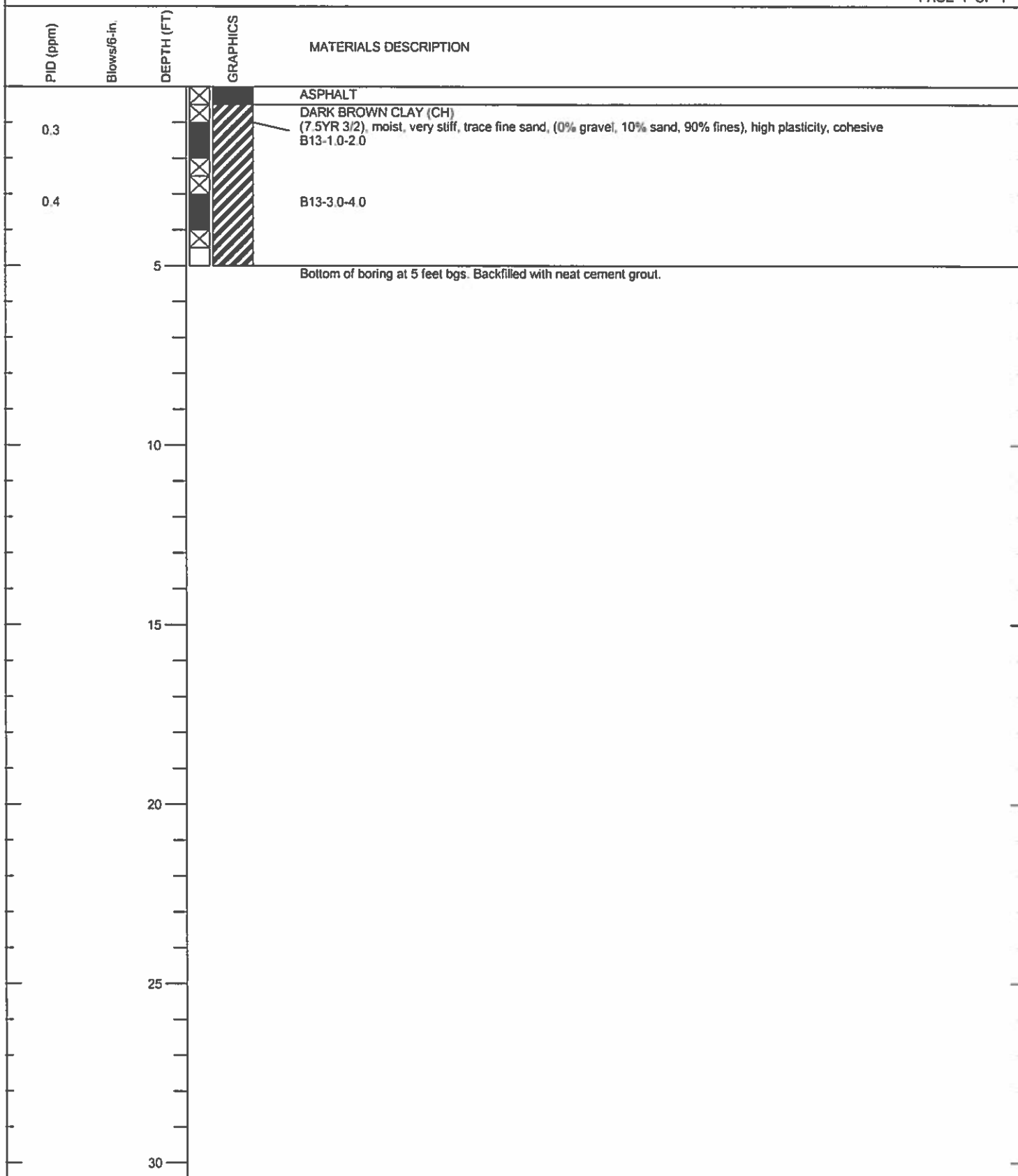
PLATE
8



PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
0.0				ASPHALT
				DARK BROWN CLAY (CH) (7.5YR 3/2), moist, very stiff, trace fine sand, (0% gravel, 10% sand, 90% fines), high plasticity, cohesive B12-1.0-2.0
0.3				B12-3.0-4.0
		5		Bottom of boring at 5 feet bgs. Backfilled with neat cement grout.
		10		
		15		
		20		
		25		
		30		

