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			Site So Carrol	o <mark>il Sam</mark> j I	pling	G&EE NO.: 11-032E INS	SPECTOR:	
DATE S	STAR	TED:		18 Ju	111			
DRILLIN DVERB COORE BROUN	NG AC URDI DINAT ND CC	GENCY EN THI ES: N: DVER:	: CKNES <u>3,983,3</u> <u>Grass</u>	<u>B</u> S: 91.3 E	EC : <u>447,</u>	HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 10.0 m WA 521.3 GROUND ELEV.: 50.17 m DA CONTAMINATION:	TUM:	10.0 m No Water; AD MSL
YPE C	F HC	LE: [] Piezon	neter	Mon	itoring Well Test Pit Auger Hole X	other <u>Direct push s</u>	ampling hole
DEPTH DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LCG CCNTAMINATED	BLOW COUNT	SFT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1				AC FILL FILL	Asphalt pavement thickness = 7cm. Poorly-graded GRAVEL with Silt and Sand: grayish brown; moist; about 70% subangular fine to coarse gravel (max.5cm); about 20% subangular fine to coarse Sand	- %Recovery = 100 PID = 1.6ppm FC = F3	
	52					(max.4.8mm); about 10% Fines; fill material (GP-GM). <u>SILTY SAND</u> : brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM).	%Recovery = 93 PID = 1.0 - 10.3ppm	
2 2 						With scrap of asphalt at 3m.	%Recovery = 96 PID = 2.9 - 4.3ppm	
	S 3				FILL	<u>CLAYEY SAND</u> : reddish brown to gray; moist; about 5% subangular fine gravel (max.2cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; medium plasticity; fill material (SC).		
5						About 3% subangular fine gravel (max.1cm); about 67% subangular fine to coarse Sand; about 30% Fines.		
6					SC	CLAYEY SAND: reddish brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; residual soil.	%Recovery = 90 PID = 0.5 - 2.0ppm	
	S4			-	SM	<u>SILTY SAND</u>: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil.		
9						L{ght brown.		

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SOIL DESCRIPTIONS

Asphalt

Sandy Lean Clay













ROCK DESCRIPTIONS



GROUNDWATER

- ☑ Groundwater 1st reading (While drilling or at completion)
- Groundwater 2nd reading (After Drilling or over 12 hours later after drilling)

×2

SOIL SAMPLERS



Direct Push Soil Sampler

MBOLS REV2.0 (MAY 2007) 11-032E.GPJ USACE SKOREA.GDT 7/21/

FIELD / LAB TEST DATA

Fines = %Passing #200 Sieve FC = Frost Classification PID = Photoionization detector Petro FLAG = Petroleum Hydrocarbons detected LL = Liquid Limit PI = Plasticity Index MC = %Moisture Content Cc = Compression Index OCR = Overconsolidation Ratio Tor = Torvane PP = Pocket Penetrometer





Key to Symbols

Project Name: Phase I Site Soil Sampling Location: Camp Carroll G&EE Number: 11-032E

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- 1. The dates of drilling/penetration and type of equipment used are shown on the logs. All soils were classified in accordance with ASTM D 2488. Results of tests conducted on recovered samples are shown on the logs.
- 2. Borehole locations and elevations were determined using GPS RTK and/or Traverse methods. Equipments used are Trimble GPS RTK and/or Sokkia Total Stations. Survey Datum is WGS84, UTM Zone 52 and Elevations are Mean Sea Level (MSL).
- 3. The groundwater table is representative of boring location and time of drilling, and may change according to seasonal precipitation.
- 4. The exploration logs are subject to the limitations, conclusions, and recommendations provided in the report. Some variation in the subsurface conditions and depth to bedrock between boring locations can be expected.
- 5. Soil and rock conditions and associated stratigraphic features as depicted in the boring logs are specific for the particular drilling location, and may vary between boreholes.
- 6. Penetration refusal depth on the logs is based on achieving an penetration speed at least 1 minutes for 2 cm penetration (<2cm/1min) within very dense residual soil or decomposed bedrock.
- 7. When direct push sampling system used, some gravely soils may have the potential to provide poor sample recovery or erroneous penetration speed due to the coarse size of the particles, as compared to the size of the sampler (35mm ID).



US Army Corps of Engineers Far East District



Note

Project Name: Phase I Site Soil Sampling Location: Camp Carroll G&EE Number: 11-032E

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		Army Engin		S		EXPLORATION LOG HOLE NO. E11-154		r East District
DRILLII OVERB	ION: START NG MI NG AC SURDE DINAT	Camp TED: ETHOE GENCY EN THI ES: N: DVER:	Carro)/EQUI (: CKNE: 3,983,: Grass	II <u>11 Au</u> PMENT <u>B</u> SS: 502.5 E	g 11 7: <u>BEC</u> EC 7: 447,6	G&EE NO.: 11-032E INS FINISHED: 11 Aug 11 DR C50PM-1 11 MULE HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 2.3 m WA 696.6 GROUND ELEV.: 52.29 m DA CONTAMINATION:	SPECTOR: ILLER: TAL DEPTH: TER DEPTH: TUM: other _ <u>Direct push</u> s	No water; AD MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
52	S1 S2				FILL	 <u>SILTY SAND</u>: brown; molst; about 10% subangular fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM). About 5% subangular fine to coarse gravel (max.3cm); about 66% subangular fine to coarse Sand (max.4.8mm); about 30% Fines. <u>SILTY SAND</u>: light brown; moist; about 80% subangular fine to coarse Sand (max.4.8mm); about 30% Fines. 	%Recovery ≈ 100 PID = 1.5ppm FC = F3 %Recovery ≈ 100 PID = 0.6 - 2.0ppm	
2						Hard pushing of sampler at 2.1-2.3m; HDP (Hydraulic Down Pressure) = 1000 psi. Penetration refusal depth = 2.3m (Penetration speed = 1cm / 1min).		

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	- ст.	Phoso	II Sita (Soil Sar	unling	HOLE NO. E11-155		
OCAT	ION: STAR	<u>Cam</u> j TED:	o Carro	 11 Au	g 11		SPECTOR: _ RILLER:	
RILLII VERB OORE	NG AC IURDI DINAT ND CC	genc` En th 'es: n dver:	Y: ICKNE : <u>3,983,4</u> <u>Grass</u>	B SS: 488.8 E	EC : _447,6	HOLE DIAMETER: <u>5.5 cm</u> TC DEPTH DRILLED: <u>1.8 m</u> W 77.1 GROUND ELEV.: <u>51.51 m</u> DA CONTAMINATION:	ATUM:	1.8 m No water; AD MSL
			Piezon			toring Well 🗀 Test Pit 🗀 Auger Hole 🛛 🕅	other <u>Direct push s</u>	ampling nole
DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	51				FILL	SILTY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 2.1ppm FC = F3	
							%Recovery = 100 PID = 4.2 - 5.2ppm	
1	52				SM	SILTY SAND: brown; moist; about 80% subangular fine to		
				***************************************		coarse Sand (max.4.8mm); about 20% Fines; residual soil; granite texture. Hard pushing of sampler at 1.6-1.8m; HDP (Hydraulic Down Pressure) = 1000 psi.		

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	J Of	Army Engin	eers			EXPLORATION LOG HOLE NO. E11-156		East istrict		
LOCAT DATE S DRILLII OVERE COORI GROUN	PROJECT: Phase II Site Soil Sampling LOCATION: Camp Carroll G&EE NO.: 11-032E INSPECTOR: DATE STARTED: 05 Aug 11 FINISHED: 05 Aug 11 DRILLER: DRILLING METHOD/EQUIPMENT: BEC HOLE DIAMETER: 5.5 cm TOTAL DEPTH: DRILLING AGENCY: BEC HOLE DIAMETER: 5.5 cm TOTAL DEPTH: OVERBURDEN THICKNESS: DEPTH DRILLED: 6.45 m WATER DEPTH: COORDINATES: N: 3,983,460.1 E: 447,679.5 GROUND ELEV.: 51.40 m DATUM: GROUND COVER: Grass CONTAMINATION:									
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA		
51	S1				FILL	Poorly-graded GRAVEL with Silt and Sand: brown; moist; about 60% angular to subangular fine to coarse gravel (max.2.5cm); about 30% subangular fine to coarse Sand; about 10% Fines; fill material (GP-GM); grass roots at 0- 0.15m. SILTY SAND: brown; moist; about 15% subangular fine to coarse gravel (max.3.3cm); about 70% subangular fine to coarse Sand; about 15% Fines; no plasticity; fill material (SM).	%Recovery = 90 PID = 1.7ppm FC = F1 FC = F3 %Recovery = 100 PID = 0.5 - 2.5ppm			
50— -	S2				CH	CLAYEY SAND: dark brown; moist; about 5% subangular fine gravel (max.2cm); about 55% fine to medium Sand; about 40% Fines; medium plasticity; fill material (SC). FAT CLAY with Sand: dark brown; moist; about 2% subangular fine gravel (max.2.5cm); about 20% subangular fine Sand; about 78% Fines; high plasticity; alluviał soil.	FC = F3			
.92					SC SM	CLAYEY SAND: brown; moist; about 60% fine to medium Sand; about 40% Fines; medium plasticity; alluvial soil. SILTY SAND: light brown; moist; about 60% fine to medium Sand; about 40% Fines; no plasticity; residual soil; Granite	%Recovery = 99 PiD = 2.4 - 4.8ppm			
3 B						texture.				
7	S3					About 70% fine to coarse Sand; about 30% Fines; w/ rock fragments at 4.0 - 6.0m.				
3						Fine to medium sand size.				
56						Dense, Hard pushing of sampler at 6.1-6.4m; HDP (Hydraulic Down Pressure) = 1300 psi. Penetration refusal depth = 6.45m (Penetration speed = 3cm / 2min).				