PROJECT	Regls Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
9



PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
10

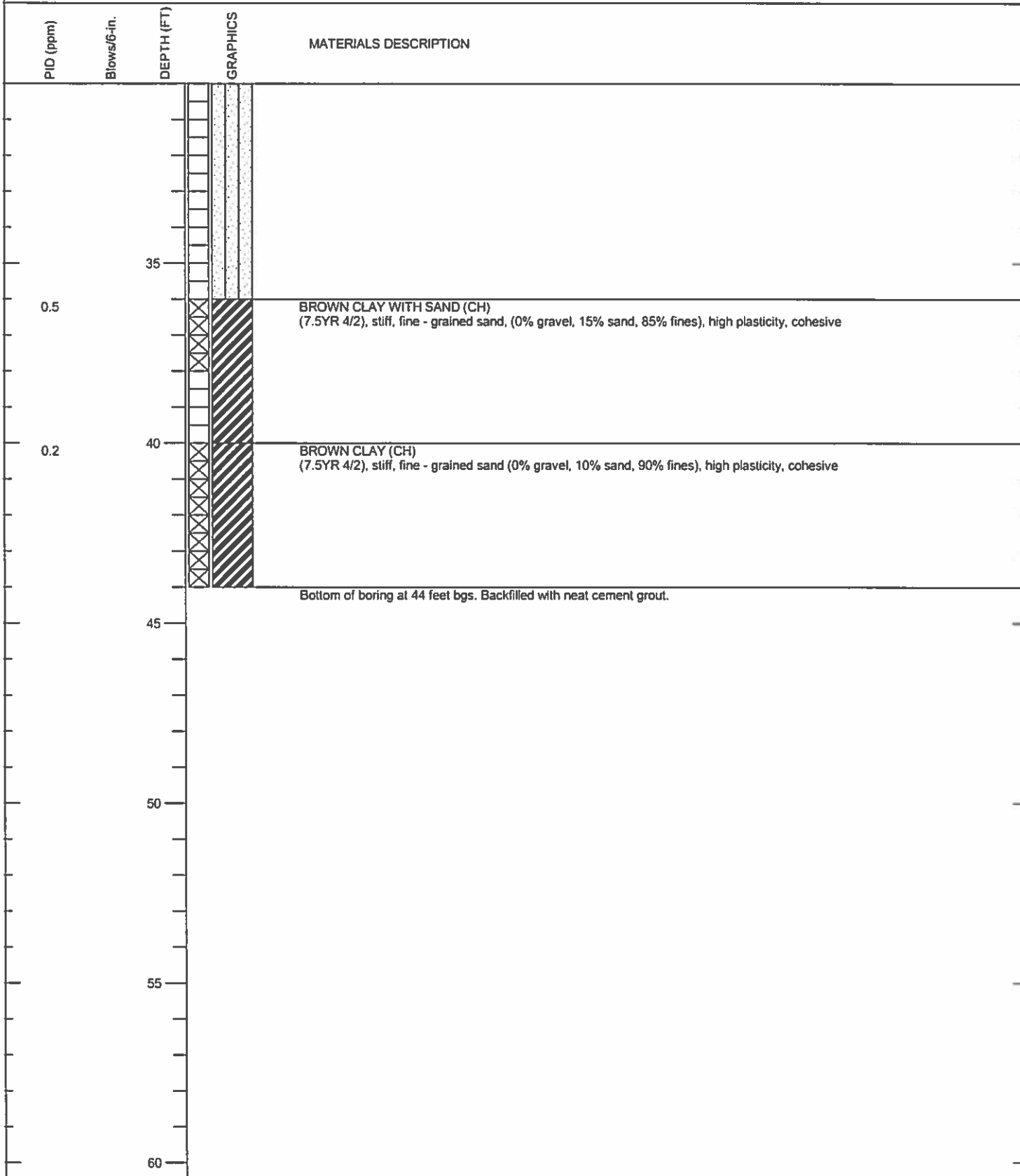


PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
				ASPHALT
				BASE ROCK
0.0				STRONG BROWN, SILTY SAND (SM) (7.5YR 4/6), dry, poorly graded, loose to medium stiff, fine - to medium - grained sand, (0% gravel, 50% sand, 50% fines)
0.0		5		
0.0		10		
0.0		15		
0.0		20		BROWN SILTY SAND WITH GRAVEL (SM) (7.5YR 4/3), loose to medium stiff, fine - to medium - grained sand, small to large gravel, (20% gravel, 55% sand, 25% fines)
0.2		25		
0.2		30		

(Continued)

PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	44 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
11


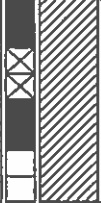



PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	44 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE

11



PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
				ASPHALT
0.1				STRONG BROWN SANDY CLAY (CL) (7.5YR 4/6), dry, stiff to very stiff, fine-grained sand, (0% gravel, 30% sand, 70% fines), medium plasticity, cohesive B16-1.0-2.0
0.3				B16-3.0-4.0
		5		Bottom of boring at 5 feet bgs. Backfilled with neat cement grout.
		10		
		15		
		20		
		25		
		30		

PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	5 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

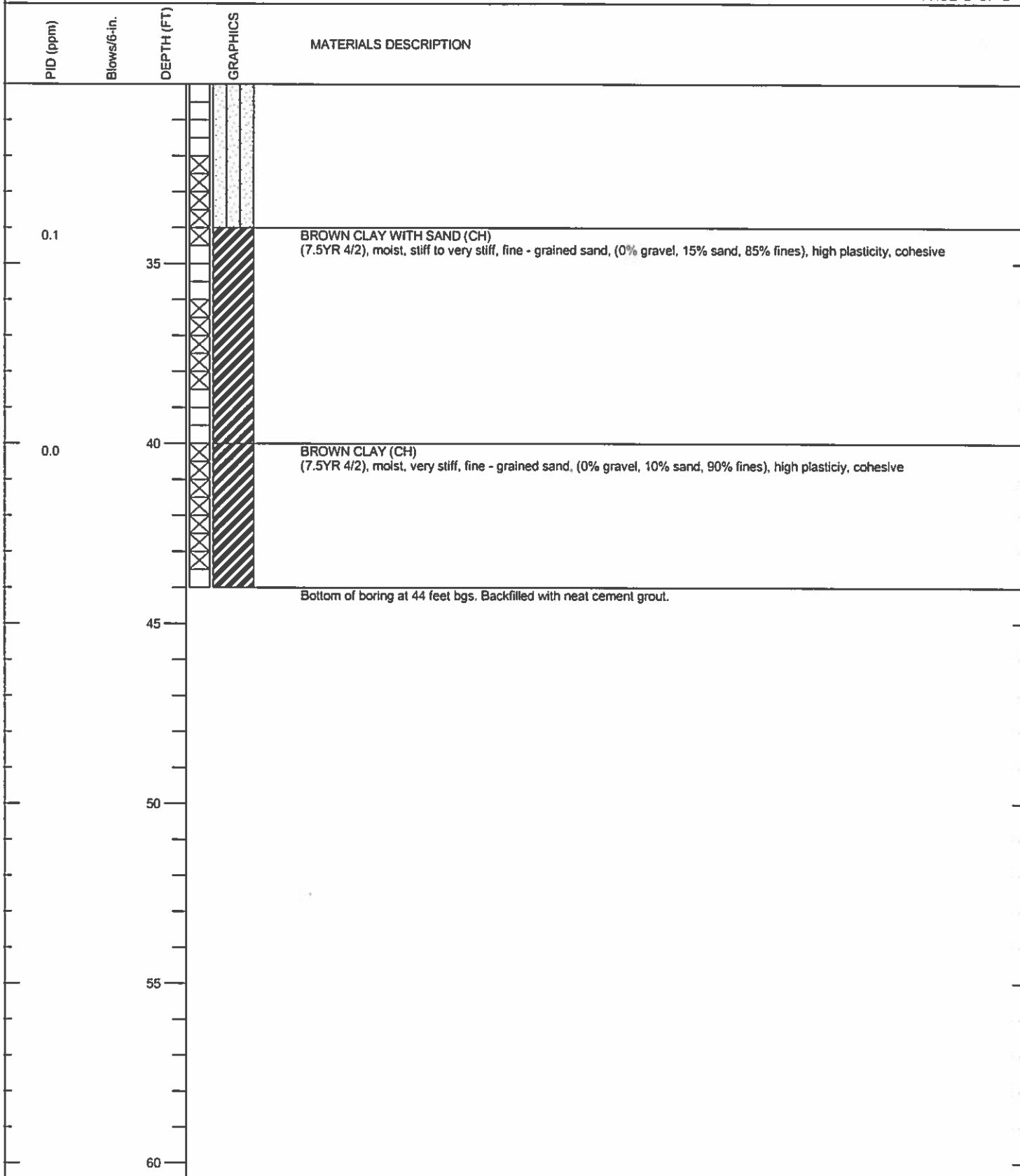
PLATE
12



PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
0.1				STRONG BROWN SANDY CLAY (CL) (7.5YR 4/6), dry, stiff to very stiff, fine - grained sand, (0% gravel, 30% sand, 70% fines), medium plasticity, cohesive
0.3		5		
0.1		10		
0.3		15		
0.1		20		
0.1		25		BROWN SILTY SAND WITH GRAVEL (SM) (7.5YR 4/3), loose to medium dense, fine - to medium - grained sand, small to large gravel, (20% gravel, 55% sand, 25% fines).
0.1		30		
		(Continued)		

PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	44 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14





PLATE
13



PROJECT	Regis Homes Bay Area, LLC	REVIEWED BY	GDT
LOCATION	39155 & 38183 State Street, Fremont, California	DIAMETER OF HOLE	7 inches
JOB NUMBER	1098.007.01.001	TOTAL DEPTH OF HOLE	44 feet
LOGGED BY	G. Creps	DATE STARTED	10/27/14
DRILL RIG	Direct push	DATE COMPLETED	10/27/14

PLATE
13










PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
				ASPHALT
				DARK BROWN SILTY GRAVEL (GM) (7.5 YR 3/3), dry, rounded to subangular gravel from 0.2- to 1-inch diameter, (70% gravel, 10% sand, 20% fines)
0.1				Sample ID: B44s-1.0-2.0
0.3				Sample ID: B44s-3.0-4.0
				Refusal on concrete debris at 4 feet bgs. Boring backfilled with neat cement grout.
		5		
		10		

PROJECT SummerHill Homes
 LOCATION 39155 State Street, Fremont, California
 JOB NUMBER 220.003.02.001
 LOGGED BY ME
 DRILL RIG Direct Push

REVIEWED BY GDT
 DIAMETER OF HOLE 2 inches
 TOTAL DEPTH OF HOLE 4 feet
 DATE STARTED 9/21/15
 DATE COMPLETED 9/21/15

PLATE









PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
				ASPHALT
				DARK BROWN SILTY GRAVEL (GM) (7.5 YR 3/3), dry, rounded to subangular gravel from 0.2- to 1-inch diameter, (70% gravel, 10% sand, 20% fines)
				Sample ID: B45s-1.0-2.0
0.0				
				Sample ID: B45s-3.0-4.0
0.0				
				Refusal on concrete debris at 4 feet bgs. Boring backfilled with neat cement grout.
		5		
		10		

PROJECT	SummerHill Homes	REVIEWED BY	GDT
LOCATION	39155 State Street, Fremont, California	DIAMETER OF HOLE	2 inches
JOB NUMBER	220.003.02.001	TOTAL DEPTH OF HOLE	4 feet
LOGGED BY	ME	DATE STARTED	9/21/15
DRILL RIG	Direct Push	DATE COMPLETED	9/21/15

PLATE








PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
				ASPHALT
				DARK BROWN SILTY GRAVEL (GM) (7.5 YR 3/3), dry, rounded to subangular gravel from 0.2- to 1-inch diameter, (70% gravel, 10% sand, 20% fines)
				<i>Sample ID: B46s-1.0-2.0</i>
0.0				Lense of very fine-grained sand from 2.5 to 2.8 feet bgs (cement)
				<i>Sample ID: B46s-3.0-4.0</i>
0.0				Refusal on concrete debris at 4 feet bgs. Boring backfilled with neat cement grout.
		5		
		10		

PROJECT	SummerHill Homes	REVIEWED BY	GDT
LOCATION	39155 State Street, Fremont, California	DIAMETER OF HOLE	2 inches
JOB NUMBER	220.003.02.001	TOTAL DEPTH OF HOLE	4 feet
LOGGED BY	ME	DATE STARTED	9/21/15
DRILL RIG	Direct Push	DATE COMPLETED	9/21/15

PLATE

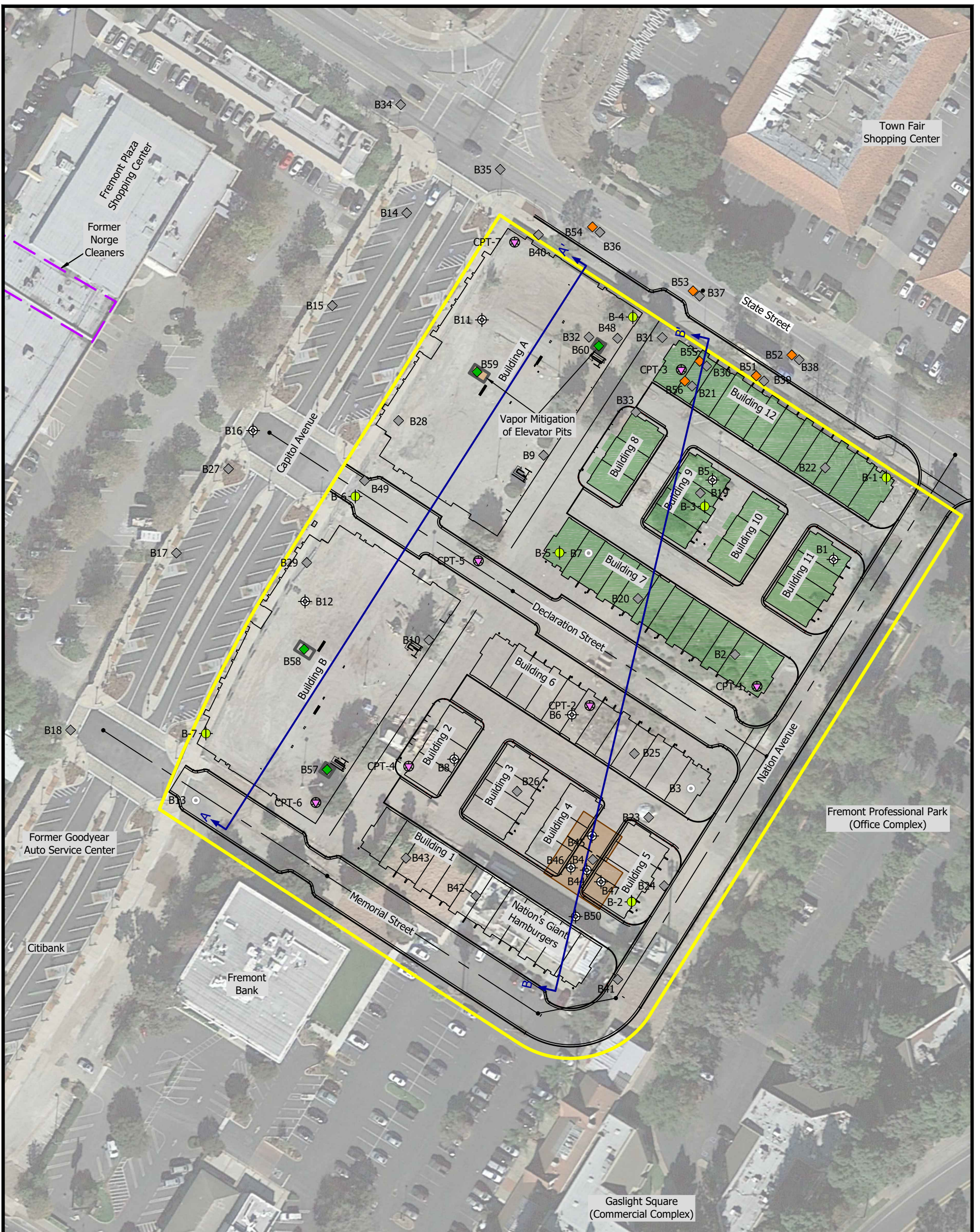


PID (ppm)	Blows/6-in.	DEPTH (FT)	GRAPHICS	MATERIALS DESCRIPTION
				ASPHALT
				DARK BROWN SILTY GRAVEL (GM) (7.5 YR 3/3), dry, rounded to subangular gravel from 0.2- to 1-inch diameter, (70% gravel, 10% sand, 20% fines)
				2-inch thick lense of olive green silt/clay present at 3.6 feet bgs, slight organic odor
				Brick debris present from 4 to 4.5 feet bgs
				Refusal on concrete debris at 4.5 feet bgs. Boring backfilled with neat cement grout.
0.0				<i>Sample ID: B47s-1.5-2.5</i>
0.0				<i>Sample ID: B47s-3.5-4.5</i>
		5		
		10		









PROJECT	SummerHill Homes	REVIEWED BY	GDT
LOCATION	39155 State Street, Fremont, California	DIAMETER OF HOLE	2 inches
JOB NUMBER	220.003.02.001	TOTAL DEPTH OF HOLE	4.5 feet
LOGGED BY	ME	DATE STARTED	9/21/15
DRILL RIG	Direct Push	DATE COMPLETED	9/21/15


PLATE


ATTACHMENT B
PES GEOLOGIC CROSS-SECTIONS




Explanation

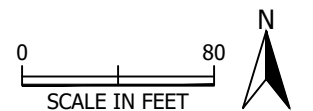
-  Approximate Property Boundary
-  Soil Vapor Sampling Location (PES)
-  Soil Vapor and Soil Sampling Location (PES)
-  Soil Sampling Location (PES)
-  Soil Vapor Sample Location
-  Soil Vapor Sample Location within planned elevator pit
-  Approximate Location of Boring by Rockridge Geotechnical Inc. June 2015
-  Approximate Location of Cone Penetration Test by Rockridge Geotechnical, Inc., June 2015

 Cross-Section Location (Arrows show direction of view)