	US Of I	Army Engin	' Corp eers	S		EXPLORATION LOG HOLE NO. E11-157		East istrict
DATE S DRILLII DRILLII OVERE COORI	TON: START NG ME NG AG BURDE DINATI	Camp ED: ENCY N THI ES: N: VER:	Carro)/EQUI : : CKNE: 3,983,4 Grass	11 Au PMENT B SS: 138.1 E	g 11 F: <u>BEC</u> EC : 447,6	G&EE NO.: 11-032E INS FINISHED: 11 Aug 11 DR 250PM-1	SPECTOR: ILLER: TAL DEPTH: TER DEPTH: TUM: other _ <u>Direct push s</u>	No water; AD MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	A-VALUE SPT	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1				FILL	SILTY SAND: brown; moist; about 5% subangular fine gravel (max, 1cm); about 35% Fines; no plasticity; fill material (SM). About 10% subangular fine to coarse gravel (max, 3cm); about 60% subangular fine to coarse Sand (max, 4.8mm); about 30% Fines. About 3% subangular fine gravel (max, 1cm); about 62% subangular fine to coarse Sand (max, 4.8mm); about 35% Fines; encountered clayey sand layer at 1.6m to 1.7m. SILTY SAND: light brown; moist; about 80% subangular fine to coarse Sand (max.4.8mm); about 20% Fines; no plasticity; residual soil. Hard pushing of sampler at 4.3-4.5m; HDP (Hydraulic Down Pressure) = 1000 psi. Penetration refusal depth = 4.5m (Penetration speed = 1.5cm / 1min).	%Recovery = 100 PID = 5.2ppm FC = F3 %Recovery = 97 PID = 7.8 - 11.2ppm %Recovery = 96 PID = 2.1 - 8.9ppm	

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PROJE LOCAT DATE \$	TON: STAR	Camp TED:	Carro	oll 12 Au	g 11	G&EE NO.: <u>11-032E</u> I FINISHED: <u>12 Aug 11</u> E	NSPECTOR: DRILLER:	
DRILLI OVERE	NG A(BURDI	GENCY EN THI	CKNE	<u> </u>	EC	DEPTH DRILLED: 8.5 m V	TOTAL DEPTH:	
	ND CC	OVER:	Grass			CONTAMINATION:	DATUM:	MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
51	S1				FILL	<u>SILTY SAND</u> : brown; moist; about 5% subangular to angular fine to coarse gravel (max.2.5cm); about 75% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM); Grass roots at 0-0.05m.	%Recovery = 100 PID = 1.8ppm FC = F3 %Recovery = 98	
0	52					Grayish brown.	PID = 2.9 - 3.7ppm	
9					FILL	CLAYEY SAND: brown; moist; about 5% angular to subangular fine gravel (max.1.5cm); about 55% subangular fine to coarse Sand; about 40% Fines; low plasticity; fill material (SC). Reddish brown.	%Recovery = 80 PID = 1.9 - 2.3ppm	
84 4	53					Brown.		
5					SM	SILTY SAND: yellowish brown; about 65% subangular fine to coarse Sand; about 35% Fines; fow plasticity; residual soil.	%Recovery = 94	
3	54			Trees of the second secon			PID = 0.9 - 1.9ppm	
	X					Light brown to brown; about 70% subangular fine to coarse Sand; about 30% Fines; no plasticity; sampler penetration speed= 7cm/1min at 7.9m.		
LL	<u> </u>	<u>4:4-1 </u>			[Hard pushing of sampler at 8.3-8.5m; HDP (Hydraulic Down Pressure) = 1500 psi. Penetration refusal depth = 8.5m (Penetration speed = 5cm / 1min).	<u>l</u>	I

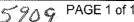
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PRO	DJE	CT:	Phase]	I Site	Soil Sa	npling			
	E S	ON: TAR IG M	Camp TED:	Carre	12 Au	g 11	G&EE NO.: <u>11-032E</u> INS FINISHED: <u>12 Aug 11</u> DR 250PM-2		an faring a far far far far far far far far far f
DRII OVE COC GRC	LLIN ERBI DRD DUN	IG A URD INAT D C(GENCY EN THI FES: N:	': CKNE 3,983, <u>Grass</u>	<u>B</u> SS: 424.1 E	EC : <u>447,</u>	HOLE DIAMETER: <u>5.5 cm</u> TO DEPTH DRILLED: <u>12.0 m</u> WA <u>589.8</u> GROUND ELEV.: <u>50.83 m</u> DA CONTAMINATION:		MSL
			T		neter		itoring Well Test Pit Auger Hole X	other <u>Direct push sa</u>	Impling hole
ELEVATION / DEPTH	(meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	-0 -	S1				FILL	SILTY SAND: brown to gravish brown; moist; about 10% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM); Grass roots at 0-0.05m.	%Recovery = 100 PID = 10.6ppm FC = F3	
0-	-	S2					Subangular fine to coarse gravel (max.3cm).	%Recovery = 100 PID = 10.9 - 14.7ppm	
8	2					FILL	<u>CLAYEY SAND</u> : brown to reddish brown; moist; about 55% 7 fine to medium Sand; about 45% Fines; low plasticity; fill 7 material (SC).	%Recovery = 87 PID = 11.4 - 12.2ppm	
		\$3				FILL	SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand; about 30% Fines; no plasticity; fill material (SM). CLAYEY SAND: reddish brown; moist; about 55% fine to medium Sand; about 45% Fines; low plasticity; fill material (SC).		
3	4						Medium to high plasticity; at 4.3-5.0m.		
								%Recovery = 91 PID = 1.3 - 3.3ppm	
	0				-	СН	FAT CLAY with Sand: reddish brown; moist; about 15% fine Sand; about 85% Fines; high plasticity; residual soil; granite texture.		
-8	3	S4			-	ML	SILT with Sand: brown; molst; about 25% fine Sand; about 75% Fines; low plasticity; residual soil.		
						SC	CLAYEY SAND: reddish brown; moist; about 55% fine Sand; about 45% Fines; residual soil. Grayish brown silty sand soil at 8.8-9.0m.		
		•				ML.	Sand; about 80% Fines; medium plasticity; residual soil; granite texture. Brown sifty sand soil at 9.7-10.0m.		
1	U					SC	CLAYEY SAND: brown; moist; about 55% subangular fine to coarse Sand; about 45% Fines; medium plasticity; residual soil; granite texture.		
						SM	SILTY SAND: gray/sh brown; moist; about 70% subangular fine to coarse Sand; about 30% Fines; no plasticity; residual soil; granite texture.		

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LOCAT DATE S DRILLIN DRILLIN OVERB COORE GROUN	Of En CT: Pha ION: Ca STARTED NG METH NG AGEN URDEN	mp Carr. : IOD/EQU ICY: ICY: N: <u>3,983</u> R: <u>Gras</u>	<u>Soil San</u> oll 12 Au IPMEN B SS: 429.5 E s	ig <u>11</u> T: <u>BEC</u> EC E: <u>447,7</u>	FINISHED: 12 Aug 11 50PM-1 HOLE DIAMETER: 5.5 cm DEPTH DRILLED: 3.4 m 33.2 GROUND ELEV.: 51.93 m CONTAMINATION: 51.93 m		MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER GRAPHIC GRAPHIC	CONTAMINATED BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1			SM	SILTY SAND: brown; moist; about 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; residual soil; granite texture.	%Recovery = 100 PID = 4.6ppm FC = F3 %Recovery = 97 PID = 4.9 - 6.6ppm %Recovery = 36 PID = 3.6 - 5.4ppm	
EPOF-E	D-G				OFFICIAL USE ONLY		PAGE 1 of 1

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LOCAT	ECT: <u>P</u> TON: <u>9</u> START	Camp ED:	Carro	ll 05 Au	g 11	G&EE NO.: <u>11-032E</u> INS	SPECTOR:	esta destanges. Antista destanges
DRILLI OVERE COORI GROUI	NG AG BURDE DINATE ND CO'	ENCY N THI S: N:: /ER:	: CKNE: 3,983,4 Grass	<u>B</u> SS: 404.3 E	EC : 447,7	HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 7.9 m WA 702.2 GROUND ELEV.: 50.51 m DA CONTAMINATION:	TAL DEPTH: TER DEPTH: TUM: other <u>Direct push</u>	2.0 m; AD MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
50	S1 S2				FILL	SILTY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3.5cm); about 65% angular to subangular fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM); grass roots at 0-0.1m. Subangular fine gravel (max.1.5cm).	%Recovery = 96 PID = 1.2ppm FC = F3 %Recovery = 100 PID = 1.2 - 1.6ppm	
48	Y				СН	FAT CLAY: reddish brown; moist; about 10% fine Sand; about 90% Fines; medium plasticity; alluvial soil.	%Recovery = 100 PID = 2.8 - 3.4ppm	
474 4 46	53				CH	SANDY FAT CLAY: reddish brown; moist; about 30% fine Sand; about 70% Fines; medium plasticity; alluvial soil. SILT with Sand: yellowish red; moist; about 25% fine Sand; about 75% Fines; no to low plasticity; residual soil; granite texture.		
5 6 47	S4				SM	<u>SILTY SAND</u> : brown; moist; about 60% fine to medium Sand; about 40% Fines; residual soil; granite texture.	%Recovery = 100 PID = 1.2 - 5.3ppm	
43						Hard pushing of sampler at 7.7-7.9m; HDP (Hydraulic Down Pressure) = 1300 psi. Penetration refusal depth = 7.9m (Penetration speed = 2cm / 5min).		