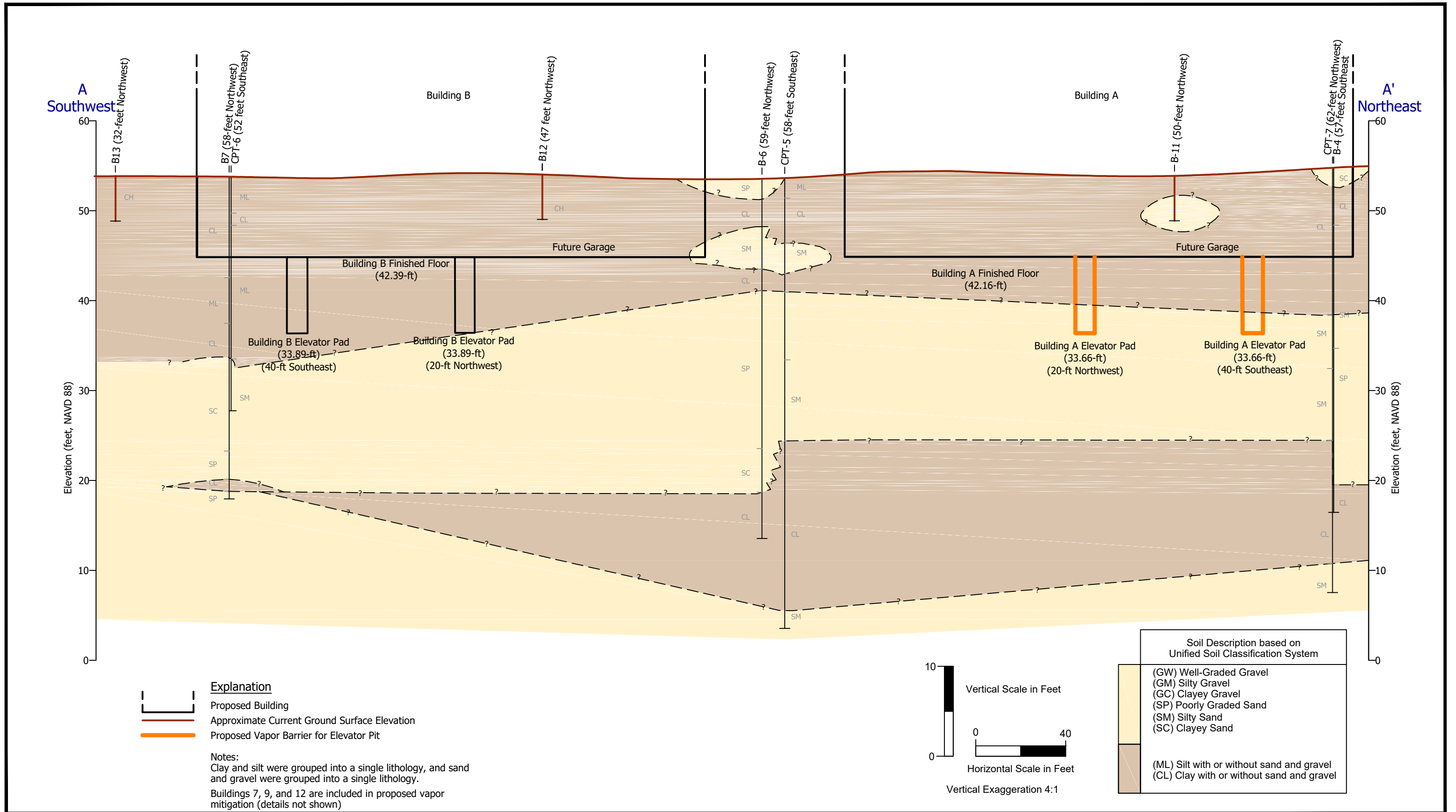
 Area of Excavation

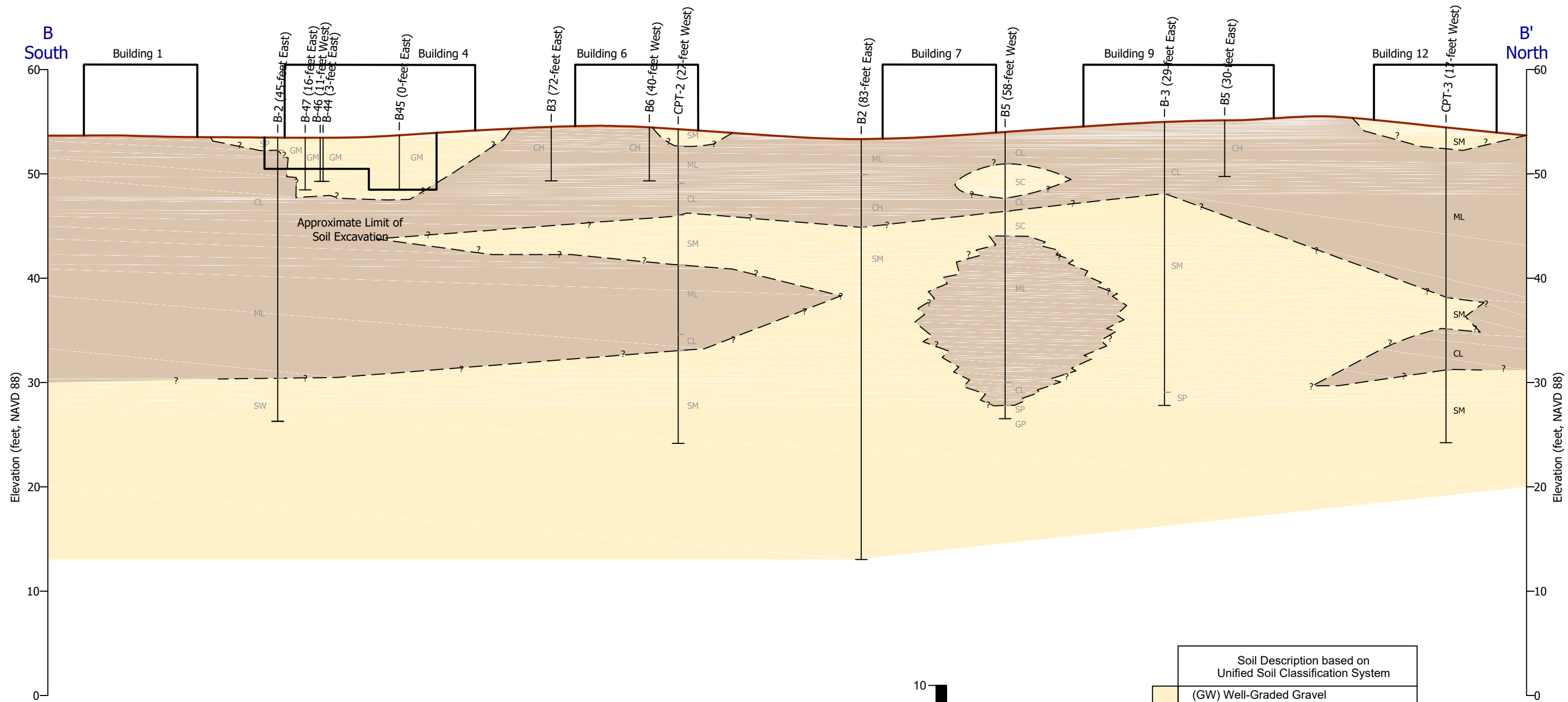
 Planned Vapor Mitigation Areas for at-grade Townhomes

 Planned Vapor Mitigation Areas for Below Grade Parking Elevator Pits





Aerial Photo: October 30, 2015 (Google 2016)

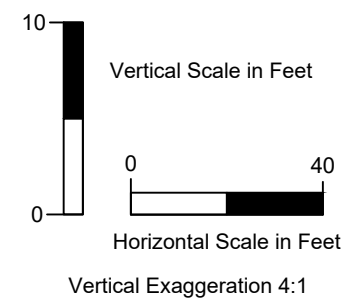




Explanation

 Projected Location of Proposed Building (Future Pad not shown)
 Approximate Current Ground Surface Elevation

Notes:
 Clay and silt were grouped into a single lithology, and sand and gravel were grouped into a single lithology.



Soil Description based on Unified Soil Classification System	
	(GW) Well-Graded Gravel
	(GM) Silty Gravel
	(GC) Clayey Gravel
	(SP) Poorly Graded Sand
	(SM) Silty Sand
	(SC) Clayey Sand
	(ML) Silt with or without sand and gravel
	(CL) Clay with or without sand and gravel

ATTACHMENT C

**DTSC J/E MODEL FOR SUBSURFACE VAPOR INTRUSION OF PCE INTO BUILDINGS FOR THE DIFFERENT
SOIL TYPES FOR THE RESIDENTIAL EXPOSURE SCENARIO**

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
127184	8.50E+03			Tetrachloroethylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	4.9E-04	4.2E+00	8.8E-06	1.2E-01

MORE
↓

	ENTER	ENTER	OR	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		SCL

MORE
↓

	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SCL	1.63	0.384	0.146	5

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})
70	26	26	350	24 (NEW)	0.5 (NEW)

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
127184	8.50E+03			Tetrachloroethylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	5.0E-04	4.2E+00	8.9E-06	1.2E-01

MORE
↓

	ENTER	ENTER	OR	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)
15	152	24		SIL

MORE
↓

	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SIL	1.49	0.439	0.18	5

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})
70	26	26	350	24 (NEW)	0.5 (NEW)

END

NEW=> Residential

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
127184	8.50E+03			Tetrachloroethylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	5.4E-04	4.5E+00	9.6E-06	1.2E-01

MORE ↓

	ENTER	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		L	

MORE ↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type <small>Lookup Soil Parameters</small>	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)	
L	1.59	0.399	0.148	5	

MORE ↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})	
70	26	26	350	24 (NEW)	0.5 (NEW)	

END

NEW=> Residential

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
ENTER	ENTER	OR	ENTER	Chemical
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	
127184	8.50E+03			Tetrachloroethylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	7.6E-04	6.4E+00	1.4E-05	1.8E-01

MORE
↓

ENTER	ENTER	OR	ENTER	ENTER
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	SL	

MORE
↓

ENTER	ENTER	ENTER	ENTER	ENTER
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SL	1.62	0.387	0.103	5

MORE
↓

Lookup Receptor Parameters

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})
70	26	26	350	24 (NEW)	0.5 (NEW)

END

NEW=> Residential

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Reset to
Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
127184	8.50E+03			Tetrachloroethylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	9.4E-04	8.0E+00	1.7E-05	2.2E-01

MORE
↓

	ENTER	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L_f (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		LS	

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)	
LS	1.62	0.39	0.076	5	

MORE
↓

Lookup Receptor
Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour) ⁻¹	
70	26	26	350	24 (NEW)	0.5 (NEW)	

NEW=> Residential

END

ATTACHMENT D

EXPOSURE POINT CONCENTRATIONS AND SITE-SPECIFIC SCREENING LEVELS FOR VOLATILE ORGANIC COMPOUNDS IN SOIL VAPOR AND INDOOR AIR FOR FUTURE ONSITE RESIDENTIAL AND COMMERCIAL EXPOSURE SCENARIOS – SOIL CLASSIFICATION AS LOAMY SAND

**Exposure Point Concentrations and Site-Specific Screening Levels for Volatile Organic Compounds in
Soil Vapor and Indoor Air for Future Onsite Residential Exposure Scenario - Soil Classification as Loamy Sand**
39155 and 39183 State Street
Fremont, California

Volatile Organic Compounds (VOCs) Detected in Soil Vapor	Soil Vapor	Indoor Air ²		Cancer Risk (unitless)	Noncancer Hazard Index (unitless)	Site-Specific Screening Level (SL)		
	EPC _{soil vapor} ¹ (µg/m ³)	Soil Vapor to Indoor Air Attenuation Factor (unitless)	EPC _{indoor air} (µg/m ³)			Soil Vapor SL Based on Carcinogenic Effects ³ (µg/m ³)	Soil Vapor SL Based on Noncarcinogenic Effects ⁴ (µg/m ³)	Lowest Soil Vapor SL ⁵ (µg/m ³)
Tetrachloroethene	8,500	9.4E-04	7.95E+00	1.7E-05	2.2E-01	509	39,022	509
Benzene	710	1.3E-03	9.10E-01	9.4E-06	2.9E-01	76	2,440	76
Toluene	1,500	1.2E-03	1.79E+00	NA	5.7E-03	NA	261,650	261,650
Ethylbenzene	280	1.1E-03	3.13E-01	2.8E-07	3.0E-04	1,005	933,292	1,005
m,p-Xylene	1,100	1.1E-03	1.23E+00	NA	1.2E-02	NA	93,403	93,403
o-Xylene	350	1.1E-03	3.93E-01	NA	3.8E-03	NA	92,993	92,993
Freon 11	2,300	1.1E-03	2.50E+00	NA	3.4E-03	NA	670,262	670,262
Freon 12	6,400	1.2E-03	7.56E+00	NA	7.3E-02	NA	88,263	88,263
Chloroform	160	1.2E-03	1.90E-01	1.6E-06	1.9E-03	103	85,977	103

Notes:

bgs = below ground surface.

EPC = exposure point concentration.

SL = screening level.

µg/m³ = micrograms per cubic meter.

¹ Represents the maximum detected concentration for onsite soil vapor samples (3 purge volumes) collected from 0 to 10 feet bgs. Note: All maximum detected concentrations were detected at 5 feet bgs.

² EPCs in soil vapor (EPC_{soil vapor}) were coupled with vapor intrusion model to estimate attenuation factors, EPCs in indoor air, cancer risk, and noncancer hazard index for residential scenario.

³ Represents the Site-specific SL for carcinogenic effects, based on a target excess cancer risk of one-in-one million (1 x 10⁻⁶).

Soil Vapor SL (Carcinogenic Effects) for compound *i* = Soil Vapor EPC_{*i*} x Target Cancer Risk of 1 x 10⁻⁶ / Cancer Risk_{*i*}

⁴ Represents the Site-specific SL for noncarcinogenic effects, based on a target hazard quotient of one (1).

Soil Vapor SL (Noncarcinogenic Effects) for compound *i* = Soil Vapor EPC_{*i*} x Target Noncancer Hazard Index of 1 / Noncancer Hazard Index_{*i*}

⁵ Represents the lower of the Site-specific SLs based on noncarcinogenic or carcinogenic effects.

**Exposure Point Concentrations and Site-Specific Screening Levels for Volatile Organic Compounds in
Soil Vapor and Indoor Air for Future Onsite Commercial Exposure Scenario - Soil Classification as Loamy Sand**
39155 and 39183 State Street
Fremont, California

Volatile Organic Compounds (VOCs) Detected in Soil Vapor	Soil Vapor	Indoor Air ²		Cancer Risk (unitless)	Noncancer Hazard Index (unitless)	Site-Specific Screening Level (SL)		
	EPC _{soil vapor} ¹ (µg/m ³)	Soil Vapor to Indoor Air Attenuation Factor (unitless)	EPC _{indoor air} (µg/m ³)			Soil Vapor SL Based on Carcinogenic Effects ³ (µg/m ³)	Soil Vapor SL Based on Noncarcinogenic Effects ⁴ (µg/m ³)	Lowest Soil Vapor SL ⁵ (µg/m ³)
Tetrachloroethene	8,500	4.7E-04	3.98E+00	1.9E-06	2.6E-02	4,444	327,781	4,444
Benzene	710	6.4E-04	4.55E-01	1.1E-06	3.5E-02	660	20,499	660
Toluene	1,500	6.0E-04	8.97E-01	NA	6.8E-04	NA	2,197,859	2,197,859
Ethylbenzene	280	5.6E-04	1.56E-01	3.2E-08	3.6E-05	8,780	7,839,657	8,780
m,p-Xylene	1,100	5.6E-04	6.14E-01	NA	1.4E-03	NA	784,585	784,585
o-Xylene	350	5.6E-04	1.96E-01	NA	4.5E-04	NA	781,141	781,141
Freon 11	2,300	5.4E-04	1.25E+00	NA	4.1E-04	NA	5,630,199	5,630,199
Freon 12	6,400	5.9E-04	3.78E+00	NA	8.6E-03	NA	741,413	741,413
Chloroform	160	5.9E-04	9.51E-02	1.8E-07	2.2E-04	897	722,209	897

Notes:

bgs = below ground surface.

EPC = exposure point concentration.

SL = screening level.

µg/m³ = micrograms per cubic meter.

¹ Represents the maximum detected concentration for onsite soil vapor samples (3 purge volumes) collected from 0 to 10 feet bgs. Note: All maximum detected concentrations were detected at 5 feet bgs.

² EPCs in soil vapor (EPC_{soil vapor}) were coupled with vapor intrusion model to estimate attenuation factors, EPCs in indoor air, cancer risk, and noncancer hazard index for commercial scenario.

³ Represents the Site-specific SL for carcinogenic effects, based on a target excess cancer risk of one-in-one million (1 x 10⁻⁶).