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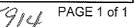
	IS Army of Engin	/ Corp eers	S		EXPLORATIO HOLE NO. E1			r East 💮
OVERBURI COORDINA GROUND (: <u>Camp</u> RTED: METHOE AGENCY DEN THI ATES: N: COVER:	Carro)/EQUI ': CKNES 3,983,4 Grass	11 05 Au PMEN ⁻ B SS: 412.4 E	ig <u>11</u> T: <u>BEC</u> EC E: <u>447,</u> 7	FINISHED: 50PM-2 HOLE DIAMETE DEPTH DRILLEI 742.7 GROUND ELEV CONTAMINATIC	05 Aug 11 R: <u>5.5 cm</u> D: <u>1.52 m</u> .: <u>52.02 m</u> DN:	_ WATER DEPTH: _ DATUM:	No water; AD MSL
ELEVATION / CEPTH (meters) SAMPLE TYPE / NUMADED] Piezom	SPT N-VALUE	USCS / DIRCS /	Itoring Well Test Pit DESCRIPTION O	Auger Hole	FIELD DATA	LAB DATA
52				FILL	SILTY SAND with Gravet: brown subangular fine to coarse gravel subangular to angular fine to coa no plasticity; fill material (SM); gr	(max.3.3cm); about 65 rse Sand; about 20% F	% Recovery = 100 PiD = 1.8ppm FC = F3 %Recovery = 100 PiD = 2.6 - 4.2ppm	
51— ^{—1} s2				SM	<u>SILTY SAND</u> : light brown; moist if fine to coarse Sand; about 20% F texture. Hard pushing of sampler at 1.2-1 Pressure) = 1300 psi.	ines; residual soil; grar	ite	
f.					Penetration refusal depth = 1.52r 2.5min).	n (Penetration speed =	1cm /	



PRO	DJE	CT:	Phase	II Sit	e Soil Sa	mnling			
LOC DAT	CATI TE S	ON: TAR	<u>Cam</u> TED:	p Car	roll 10 Au	ug 11	G&EE NO.: <u>11-032E</u> IN	SPECTOR:	n dag og skyrte som en som e Som en som en
DRI OVE COC	LLIN ERBI DRD	ig a Urd Vinat	GENC EN TH 'ES: N	Y: HCKN ↓: <u>3,98</u>	ESS:	BEC E: <u>447,</u>	HOLE DIAMETER: 5.5 cm TC DEPTH DRILLED: 10.95 m W/ 724.0 GROUND ELEV.: 50.76 m DA CONTAMINATION:	ATER DEPTH:	10.95 m 8.25 m; AD MSL
TYP	ΈO	F HC	DLE:	□ Piez	ometer	Mor		other <u>Direct push sa</u>	mpling hole
ELEVATION / DEPTH	(meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG	CONTAMINATED BLOW COUNT	SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	-0	S 1				FILL	SILTY SAND with Gravel: brown; dry to moist; about 30% subangular fine to coarse gravel (max.3.5cm); about 55%	%Recovery = 100 PID = 8.3ppm	
io—		S2				FILL	angular to subangular fine to coarse Sand; about 15% Fines; no plasticity; fill material (SM). <u>SILTY SAND</u> : light brown; moist; about 80% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM).	FC = F3 %Recovery = 100 PiD = 5.1 - 13.7ppm FC = F3	
	2 -						Grayish brown.	%Recovery = 100 PID = 5.7 - 13.8ppm	
8	4	\$3				FILL FILL SC	CLAYEY SAND: brown; moist; about 55% subangular fine to medium Sand; about 45% Fines; medium plasticity; fill material (SC); at 2.7-2.8m. SILTY SAND: light brown; about 80% fine to coarse Sand; about 20% Fines; fill material (SM); at 2.8-3.1m. CLAYEY SAND: reddish brown; moist; about 65% fine Sand; about 35% Fines; low to medium plasticity; residual soil; granite texture.		
	5						Brown to grayish brown; subangular fine to medium Sand; low plasticity.	%Recovery = 94 PID = 8.2 - 17.4ppm	
		84				SM	<u>SILTY SAND</u> : brown; moist; about 70% fine to medium Sand; about 30% Fines; no plasticity; residual soil; w/rock fragments (5mm), granite texture. Light brown.		
}{	3	Ţ					Granite texture.		
							More silty soil at 9-10m.		
-1	0					SC	<u>CLAYEY SAND</u> : brown; wet to moist; about 65% subangular fine to coarse Sand; about 35% Fines; low plasticity; residual soil.		
Η			ÉÉ			SM	SILTY SAND: light brown; about 55% fine to coarse Sand; about 45% Fines; residual soil; dense.		

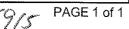


		Engir				HOLE NO. E11-164		strict
DATE S DRILLII DRILLII OVERE COORI	ION: STAR NG M NG AO URD DINAT	Camp TED: ETHOI GENC` EN TH ES: N DVER:	D/EQUI 7: ICKNE 3,983, Grass	II <u>11 Au</u> PMEN ⁻ <u>B</u> SS: <u>348.6</u> E	g 11 F: <u>BE(</u> EC :: 447,'	G&EE NO.: 11-032E INS FINISHED: 11 Aug 11 DR C50PM-2 0 0 HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 11.0 m WA 726.8 GROUND ELEV.: 50.63 m DA CONTAMINATION: Yes Yes Yes	SPECTOR: ILLER: TAL DEPTH: TER DEPTH: Ca TUM: 	<u>wed (8.2m); A</u> D MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
0-	51 52				FILL	SILTY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3.5cm); about 70% subangular fine to coarse Sand; about 20% Fines; no plasticity; filt material (SM); Grass roots at 0-0.05m. SILTY SAND with Gravel: about 15% subangular fine to coarse gravel (max.2.5cm); about 65% subangular fine to coarse Sand; about 20% Fines,	%Recovery = 100 PID = 2ppm FC = F3 %Recovery = 87 PID = 0.6 - 0.9ppm	
2	53				FILL	SILTY SAND: about 5% subangular fine to coarse gravel; about 70% subangular fine to coarse Sand; about 25% Fines. CLAYEY SAND: reddish brown; moist; about 65% fine to medium Sand; about 35% Fines; low plasticity; fill material (SC). SILTY SAND: gravish brown; moist; about 75% subangular fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM). CLAYEY SAND: reddish brown; about 65% fine to medium Sand; about 35% Fines. SILTY SAND: gravish brown; about 75% subangular fine to coarse Sand; about 25% Fines.	%Recovery = 95 PID = 0 - 0.9ppm	
3					sw	Brownish gray. <u>Well-graded SAND</u> : bluish gray; moist to wel; about 95% subangular fine to coarse Sand; about 5% Fines; no plasticity;	%Recovery = 79 PID = 4.2 - 50.8ppm	
6					SC SM	alluvial soil; weak solvent odor. 5.0 to 5.6m; PID ≈ 50.8 ppm. CLAYEY SAND: brown; molst; about 10% subangular fine to coarse gravel; about 60% subangular to angular fine to coarse Sand; about 30% Fines; low plasticity; alluvial soil. SILTY SAND: dark brown to brown; moist; about 75% subangular fine to coarse Sand; about 25% Fines; no plasticity; alluvial soil.		
8	S4				SC ML	CLAYEY SAND: brown to reddish brown; moist; about 5% subrounded fine gravel; about 50% fine Sand; about 45% Fines; medium plasticity; alluvial soil. SANDY SILT: brown mottled with white; about 40% angular to subangular fine Sand; about 60% Fines; low plasticity;		
10					SM ML	residual soil; granite texture. <u>SILTY SAND</u> : yellowish brown to brown; moist; about 65% angular to subangular fine Sand; about 35% Fines; residual soil; granite texture. <u>SANDY SILT</u> : brown mottled with white; about 40%; about 60% Fines; residual soil; End of direct push sampling at		
				-		11.0m. Confirmed depths of FILL MATERIAL \approx 0 -5 m, ALLUVIAL SOILS \approx 5 - 8.4m, and RESIDUAL SOIL \approx 8.4 - 11.0m.		



		Engir		Soil Sai	nnling	HOLE NO. E11-165		strict
LOCA DATE	FION: STAR	<u>Camr</u> TED:) Carro	oll 06 Au	g 11	G&EE NO.: 11-032E INS	SPECTOR:	
OVERI COOR GROU	BURD DINAT ND CO	EN TH 'ES: N DVER:	: <u>3,983,</u> <u>Grass</u>	SS:	: 447,	DEPTH DRILLED: <u>11.0 m</u> WA 705.6 GROUND ELEV.: <u>49.64 m</u> DA CONTAMINATION:		11.0 m aved (3.4m); AD MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	I	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
-0	\$1				FILL	SILTY SAND with Gravel: brown to light brown; moist; about 20% subangular fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 20% Fines; no plasticity; fill material (SM). More gravels at 0.5-1m = gravel (35%), sand(45%), fine(20%).	%Recovery = 100 PID = 4.2ppm FC = F3 %Recovery = 93 PID = 2.3 - 5.8ppm FC = F3	
82	S2					Brown; about 15% fine to coarse gravel (max.4cm); about 60% fine to coarse Sand; about 25% Fines; asphalt pavement scrap at 2.3m and 2.7m; PID =17.2 ppm at 2-3m.	%Recovery = 96 PID = 8.0 - 17.2ppm	
34	53							
i6			• • • • • • • • • • • • • • • • • • •		SC SM	About 20% subangular fine to coarse gravel; about 60% subangular fine to coarse Sand; about 20% Fines. <u>CLAYEY SAND</u> : brown; moist; about 55% fine Sand; about 45% Fines; low plasticity; altruial soil. <u>SILTY SAND with Gravel</u> : brown; moist; about 20% subangular to subrounded fine to coarse gravel (max.3.5cm); about 60% angular fine to coarse Sand; about 20% Fines; no	%Recovery = 86 PID = 5.6 - 10.6ppm	
	∑ 84				SC	plasticity; alluvial soil; PID =10.6 ppm at 6-7m. <u>CLAYEY SAND</u> : brown; moist; about 55% fine Sand; about 45% Fines; low plasticity; alluvial soil.		
8					СН	FAT CLAY: dark greenish gray grades to brown; moist; about 5% subangular to subrounded fine gravel (max.2cm); about 5% fine Sand; about 90% Fines; high plasticity; alluvial soil; PID in hole = 3.7m.		
					ML	<u>SILT with Sand</u> : brown; moist; about 20% fine Sand; about 80% Fines; low plasticity; residual soil; granite texture.		
	ŀ				SM	SILTY SAND: brown; moist; about 70% fine to coarse Sand;		

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DRILLI DRILLI OVERE COORI GROUI	ng Mi Ng Aq Burdi Dinat Nd Co	ETHOI GENCY EN TH ES: N: VER:	D/EQUI /: ICKNE: : <u>3,983,</u> 4	<u>B</u> SS: 422.0 E and cem	F: <u>BEC</u> EC :: <u>447,8</u> :: <u>ent co</u>	DEPTH DRILLED:2.7 m	DRILLER:	No water; AD MSL
ELEVATION / CEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	51				PCC FILL SM	Portland cement concrete pavement thickness = 15cm. Poorly-graded GRAVEL with Sand: fill material (GP); base course material. SILTY SAND: brown; moist; about 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; residual soil; granite texture. Hard pushing of sampler at 2.4-2.7m; HDP (Hydraulic Down Pressure) = 1000 psi.	%Recovery = 100 PID = 5.2ppm FC = F3 %Recovery = 92 PID = 3.2 - 4.2ppm	
						Penetration refusal depth = 2.7m (Penetration speed = 2cm 1min).	/	

LC	CAT	ION:	<u>Cam</u>	p Carro	<u>Soil Sai</u> oll		G&EE NO.: <u>11-032E</u> IN	SPECTOR:		
				D/EQU	UT AU	<u>g 11</u> T: <u>BE</u> C		ORILLER:		
0\ 0\	/ERE	URD DINA1	EN TH 'ES: N	IICKNE : <u>3,983,</u>	SS: <u> </u>	: 447,	DEPTH DRILLED: <u>5.55 m</u> W/ 845.9 GROUND ELEV.: <u>55.98 m</u> DA	TAL DEPTH: ATER DEPTH: TUM:	5.03 m; AD	
					neter			other <u>Direct push</u> s	sampling hole	
ELEVATION /	UEP (H (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA	
		sı				FILL	CLAYEY SAND: reddish brown; moist; about 5% subangular fine gravel (max.2cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC).	%Recovery = 100 PID = 2.5ppm FC = F3		
55	1	52				FILL	SILTY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 3.5 - 4.0ppm FC = F3		
54	2					СН	SANDY FAT CLAY: dark brown; moist; about 40% subangular fine to medium Sand (max.2mm); about 60% _Fines; high plasticity; alluvial soil.	%Recovery ≈ 93		
-	-						FAT CLAY with Sand: brown; moist; about 20% subangular fine to medium Sand (max.2mm); about 80% Fines; high plasticity; alluvial soil.	PID = 4.1 - 9.8ppm		
53	3					SC	CLAYEY SAND: dark brown; moist; about 2% subangular fine gravel (max.1cm); about 63% subangular fine to medium Sand (max.2mm); about 35% Fines; medium plasticity; alluvial soil. Brown.			
52	4	S3				SM	SILTY SAND: brown; moist; about 75% subangular fine to			
 51	5	¥					coarse Sand (max.4.8mm); about 25% Fines; no plasticity; residual soil; granite texture.			
							Hard pushing of sampler at 5.3-5.55m; HDP (Hydraulic Down Pressure) = 1000 psi.			

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32E INSPECTOR: ig 11 DRILLER: 5.5 cm TOTAL DEPTH: 3.0 m WATER DEPTH: 2.19 m DATUM: MSL
IALS FIELD DATA LAB DATA
10% subangular %Recovery = 100 lar fine to coarse PID = 1.8ppm lasticity; fill material FC = F3
We covery = 97 PID = 2.9 - 3.8ppm FC = F3
on speed = 1cm /

ENVIRO-EXPLORATION LOG 11-0326-PHASE2-FINAL.GPJ USACE SKOREA.GDT 8/22/11

		Engin		~		HOLE NO. ${f E}$	11-169	<u> </u>	District
PROJE LOCAT DATE S DRILLI	'ION: STAR	Camp TED:	Carro	<u>ll</u> 09 Au	g 11	G&EE NO.: FINISHED: C50PM-1	11-032E 09 Aug 11	INSPECTOR:	
GROUN	SURDI DINAT	EN THI ES: N: DVER:	CKNE: <u>3,983,4</u> Dirt	SS: 405.3 E	: 447,7	DEPTH DRILLE 789.7 GROUND ELEN CONTAMINATI	ED: <u>1.8 m</u> /.: <u>52.63 m</u> ON:	WATER DEPTH:	1.8 m NA MSL
TYPE C	of Ho] Piezon	neter	Moni	itoring Well Test Pit	Auger Hole	X other <u>Direct push</u>	sampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION	OF MATERIALS	FIELD DATA	LAB DATA
0	S1				FILL	SILTY SAND: brown; moist; ab coarse gravel (max.5cm); abou coarse Sand (max.4.8mm); abo material (SM).	65% subangular fine to	PID = 2.3ppm	
52-						About 10% subangular fine grav subangular fine to coarse Sand Fines.	rel (max.2cm); about 65% (max.4.8mm); about 25%	% %Recovery = 100 % PiD = 2.4 - 3.0ppm	
-1	52				SM	SILTY SAND: brown; moist; abd coarse Sand (max.4.8mm); abo residual soil; granite texture.	out 75% subangular fine ut 25% Fines; no plastici	FC = F3	
51						Hard pushing of sampler at 1.7- Pressure) = 1000 psi.	1.8m; HDP (Hydraulic Do	חאינ	

CEPOF-ED-G

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PROJE LOCAT DATE S	ION:	<u>Camp</u> ED:	Carro	<u>ll</u> 07 Au	g 11	G&EE NO.: <u>11-032E</u> FINISHED: <u>07 Aug 11</u> C50PM-1	INSPECTOR:	
DRILLII OVERB COORE	NG AG URDE DINATE	ENCY N THI ES: N:	/: CKNE\$ 3,983, ;	<u>B</u> SS: 393.3 E	EC	HOLE DIAMETER: <u>5.5 cm</u> DEPTH DRILLED: <u>7.5 m</u> B08.9 GROUND ELEV.: <u>53.73 m</u> m) CONTAMINATION:	WATER DEPTH:	1.8 m; AD
TYPE C				neter	Mon	itoring Well Test Pit Auger Hole	X other <u>Direct push s</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	51 52 Y 53				FILL FILL FILL FILL	 SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity material (SM). Poorly-graded SAND: yellowish brown; moist; about 5% Fine plasticity; fill material (SP). Poorly-graded GRAVEL with Sand: gray; wet; about 70% rounded fine to coarse gravel (max.3cm); about 25% subangular coarse Sand (max.4.8mm); about 5% Fines; n plasticity; fill material (GP). FAT CLAY: reddish brown; moist; about 10% fine Sand (max.0.43mm); about 90% Fines; high plasticity; fill material (GP). FAT CLAY: reddish brown; moist; about 10% fine Sand (max.0.43mm); about 90% Fines; high plasticity; fill material (CH). CLAYEY SAND: brown to reddish brown; moist; subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC); PID = 46.7 ppm at 1-1.3m. CLAYEY SAND: gray; moist; about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; alluvial soil; with organics. SANDY LEAN CLAY: dark brown; moist; about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; alluvial soil. SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil; granite texture. 	r, fill PID = 18.5ppm FC = F3 FC = NFS WRecovery = 77 PID = 24.7 - 46.7ppm FC = NFS FC = F3 al FC = F3 FC = F3 FC = F3 FC = F3 PID = 31.2 - 36.8ppm PD = 31.2 - 36.8ppm PID = 18.6 - 25.9ppm	

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LOCA [.] DATE	FION: STAR	<u>Camp</u> TED:	Carro	oll 09 Au	npling g 11 T· BEC	G&EE NO.: 11-032E INS		
DRILL OVER COOR GROU	NG A BURD DINA ⁻ ND CO	GENC) EN THI FES: N: DVER:	/: CKNE 3 <u>,983,</u> <u>Dirt</u>	<u> </u>	EC E: <u>447,7</u>	HOLE DIAMETER: <u>5.5 cm</u> TO DEPTH DRILLED: <u>6.5 m</u> WA GROUND ELEV.: <u>52.11 m</u> DA CONTAMINATION:	TAL DEPTH: TER DEPTH: TUM: other <u>Direct push</u>	
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	CRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT SPT M-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
520	S1				FILL	CLAYEY SAND: dark brown; wet; about 10% subangular fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC). Greenish gray to brown; moist.	%Recovery = 30 PID = 1.8ppm FC = F3 %Recovery = 45 PID = 2.5 - 3.9ppm	
511	S2					Brown; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no gravels.		
502					FILL	SILTY SAND with Gravel: grayish brown; moist; about 20% subangular fine gravel (max.2cm); about 55% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM); with waste materials (plywood, scraps of porcelain).	%Recovery = 52 PID = 1.4 - 6.5ppm	
49					FILL	CLAYEY SAND with Gravel: gray to brown; moist; about 25% subangular fine to coarse gravel (max.5cm); about 50% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; medium plasticity; fill material (SC); with waste materials (scraps of sand bag).		
8	53				SM	SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil; disturbed granite texture at 4.2m to 4.7m.		
75								
IG6						Hard pushing of sampler at 6.3-6.5m; HDP (Hydraulic Down Pressure) = 1000 psi.		