Soil Vapor SL (Carcinogenic Effects) for compound *i* = Soil Vapor EPC_{*i*} x Target Cancer Risk of 1 x 10⁻⁶ / Cancer Risk_{*i*}

⁴ Represents the Site-specific SL for noncarcinogenic effects, based on a target hazard quotient of one (1).

Soil Vapor SL (Noncarcinogenic Effects) for compound *i* = Soil Vapor EPC_{*i*} x Target Noncancer Hazard Index of 1 / Noncancer Hazard Index_{*i*}

⁵ Represents the lower of the Site-specific SLs based on noncarcinogenic or carcinogenic effects.

ATTACHMENT E

DTSC J/E MODEL FOR SUBSURFACE VAPOR INTRUSION INTO BUILDINGS FOR LOAMY SAND

**DTSC J/E MODEL FOR SUBSURFACE VAPOR INTRUSION INTO BUILDINGS
FOR THE RESIDENTIAL EXPOSURE SCENARIO**

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
127184	8.50E+03			Tetrachloroethylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	9.4E-04	8.0E+00	1.7E-05	2.2E-01

MORE
↓

	ENTER	ENTER	ENTER	OR	ENTER
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)	Vadose zone SCS soil type (used to estimate soil vapor permeability)		User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

	ENTER	ENTER	ENTER	ENTER	ENTER
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)		Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076		5

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})	
70	26	26	350	24	0.5	
				(NEW)	(NEW)	

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Benzene

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
7.10E+02	1.3E-03	9.1E-01	9.4E-06	2.9E-01

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
71432	7.10E+02			Benzene

MESSAGE: See VLOOKUP table comments on chemical properties and/or toxicity criteria for this chemical.

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_f (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_s (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH (hour^{-1})
70	26	26	350	24 (NEW)	0.5 (NEW)

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Toluene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
108883	1.50E+03			Toluene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
1.50E+03	1.2E-03	1.8E+00	NA	5.7E-03

MORE
↓

	ENTER	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		LS	

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate)	
LS	1.62	0.39	0.076	5	

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})	
70	26	26	350	24 (NEW)	0.5 (NEW)	

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Ethylbenzene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
100414	2.80E+02			Ethylbenzene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
2.80E+02	1.1E-03	3.1E-01	2.8E-07	3.0E-04

MORE
↓

	ENTER	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		LS	

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate)	Q_{soil} (L/m)
LS	1.62	0.39	0.076		5

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})	
70	26	26	350	24 (NEW)	0.5 (NEW)	

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: m-Xylene

DATA ENTRY SHEET

Reset to
Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C _g (µg/m ³)		Soil gas conc., C _g (ppmv)	Chemical
108383	1.10E+03			m-Xylene

Results Summary				
Soil Gas Conc. (µg/m ³)	Attenuation Factor (unitless)	Indoor Air Conc. (µg/m ³)	Cancer Risk	Noncancer Hazard
1.10E+03	1.1E-03	1.2E+00	NA	1.2E-02

MORE
↓

	ENTER	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	Soil gas sampling depth below grade, L _s (cm)	Average soil temperature, T _s (°C)		Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k _v (cm ²)
15	152	24		LS	

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ _b ^A (g/cm ³)	Vadose zone soil total porosity, n ^V (unitless)	Vadose zone soil water-filled porosity, θ _w ^V (cm ³ /cm ³)	Average vapor flow rate into bldg. (Leave blank to calculate)	Q _{soil} (L/m)
LS	1.62	0.39	0.076		5

MORE
↓

Lookup Receptor
Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT _C (yrs)	Averaging time for noncarcinogens, AT _{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour) ⁻¹	
70	26	26	350	24 (NEW)	0.5 (NEW)	

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: o-Xylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C _g (µg/m ³)	OR	ENTER Soil gas conc., C _g (ppmv)	Chemical
95476	3.50E+02			o-Xylene

Results Summary				
Soil Gas Conc. (µg/m ³)	Attenuation Factor (unitless)	Indoor Air Conc. (µg/m ³)	Cancer Risk	Noncancer Hazard
3.50E+02	1.1E-03	3.9E-01	NA	3.8E-03

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	ENTER Soil gas sampling depth, below grade, L _s (cm)	ENTER Average soil temperature, T _s (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k _v (cm ²)
15	152	24	LS		

MORE
↓

ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ _b ^A (g/cm ³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ _w ^V (cm ³ /cm ³)		ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q _{soil} (L/m)
LS	1.62	0.39	0.076		5

MORE
↓

Lookup Receptor
Parameters

ENTER Averaging time for carcinogens, AT _C (yrs)	ENTER Averaging time for noncarcinogens, AT _{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH (hour) ⁻¹
70	26	26	350	24 (NEW)	0.5 (NEW)

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Trichlorofluoromethane

DATA ENTRY SHEET

Reset to
Defaults

Soil Gas Concentration Data				
ENTER	ENTER	OR	ENTER	Chemical
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C _g (µg/m ³)		Soil gas conc., C _g (ppmv)	
75694	2.30E+03			Trichlorofluoromethane

Results Summary				
Soil Gas Conc. (µg/m ³)	Attenuation Factor (unitless)	Indoor Air Conc. (µg/m ³)	Cancer Risk	Noncancer Hazard
2.30E+03	1.1E-03	2.5E+00	NA	3.4E-03

MORE
↓

ENTER	ENTER	ENTER	ENTER	OR	ENTER
Depth below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	Soil gas sampling depth below grade, L _S (cm)	Average soil temperature, T _S (°C)	Vadose zone SCS soil type (used to estimate soil vapor permeability)		User-defined vadose zone soil vapor permeability, k _v (cm ²)
15	152	24	LS		

MORE
↓

ENTER	ENTER	ENTER	ENTER	ENTER
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ _b ^A (g/cm ³)	Vadose zone soil total porosity, n ^V (unitless)	Vadose zone soil water-filled porosity, θ _w ^V (cm ³ /cm ³)	Average vapor flow rate into bldg. (Leave blank to calculate) Q _{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT _C (yrs)	Averaging time for noncarcinogens, AT _{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour) ⁻¹
70	26	26	350	24 (NEW)	0.5 (NEW)

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Dichlorodifluoromethane

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
6.40E+03	1.2E-03	7.6E+00	NA	7.3E-02

Reset to
Defaults

Soil Gas Concentration Data				
ENTER	ENTER	OR	ENTER	Chemical
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	
75718	6.40E+03			Dichlorodifluoromethane

MORE
↓

ENTER	ENTER	ENTER	ENTER	OR	ENTER
Depth below grade to bottom of enclosed space floor, L_f (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)	Vadose zone SCS soil type (used to estimate soil vapor permeability)		User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER	ENTER	ENTER	ENTER	ENTER
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour) ⁻¹
70	26	26	350	24 (NEW)	0.5 (NEW)