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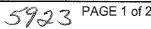
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×4

	TION: STAR	<u>Camr</u> TED:) Carro		g 11	G&EE NO.: <u>11-032E</u> INS	SPECTOR:	
OVERI COORI GROUI	BURD DINAT ND CO	EN TH ES: N DVER:	ICKNE 3,983, Dirt	SS: <u>357.0</u> E	: <u>447,</u>	DEPTH DRILLED: 8.7 m WA 767.7 GROUND ELEV.: 51.11 m DA CONTAMINATION:	TAL DEPTH: ATER DEPTH: TUM:	MSL
	T	1	Piezor	neter		itoring Well	other <u>Direct push s</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	51				FILL FILL FILL	SILTY SAND with Gravel: gravish brown; moist; about 30% subangular fine to coarse gravel (max.3cm); about 50% subangular fine to coarse Sand (max.4.8mm); about 20% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 2.5ppm FC = F3 FC = NFS	
	52				FILL	Poorly-graded SAND with Silt: brown; moist; about 90% subangular fine to medium Sand (max.2mm); about 10% Fines; no plasticity; fill material (SP-SM). CLAYEY SAND: reddish brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC). Encountered silty sand layer at 0.5m to 0.7m. SILTY SAND: brown; moist; about 70% subangular fine to	FC = F3 %Recovery = 92 PID = 1.0 - 2.6ppm	
	¥					About 10% subangular fine to coarse gravel (max.3cm); about	%Recovery = 86 PID = 5.1 - 8.2ppm	
	S3				FILL	60% subangular fine to coarse graver (max.3cm), about 60% subangular fine to coarse Sand (max.4.8mm); about 30% Fines, <u>CLAYEY SAND</u> : brown; moist; about 5% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC).		
5			1	-	СН	SANDY FAT CLAY: gray to brown; moist; about 3% subangular fine gravel (max.1cm); about 37% subangular fine to coarse Sand (max.4.8mm); about 60% Fines; high		
-					ML	plasticity: alluvial soit; with organics. <u>SANDY SILT</u> : reddish brown; moist; about 40% subangular fine to medium Sand (max.2mm); about 60% Fines; medium plasticity; residual soil.	"&Recovery = 90 PID = 0.3 - 5.0ppm	
					SM	SILTY SAND: brown; moist; about 60% subangular fine to medium Sand (max.2mm); about 40% Fines; no to medium plasticity; residual soil; granite texture.		
	S4					About 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity.		
						Hard pushing of sampler at 8.5-8.7m; HDP (Hydraulic Down Pressure) = 1000 psi. Penetration refusal depth = 8.7m (Penetration speed = 5cm /		



<u>Ulania</u>	UT UT	⊏ngır	neers			HOLE NO. E11-173	D	istrict
LOCA DATE DRILL DRILL OVER COOR GROU	FION: STAR NG MI NG AC BURDI DINAT ND CC	Camp FED: ETHOI GENC EN TH ES: N VER:	Y: ICKNE: : 3 ,983, :	II 10 Au IPMEN' B SS: 363.9 E Inside I	g 11 T: <u>BE(</u> EC E: <u>447</u> , and fa	G&EE NO.: 11-032E INS FINISHED: 10 Aug 11 DR C50PM-1 0 0 0 HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 10.0 m WA 811.9 GROUND ELEV.: 53.53 m DA 'm) CONTAMINATION:	SPECTOR: ILLER: TAL DEPTH: TER DEPTH: TUM: Other Direct push s	NA MSL
ELEVATION / CEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1				FILL FILL FILL FILL FILL	 SANDY LEAN CLAY: gray; wet; about 5% subangular fine gravel (max.2cm); about 30% subangular fine to coarse Sand (max.4.8mm); about 65% Fines; medium plasticity; fill material (CL). Poorly-graded SAND: brown; wet; about 95% subangular fine to coarse Sand (max.4.8mm); about 5% Fines; no plasticity; fill material (SP). Poorly-graded GRAVEL with Sand: grayish brown; wet; about 70% subangular fine to coarse gravel (max.3cm); about 25% subangular fine to coarse gravel (max.3cm); about 25% subangular fine to coarse gravel (max.3cm); about 25% subangular fine to coarse gravel (max.3cm); about 5% Fines; no plasticity; fill material (GP). FAT CLAY: reddish brown; moist; about 3% subangular fine gravel (max.2cm); about 7% subangular fine to medium Sand (max.2mm); about 90% Fines; no gravels. SiLTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM). CLAYEY SAND: reddish brown; moist; about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SC). SiLTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; medium plasticity; fill material (SC). SiLTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SC). SiLTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM). About 5% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM). About 5% subangular fine to coarse Sand (max.4.8mm); about 30% Fines. SiLTY SAND: brown; moist; about 70% subangular fine gravel (max.2cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines. 	%Recovery = 100 PID = 7.4ppm FC = F3 FC = NFS FC = NFS %Recovery = 93 PID = 3.2 - 4.2ppm FC = F3 %Recovery = 88 PID = 4.8 - 5.6ppm	
5					CL SP-SM SC	SANDY LEAN CLAY: grayish brown; moist to wet; about 40% subangular fine to medium Sand (max.2mm); about 60% Fines; medium plasticity; alluvial soil. Poorly-graded SAND with Silt: grayish brown; wet; about 90% subangular fine to coarse Sand (max.4.8mm); about 10% c	%Recovery = 81 PID = 4.7 - 15.3ppm	



DRILLI DVERE	BURDEN	ICY: THICKN	BIESS:	EC	HOLE DIAMETER: <u>5.5 cm</u> TO ⁻ DEPTH DRILLED: <u>10.0 m</u> WA	TAL DEPTH: TER DEPTH: _ TUM:	NA
GROUI		R: <u>Dir</u>	t (Inside l	and far	m) CONTAMINATION:	other _Direct push sa	
ELEVA!ION / DEPTH (meters)	SAMPLE TYPE / NUMBER GRAPHIC GRAPHIC	CONTAMINATED BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
7					CLAYEY SAND: dark brown; wet; about 60% subangular fine to coarse Sand (max.4.8mm); about 40% Fines; medium plasticity; alluvial soil. Brown; about 3% subangular fine gravel (max.1cm); about 67% subangular fine to coarse Sand (max.4.8mm); about 30% Fines.		
7	54				Light gray to brown; moist; about 60% subangular fine to medium Sand (max.2mm); about 40% Fines; high plasticity.		
8				CH SC	EAT CLAY: grayish brown; moist; about 5% fine Sand (max.0.43mm); about 95% Fines; high plasticity; alluvial soil. CLAYEY SAND: brown to grayish brown; moist; about 5% subangular fine gravel (max.2cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; high plasticity; alluvial soil.		
9					Light gray to brown; moist; about 2% subangular fine gravel (max.1cm); about 63% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; high plasticity.		
				SM	SILTY SAND: brown; moist; about 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; residual soil; granite texture. Hard pushing of sampler at 9.9-10.0m; HDP (Hydraulic Down Pressure) = 1000 psi. Penetration refusal depth = 10.0m (Penetration speed = 1.5cm / 1min).		

PROJE								Sector Sciences
DATE S	ION: STAR	<u>Cam</u> TED:	<u>) Carro</u>	08 Au	g 11		ISPECTOR:	
DRILLI	NG M	ETHO	D/EQU	IPMEN ⁻	T: <u>BE</u>	C50PM-1		
DRILLI		JENC	Y:	B	EC	HOLE DIAMETER: <u>5.5 cm</u> TC	DTAL DEPTH:	
OVERE COORE	DINAT	EN IN ES: N	:3.983.	366.3 E	447.	DEPTH DRILLED: <u>8.9 m</u> W 839.1 GROUND ELEV.: <u>54.98 m</u> D/	ATER DEPTH: _ ATUM:	<u>1.92 m; AD</u> MSL
GROUN		OVER:	<u>Portla</u>	and cen	ient co	ncrete (DONEAMINATION:		
TYPE C	DF HC	LE: (□ Piezor	neter	Mor	itoring Well 🔲 Test Pit 🔲 Auger Hole 🛛 🗙	other <u>Direct push sa</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
۳.		न्य-त			PCC	Portland cement concrete pavement thickness = 20cm,		
					FILL	Poorly-graded GRAVEL with Sand: fill material (GP); base	/ %Recovery = 80	
ſ	S1					CLAYEY SAND: grayish brown to reddish brown; moist; about 10% subangular fine to coarse gravel (max.4cm); about	PID = 11.6ppm FC = F3	
i41					FILL	60% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC).	/ %Recovery = 90 PiD = 3.6 - 11.7ppm	
						SILTY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 60% subangular fine to	FC = F3	
	52 					coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM).		
32	Ŧ					About 5% subangular fine gravel (max.2cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 30%		
					FILL.	Fines; encountered clayey sand layer at 1.7m to 1.8m. CLAYEY SAND: brown; moist to wet; about 70% subangular	%Recovery = 85	
					FILL	fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC); wet zone ≈ 2.8m.	PID = 2.4 - 3.5ppm	
23	ĺ					SILTY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material		
-						(max.4.onim), about 25% rines; no plasticity; fill material (SM). About 5% subangular fine gravel (max.1cm); about 70%		
	S 3					subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered clayey sand layer at 3.9m to 4.0m.		
14						· · · · · · · · · · · · · · · · · · ·		
+					FILL	CLAYEY SAND: greenish gray to brown; moist; about 3% subangular fine gravel (max.1cm); about 62% subangular fine		
	XX	¥¥			SC	to coarse Sand (max.4.8mm); about 35% Fines; medium \plasticity; fill material (SC).	7	
>5					СН	CLAYEY SAND: greenish gray; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30%	Γ	
+				Ī	SC	Fines; medium plasticity; alluvial soil.	%Recovery = 42 PID = 3.7 - 6.2ppm	
	2. X. X					subangular fine to medium Sand (max.2mm); about 70% Fines; high plasticity; alluvial soil.		
						CLAYEY SAND: dark brown; moist; about 65% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; medium		
+						plasticity; alluvial soil.		
7								
	S4							
+					CL	SANDY.LEAN CLAY: brown; moist; about 30% subangular fine to medium Sand (max.2mm); about 70% Fines; medium plasticity; alluvial soil.		
8				-	SM	SILTY SAND: brown; moist; about 70% subangular fine to	-	
						coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil; granite texture.		
+						Hard pushing of sampler at 8,7-8.9m; HDP (Hydraulic Down Pressure) ≈ 1000 psi.		
· •	L	المتلاملة.	I			Penetration refusal depth = 8.9m (Penetration speed = 2cm /	<u> </u>	

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PROJE LOCAT DATE \$	ION:	Camp TED:	Carro	ll 10 Au	g 11	G&EE NO.: <u>11-032E</u> INS FINISHED: <u>10 Aug 11</u> DR	SPECTOR: _	
DRILLI DRILLI OVERE COORI	NG M NG A BURDI DINAT ND CC	ETHOE GENCY EN THI ES: N: DVER:)/EQUI 7: CKNE 3,983,7 <u>Grass</u>	PMEN B SS: <u>346.8</u> E	Г: <u>ВЕС</u> ЕС :: <u>447,7</u>	C50PM-2 HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 7.25 m WA 784.2 GROUND ELEV.: 51.07 m DA CONTAMINATION:	TAL DEPTH:	MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1 S2				Fill	SILTY SAND: brown grades to brownish gray; moist; about 5% subangular to subrounded fine gravel (max.2cm); about 75% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 6.0ppm FC = F3 %Recovery = 85 PID = 8.4 - 10.0ppm	
492					FILL	More gravels at 2,0-2,4m. <u>CLAYEY SAND</u> : brown to reddish brown; moist; about 60% subangular fine to coarse Sand; about 40% Fines; medium plasticity; fill material (SC). <u>SILTY SAND</u> : brownish gray; moist to wet; about 80% subangular to angular fine to coarse Sand; about 20% Fines;	%Recovery = 89 PID = 6.3 - 12.6ppm	
4 474	S3				FILL	Subargular to angular inte to Coarse Sand, about 20% Fines, no plasticity; fill material (SM). CLAYEY SAND: brown; moist; about 65% angular to subangular fine to coarse Sand; about 35% Fines; low to medium plasticity; fill material (SC). SANDY FAT CLAY: dark greenish gray; moist; about 30% fine to medium Sand; about 70% Fines; medium to high		
465						plasticity; alluvial soil. Brownish gray grades to light gray; moist; angular to subangular fine to coarse Sand.	%Recovery = 76 PID = 6.6 - 9.4ppm	
15 ⁶	54				SC	CLAYEY SAND: yellowish brown; moist; about 60% subangular fine to coarse Sand; about 40% Fines; low plasticity; alluvial soil. SILTY SAND: light brown to brown; moist; about 70%		
447						angular fine to coarse Sand; about 30% Fines; no plasticity; residual soil; granite texture. Hard pushing of sampler at 7.1-7.25m; HDP (Hydraulic Down Pressure) = 1500 psi. Penetration refusal depth = 7.25m (Penetration speed = 1.2cm / 1min).		

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	S Army C Enginee	Corps ers		EXPLORATION LOG HOLE NO. E11-176		East istrict
OVERBURD COORDINA	Camp C TED: IETHOD/E GENCY: EN THICH TES: N: 3, OVER: D	arroll 10 A QUIPMEN MESS:	ug 11 IT: <u>BEC</u> BEC E: <u>447,8</u> land far	G&EE NO.: <u>11-032E</u> FINISHED: <u>10 Aug 11</u> 50PM-1 HOLE DIAMETER: <u>5.5 cm</u> DEPTH DRILLED: <u>10.0 m</u>	INSPECTOR: DRILLER: TOTAL DEPTH: WATER DEPTH: DATUM: X other <u>Direct push s</u>	MSL
ELEVALION/ DEPTH (meters) SAMPLE TYPE/ NJMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
1 S1 1 S2 1 S2 2			FILL FILL	 CLAYEY SAND: gray; wet; about 10% subangular fine grav (max.2cm); about 35% Fines; medium plasticity; fill mate (SC). Poorly-graded SAND: brown; wet; about 95% subangular fine to coarse Sand (max.4.8mm); about 5% Fines; no plasticity; fill material (SP). Poorly-graded GRAVEL with Sand: grayish brown; wet; about 70% subangular fine to coarse gravel (max.3cm); about 25% subangular fine to coarse Sand (max.4.8mm); about 52 Fines; no plasticity; fill material (GP). EAT CLAY: reddish brown; moist; about 90% Fines; high plastic fill material (CH). SILTY SAND: brown; moist; about 5% subangular fine grav (max.2cm); about 65% subangular fine to coarse Sand (max.2cm); about 65% subangular fine to coarse Sand (max.2cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM). EAT CLAY with Sand: reddish brown; moist; about 20% subangular fine to medium Sand (max.2mm); about 80% Fines; high plasticity; fill material (CH). SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM). EAT CLAY with Sand: reddish brown; moist; about 20% subangular fine to medium Sand (max.2mm); about 80% Fines; high plasticity; fill material (CH). SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM); encountered clayey layer(2cm). About 10% subangular fine to coarse Sand (max.4.8mm); about 25 Fines. CLAYEY SAND: brown; moist; about 10% subangular fine gravel (max.2cm); about 65% subangular fine to coarse San (max.4.8mm); about 25% Fines; medium plasticity; fill materia (SC). 	PID = 4ppm FC = F3 FC = NFS %Recovery = 80 PID = 2.9 - 3.2ppm FC = NFS FC = F3 %Recovery = 59 PID = 4.6 - 10.1ppm PID = 4.6 - 10.1ppm	

		Army Engine		S		EXPLORATION LOG HOLE NO. E11-176		East istrict
DRILLI OVERE	TON: START NG ME NG AG SURDE DINATI ND CO	Camp ED: ETHOD ENCY: EN THIC ES: N: . VER:	Carro /EQUI : : : : : : : : : : : : : : : : : : :	10 Au PMENT B SS: 341.6 E (nside l	g 11 : <u>BEC</u> EC : <u>447,8</u> and far	G&EE NO.: 11-032E FINISHED: 10 Aug 11 :50PM-1	INSPECTOR: DRILLER: TOTAL DEPTH: WATER DEPTH: DATUM: X other _ <u>Direct push s</u>	10.0 m NA MSL ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NJMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	54				SC CL SC CH CH SC	CLAYEY SAND: gray; moist; about 65% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; medium plasticity; alluvial soil. LEAN CLAY: grayish brown; moist; about 5% fine Sand (max.0.43mm); about 95% Fines; medium plasticity; alluvia soil. CLAYEY SAND: dark brown; moist to wet; about 65% subangular fine to medium Sand (max.2mm); about 35% Fines; medium plasticity; alluvial soil. EAT CLAY: dark brown; moist; about 5% fine Sand (max.0.43mm); about 95% Fines; high plasticity; alluvial so Gray. About 10% fine Sand (max.0.43mm); about 90% Fines. CLAYEY SAND: light gray; moist; subangular fine to coars gravel (max.3cm); about 60% subangular fine to coarse Sa (max.4.8mm); about 40% Fines; high plasticity; alluvial soil SANDY FAT CLAY: gray; moist to wet; about 30% subangular fine to medium Sand (max.2mm); about 70% Fines; high plasticity; alluvial soil.	e nd	
[subangular fine gravel (max.2cm); about 75% subangular fi to coarse Sand (max.4.8mm); about 20% Fines; no plastici alluvial soil. Hard pushing of sampler at 9.9-10.0m; HDP (Hydraulic Do Pressure) = 1000 psi. Penetration refusal depth = 10.0m (Penetration speed = 86 Imin).	ty: wn	