NEW=> Residential

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Residential
Chemical: Chloroform

DATA ENTRY SHEET

Reset to
Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C _g (µg/m ³)		ENTER Soil gas conc., C _g (ppmv)	Chemical
67663	1.60E+02			Chloroform

Results Summary				
Soil Gas Conc. (µg/m ³)	Attenuation Factor (unitless)	Indoor Air Conc. (µg/m ³)	Cancer Risk	Noncancer Hazard
1.60E+02	1.2E-03	1.9E-01	1.6E-06	1.9E-03

MORE
↓

	ENTER	ENTER	OR	
Depth below grade to bottom of enclosed space floor, L _F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L _s (cm)	ENTER Average soil temperature, T _s (°C)		Vadose zone SCS soil type (used to estimate soil vapor permeability)
15	152	24		LS

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ _b ^A (g/cm ³)	ENTER Vadose zone soil total porosity, n ^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ _w ^V (cm ³ /cm ³)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate)	Q _{soil} (L/m)
LS	1.62	0.39	0.076		5

MORE
↓

Lookup Receptor
Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT _C (yrs)	ENTER Averaging time for noncarcinogens, AT _{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH (hour) ⁻¹	
70	26	26	350	24 (NEW)	0.5 (NEW)	

NEW=> Residential

END

**DTSC J/E MODEL FOR SUBSURFACE VAPOR INTRUSION INTO BUILDINGS
FOR THE COMMERCIAL EXPOSURE SCENARIO**

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Tetrachloroethylene

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
8.50E+03	4.7E-04	4.0E+00	1.9E-06	2.6E-02

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
127184	8.50E+03			Tetrachloroethylene

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_s (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

NEW=> Commercial

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Benzene

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
7.10E+02	6.4E-04	4.6E-01	1.1E-06	3.5E-02

Reset to Defaults

Soil Gas Concentration Data				
ENTER	ENTER	OR	ENTER	Chemical
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	
71432	7.10E+02			Benzene

MESSAGE: See VLOOKUP table comments on chemical properties and/or toxicity criteria for this chemical.

MORE
↓

ENTER	ENTER	ENTER	ENTER	OR	ENTER
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s (°C)	Vadose zone SCS soil type (used to estimate soil vapor permeability)		User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER	ENTER	ENTER	ENTER	ENTER
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

NEW=> Commercial

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Toluene

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
1.50E+03	6.0E-04	9.0E-01	NA	6.8E-04

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
108883	1.50E+03			Toluene

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_s (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

NEW=> Commercial

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Ethylbenzene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
100414	2.80E+02			Ethylbenzene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
2.80E+02	5.6E-04	1.6E-01	3.2E-08	3.6E-05

MORE
↓

	ENTER	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		LS	

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate)	Q_{soil} (L/m)
LS	1.62	0.39	0.076		5

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})	
70	25	25	250	8 (NEW)	1 (NEW)	

END

NEW=> Commercial

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: m-Xylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
108383	1.10E+03			m-Xylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
1.10E+03	5.6E-04	6.1E-01	NA	1.4E-03

MORE ↓

	ENTER	ENTER	OR	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)		Vadose zone SCS soil type (used to estimate soil vapor permeability)
				User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24		LS

MORE ↓

	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE ↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: o-Xylene

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
95476	3.50E+02			o-Xylene

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
3.50E+02	5.6E-04	2.0E-01	NA	4.5E-04

MORE
↓

	ENTER	OR	ENTER	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS	

MORE
↓

	ENTER	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)	
LS	1.62	0.39	0.076	5	

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour^{-1})	
70	25	25	250	8 (NEW)	1 (NEW)	

NEW=> Commercial

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Trichlorofluoromethane

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
2.30E+03	5.4E-04	1.3E+00	NA	4.1E-04

Reset to Defaults

Soil Gas Concentration Data				
ENTER	ENTER	OR	ENTER	Chemical
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	
75694	2.30E+03			Trichlorofluoromethane

MORE
↓

ENTER	ENTER	ENTER	ENTER	OR	ENTER
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)	Vadose zone SCS soil type (used to estimate soil vapor permeability)		User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER	ENTER	ENTER	ENTER	ENTER
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time ET (hrs/day)	Air Exchange Rate ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

END

NEW=> Commercial

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Dichlorodifluoromethane

DATA ENTRY SHEET

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
6.40E+03	5.9E-04	3.8E+00	NA	8.6E-03

Reset to Defaults

Soil Gas Concentration Data				
ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)	OR	ENTER Soil gas conc., C_g (ppmv)	Chemical
75718	6.40E+03			Dichlorodifluoromethane

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Soil gas sampling depth below grade, L_s (cm)	ENTER Average soil temperature, T_s (°C)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS		

MORE
↓

ENTER Vadose zone SCS soil type (Lookup Soil Parameters)	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor
Parameters

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Exposure Time ET (hrs/day)	ENTER Air Exchange Rate ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

END

Department of Toxic Substances Control Vapor Intrusion Screening Model - Soil Gas

Scenario: Commercial
Chemical: Chloroform

DATA ENTRY SHEET

Reset to Defaults

Soil Gas Concentration Data				
	ENTER	OR	ENTER	
Chemical CAS No. (numbers only, no dashes)	Soil gas conc., C_g ($\mu\text{g}/\text{m}^3$)		Soil gas conc., C_g (ppmv)	Chemical
67663	1.60E+02			Chloroform

Results Summary				
Soil Gas Conc. ($\mu\text{g}/\text{m}^3$)	Attenuation Factor (unitless)	Indoor Air Conc. ($\mu\text{g}/\text{m}^3$)	Cancer Risk	Noncancer Hazard
1.60E+02	5.9E-04	9.5E-02	1.8E-07	2.2E-04

MORE
↓

	ENTER	ENTER	OR	
Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	Soil gas sampling depth below grade, L_s (cm)	Average soil temperature, T_s ($^{\circ}\text{C}$)	Vadose zone SCS soil type (used to estimate soil vapor permeability)	User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	152	24	LS	

MORE
↓

	ENTER	ENTER	ENTER	
Vadose zone SCS soil type (Lookup Soil Parameters)	Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	Vadose zone soil total porosity, n^V (unitless)	Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
LS	1.62	0.39	0.076	5

MORE
↓

Lookup Receptor Parameters

	ENTER	ENTER	ENTER	ENTER	ENTER
Averaging time for carcinogens, AT_C (yrs)	Averaging time for noncarcinogens, AT_{NC} (yrs)	Exposure duration, ED (yrs)	Exposure frequency, EF (days/yr)	Exposure Time, ET (hrs/day)	Air Exchange Rate, ACH (hour^{-1})
70	25	25	250	8 (NEW)	1 (NEW)

NEW=> Commercial

END