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LOCAT	TION: STAR	<u>Cam</u> TED:	<u>II Site</u> p Carro	oll 08 Au	ıg 11	G&EE NO.: <u>11-032E</u> INS FINISHED: <u>08 Aug 11</u> DR	SPECTOR:	
DRILLI OVERE COORI GROUI	NG A BURD DINA ⁻ ND Co	GENC EN TH FES: N OVER:	Y: HCKNE I: 3,983,	<u>B</u> SS: <u>340.9</u> E and cen	EC E: <u>447,</u> nent co	DEPTH DRILLED: <u>9.0 m</u> WA 834.7 GROUND ELEV.: <u>54.71 m</u> DA ncrete (DGNTEAMINIA THON:	TAL DEPTH:	9.0 m 0.2 m; AD MSL
ELEVATION / DEPTH Imeters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1				PCC FILL FILL	Portland cement concrete pavement thickness = 20cm. Poorly-graded GRAVEL with Sand: fill material (GP); base course material. CLAYEY SAND: greenish gray; moist; about 5% subangular fine to coarse gravel (max.3cm); about 70% subangular fine to	%Recovery = 70 PID == 4.1ppm FC = F3	
3	52				FILL	coarse Sand (max.4.8mm); about 25% Fines; medium plasticity; fill material (SC). <u>SILTY SAND</u> : brown; moist; about 5% subangular fine gravef (max.4.8mm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM). About 5% subangular fine gravef (max.1cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; encountered clayey sand layer at 2.2m to 2.3m.	%Recovery = 98 PID = 5.1 - 7.2ppm FC = F3	
2						About 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no gravels.	%Recovery = 87 PID = 4.5 - 6.5ppm	
1	53				FILL	CLAYEY SAND: reddish brown to brown; moist; about 10% subangular fine gravel (max.2cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC); encountered silty sand layer at 3.7m to 3.8m.		
)5 5 						Brown; moist to wet; about 10% subangular fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 30% Fines.		
					SC	<u>CLAYEY SAND</u> : dark brown; moist; about 60% subangular fine to medium Sand (max.2mm); about 40% Fines; medium plasticity; alluvial soil.	%Recovery = 74 PID = 2.7 - 5.2ppm	
7 7	S4				СН	SANDY FAT CLAY: light gravish brown; moist; about 40% subangular fine to medium Sand (max.2mm); about 60% Fines; high plasticity; alluvial soil.		
					SM	SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil; granite texture.		
						Hard pushing of sampler at 8.7-9.0m; HDP (Hydraulic Down Pressure) = 1000 psi.		

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LOCAT DATE S DRILLI	FION: STAR NG M	<u>Cam</u> TED: ETHC	p Carro D/EQU	IPMEN'	ig 11 T: <u>BE</u> C	FINISHED: <u>06 Aug 11</u> DR 250PM-2	SPECTOR:	
overe Coori	BURDI DINAT	EN TH ES: N	l: <u>3,983</u> ,	ISS: <u>357.5</u> E	: <u>447,</u>	DEPTH DRILLED: <u>10.0 m</u> WA 752.1 GROUND ELEV.: <u>50.99 m</u> DA	TAL DEPTH: \TER DEPTH: _ TUM:	10.0 m 3.35 m; AD MSL
				s meter	🗆 Mon		other <u>Direct push s</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
ſ	S1				FILL	SILTY SAND: brown grades to light brown; moist; about 10% subangular to subrounded fine to coarse gravel (max.3.5cm); about 70% subangular fine to coarse Sand; about 20% Fines;	%Recovery = 100 PID = 3.3ppm FC = F3	
.01						no plasticity; fill material (SM).	%Recovery = 100 PID = 2.0 - 6.3ppm	
	S2					<u>CLAYEY SAND</u> : brown; moist; about 55% fine Sand; about 45% Fines; medium plasticity; at 1.3-1.5m. <u>SILTY SAND</u> : brown; moist; about 5% subangular fine to coarse gravel (max.3.2cm); about 70% subangular fine to	FC = F3	
92				:		coarse Šand; about 25% Fines; no plasticity; at 1.5-5.0m.	%Recovery = 95 PID = 7.2 - 8.0ppm	
83 74	↓ \$3					No gravels below 3.0m, Clayey sand layers encountered at 3.3-3.6m and 4.0-5.0m,		
					SC	CLAYEY SAND: grayish brown; moist to wet; about 60% fine to medium Sand; about 40% Fines; medium plasticity, alluvial soil.	%Recovery = 71 PID = 4.4 - 8.5ppm	
j6 	V					Dark greenish gray; groundwater encountered at 6.0m while sampling.		
7	S4					Easy sampler penetration at 7 - 8m; PID in hole = 3.0 ppm.		
8					SM	SILTY SAND: gravish brown to brown; moist to wet; about 70% subangular fine to coarse Sand; about 30% Fines; no plasticity; residual soil; greenish-gray mottled with white; granite texture.		

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PRC	JEC	T:	Phase	II Site	<u>Soil S</u> ai	mpling																
LOC DAT DRIL DRIL	ATIO	on: Far g M g A	<u>Cam</u> TED: ETHO GENC	<u>p Carro</u> D/EQU Y:	<u>II</u> 10 Au IPMEN B	ig 11 T: <u>BE</u> C	G&EE NO.: <u>11-032E</u> FINISHED: <u>10 Aug 11</u> C50PM-2	NSPECTOR: DRILLER:														
COC	DRDI	NAT	res: N	:3 <u>,983,</u>	<u>337.7</u> E	E: <u>447,</u>	<u>767.8</u> GROUND ELEV.: <u>50.60 m</u> E	DATUM:	MSL													
GRC	DUNI E OF	2 CC 7 HC	DVER: DLE:	<u>Grass</u> Piezor	neter	Mor	CONTAMINATION:	X other Direct push s	ampling hole													
7		YPE /	NTED	IN																		
ELEVATION / DEPTH (metere)	(statati	SAMPLE TYPE NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA													
[0		×××			PCC FILL	Portland cement concrete pavement thickness = 10cm.	 FC = F1														
50-	1	S1				FILL	Poorly-graded GRAVEL with Silt and Sand: gray; wet; about 75% angular to subangular fine to coarse gravel (max.3cm); about 15% fine to medium Sand; about 10% Fines; fill material (GP-GM).	ג א / %Recovery = 97 א / PID ≈ 22.5ppm ר FC ≈ F3														
		52																	FILL	SILTY SAND with Gravel: brown; moist; about 15% subangular fine to coarse gravel (max.4cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 20% Fines; no plasticity; fill material (SM). CLAYEY SAND: brown to reddish brown; moist; about 5% fine gravel (max.1cm); about 55% subangular fine to coarse	<pre></pre>	
18	2	\$3					Sand; about 40% Fines; fow plasticity; fill material (SC). <u>SILTY SAND</u> : brown; moist; about 70% subangular fine to coarse Sand; about 30% Fines; fill material (SM). Subangular to subrounded coarse gravel (max. 4cm) at 2.0- 2.7m, <u>CLAYEY SAND</u> : brown; moist; about 65% fine to coarse Sand; about 35% Fines; low plasticity; at 2.7-2.85m and 3.6- 3.75m.	/ %Recovery = 60 PID = 3.0 - 5.4ppm														
6							Brown to grayish brown; fine gravel.	%Recovery = 60														
				' i	-	СН	FAT CLAY with Sand: gravish brown to brownish grav.	PID = 1.2 - 14.5ppm														
-6						SC	moist; fine gravel; about 85%; about 15% Fines; high plasticity; alluvial soil. CLAYEY SAND: brownish grav to brown: moist to wet: about															
4							70% subrounded fine to coarse Sand; about 30% Fines; low to medium plasticity; alluvial soil.															
8		3			- - - - - - - - - - - - - - - - - - -	SC	<u>CLAYEY SAND</u> : reddish brown; moist; about 60% fine Sand; about 40% Fines; low plasticity; residual soil; granite texture. More silty.															
						ML SM	SILT with Sand: reddish brown; moist; about 25% fine Sand; about 75% Fines; low plasticity; residual soil; granite texture. SILTY SAND: brown to light brown; moist; about 70% fine to coarse Sand; about 30% Fines; residual soil; granite texture.															

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LOCA DATE	TION: STAR	Phase I Camp TED: ETHOD	Carro	09 Au	ıg 11	G&EE NO.: <u>11-032E</u> INS FINISHED: <u>09 Aug 11</u> DR C50PM-2		
DRILL OVER COOR GROU	ING A BURD DINA ND C	GENCY EN THI TES: N: OVER:	: CKNE <u>3,983,</u> <u>Grass</u>	B SS: 323.0 E	EC E: <u>447,</u>	HOLE DIAMETER: <u>5.5 cm</u> TO DEPTH DRILLED: <u>10.0 m</u> WA 748.9 GROUND ELEV.: <u>50.14 m</u> DA CONTAMINATION: <u>Yes</u>	TAL DEPTH: \TER DEPTH: TUM:	MSL
		DLE: C		neter	U Mon	itoring Well Test Pit Auger Hole X	other <u>Direct push s</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
500	S1				FILL	SILTY SAND: brown; moist; about 5% subrounded to subangular fine to coarse gravel (max.3.5cm); about 65% subangular fine to coarse Sand; about 30% Fines; no plasticity; fill material (SM); grass roots at 0-0.1m.	%Recovery = 100 PID = 2.5ppm FC = F3 %Recovery = 87	
	S2					Brown to light brown; about 15% subangular fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand; about 25% Fines; no plasticity; at 1.0-4.0m.	PID = 3.1 - 6.2ppm	
82						2.0 to 3.0m; PID = 279 ppm.	%Recovery = 85 PID = 11 - 366ppm	
	S3					3.0 to 4.0m; PiD = 366 ppm.		
34						Dark bluish gray to grayish brown; wet to moist; about 10% subangular fine gravel (max.1cm); about 65% fine to coarse Sand; about 25% Fines; wet sample at 4.3m; more clayey soils.		
6					FILL	<u>SILTY SAND</u> : gray to dark bluish gray; wet to moist; about 80% subangular fine to coarse Sand; about 20% Fines; medium plasticity; fill material (SM). 5.0 to 6.0m; PID = 314 ppm. <u>CLAYEY SAND</u> : reddish brown; about 60%; about 40% Fines; at 5.65-6.0m.	%Recovery = 71 PID = 7.9 - 314ppm	
	Ţ			-	CL SC	LEAN CLAY with Sand: brown to grayish brown; moist; about 25% fine Sand; about 75% Fines; medium plasticity; alluvial soil.		
8	S4		1		СН	60% subangular fine to coarse Sand; about 40% Fines; alluvial soil. <u>FAT CLAY with Sand</u> : dark brownish gray; moist; about 20% fine Sand; about 80% Fines; high plasticity; alluvial soil.		
					SC	CLAYEY SAND: brown; moist; about 55% fine Sand; about 45% Fines; medium plasticity; alluvial soil.		
L ₁₀				-	SC	CLAYEY SAND: yellowish brown; moist; about 60% subangular fine to coarse Sand; about 40% Fines; residual soli; granite texture.		ł



LOCAT	TION: START NG MI	Camp FED: ETHOD	OCarro	II 08 Au PMEN	mpling Ig 11 T: <u>BEC</u> EC	G&EE NO.: <u>11-032E</u> INS FINISHED: <u>08 Aug 11</u> DR C50PM-2	SPECTOR:	
OVERE COORI GROUN	BURDE DINAT ND CC	EN THI ES: N: VER:	ICKNE: 3,983,	SS: <u>318.1</u> E	: <u>447,</u>	DEPTH DRILLED: 7.0 m WA 762.6 GROUND ELEV.: 49.93 m DA CONTAMINATION:	TAL DEPTH:	MSL
CELEVALION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED		SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	Si				FILL	SILTY SAND: brown to light brown; moist; about 5% subangular to subrounded fine to coarse gravel (max.4.5cm); about 70% subangular fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM).	%Recovery = 100 PiD = 0.6ppm FC = F3	
⊨1	S2					CLAYEY SAND: reddish brown; about 60% fine Sand; about	%Recovery ≈ 93 PID = 2.8 - 3.8ppm	
-2					FILL	40% Fines; medium plasticity; fill material (SC); at 1.4-1.6m. SILTY SAND: brown to light brown; moist; about 5% subangular to subrounded fine to coarse gravel (max.4.5cm); about 70% subangular fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM).	FC = F3 %Recovery = 57 PID = 1.6 - 3.5ppm	
	53				FILL	SILTY SAND with Grave[: brown; moist to wet; about 15% subangular fine gravel (max.2cm); about 65% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM). CLAYEY SAND: reddish brown; wet to moist; about 10% subrounded fine gravel; about 60% fine to medium Sand; about 30% Fines; low plasticity; fill material (SC). Wet sample at 3.6m,		
-4	XXXXXXX							
5 -					FILL	SILTY SAND: brown; moist; about 10% subangular fine gravel; about 60% fine to coarse Sand; about 30% Fines; fill material (SM).		
	₽				СН	Water encountered at 5.5m, FAT CLAY with Sand: dark greenish gray to brownish gray;		
						moist; about 20% fine Sand; about 80% Fines; high plasticity; alluviat soil.		
1_7 L			I			End of direct push sampling at 7.0m; Confirmed depths of FILL MATERIAL = 0-5.9m and ALLUVIAL SOILS = 5.9 - 7m.		

		- 	Soll Sec		HOLE NO. E11-182		istrict
LOCAT DATE S DRILLII DRILLII OVERE COORE	NG METH NG AGEN BURDEN ⁻ DINATES:	mp Carro : IOD/EQU ICY: FHICKNE N: <u>3,983</u> ,	011 07 Au IPMEN B SS: 301.8 E	g 11 T: <u>BEC</u> EC : <u>447,'</u>	G&EE NO.: 11-032E INS FINISHED: 07 Aug 11 DR C50PM-2 HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 10.0 m WA 747.3 GROUND ELEV.: 49.73 m DA	SPECTOR: RILLER: TAL DEPTH: _ ATER DEPTH: _ TUM:	2.53 m; AD
TYPE C	DF HOLE:	Piezo	meter	🗆 Mon	CONTAMINATION: itoring Well □ Test Pit □ Auger Hole 🕅	other Direct push s	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER GRAPHIC LOG	CONTAMINATED BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1	XXXXX		FILL	SILTY SAND: brown; molst; about 10% subangular fine to coarse gravel (max.5cm); about 70% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 0.8ppm FC = F3 %Recovery = 92	
ł 8	52				Grayish brown.	PID = 1.1 - 2.1ppm	
2	Y	7920000		FILL	CLAYEY SAND: brown; moist; about 5% subangular fine to coarse gravel (max.4cm); about 55% subangular fine to coarse Sand; about 40% Fines; low plasticity; fill material (SC).	%Recovery = 86 PID = 1.7 - 2.9ppm	
6	53			FILL	SILTY SAND: brown to reddish brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 60% fine to medium Sand; about 30% Fines; no plasticity; fill material (SM). Fine gravel (max.1.5cm).		
46				FILL FILL SC	CLAYEY SAND: brown; molst; about 55% subangular fine to coarse Sand; about 45% Fines; low plasticity; fill material (SC). SILTY SAND: brown; molst; about 5% subangular fine gravel; about 70% fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM). CLAYEY SAND with Gravel: brownish gray; molst; about 25% subrounded fine to coarse gravel (max.4cm); about 40% subangular fine to coarse Sand; about 35% Fines; alluvial soil.	%Recovery = 90 PID ≈ 1.9 - 7.5ppm	
2	3			CH	SANDY FAT CLAY: dark brownish gray; wet; about 30% fine to medium Sand; about 70% Fines; medium to high plasticity; alluvial soil; A coarse gravel (3cm) encountered at 8.7m.		
				SC CH	CLAYEY SAND with Gravel: grayish brown; moist; about 20% subrounded fine to coarse gravel; about 65% subangular fine to coarse Sand; about 15% Fines; alluvial soil. FAT CLAY with Sand: brown; moist; about 15% fine Sand; about 85% Fines; high plasticity; alluvial soil.		

CEPOF-ED-G

					mpling		SPECTOR:	
						FINISHED: 07 Aug 11 DR	NLLER:	
						C 50PM-2 HOLE DIAMETER: <u>5.5 cm</u> TO	TAL DEPTH:	12.0 m
OVERE	SURD	EN THI	CKNE	SS:		DEPTH DRILLED:12.0 m WA	TER DEPTH:	2.07 m; AD
GROUN	DINAT	ES: N: VFR·	<u>3,983,2</u> Grass	<u>288.9</u> E	E: <u>447,</u>	718.0 GROUND ELEV.: <u>49.38 m</u> DA CONTAMINATION:	TUM:	MSL
TYPE C	DF HO	LE: [] Piezon	neter	🗆 Mor		other <u>Direct push sa</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
_ 0	S1	XXX			FILL	SILTY SAND with Gravel: brown; moist; about 15%	%Recovery = 100	
						subangular fine to coarse gravel (max.4cm); about 65% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM); grass roots at 0-0.05m.	PID = 3.5ppm FC = F3 %Recovery = 97	
	S2					Light brown; more gravels at 1.2-1.5m.	PID = 4.4 - 5.0ppm	
18								
2	Y					Brown; PID in hole (0-3m open hole) = 1.4 ppm.	%Recovery = 100 PID = 2.1 - 7.3ppm	
					1		140 - 2,1 - 7,5ppm	
6-								
	53				FILL	CLAYEY SAND: reddish brown; moist; about 5% subangular fine gravel (max.1cm); about 55% fine to medium Sand; about 40% Fines; medium plasticity; fill material (SC).		
-4				:		40% Fines, medium plasticity, illi materiai (SC).		
					FILL	SILTY SAND: gravish brown; moist; about 5% subangular		
4						fine gravel (max.2cm); about 65% fine to coarse Sand; about 30% Fines; no plasticity; fill material (SM); PID in hole (0-5m	%Recovery = 85 PID = 1.7 - 5.9ppm	
-6						open hole) = 0 ppm,		
	₽				FILL	CLAYEY SAND: brown; moist to wet; about 60% fine to		
2	54			ĺ		medium Sand; about 40% Fines; low plasticity; fill material (SC); Wet sample at 6.8m.		
8				1	FILL	LEAN CLAY with Sand: yellowish brown; moist; about 20%		
					8'4LL	\fine Sand; about 80% Fines; low plasticity; fill material (CL). / CLAYEY SAND: brown; moist to wet; about 60% fine to medium Sand; about 40% Fines; low plasticity; fill material		
	XA			Ē	CL	(SC). LEAN CLAY: greenish black to dark reddish brown; moist:		
<u>-</u>				i		fine to coarse Sand; about 100% Fines; medium plasticity; alluvial soil; 2.5cm subrounded gravel at 9.7m.		
-10 -				ľ	SC	CLAYEY SAND: dark brown to gravish brown; moist to wet; about 60% fine to coarse Sand; about 40% Fines; fow		
				-	CL.	plasticity; alluvial soil. LEAN CLAY: brown; moist; about 10% fine Sand; about 90%		
					sc	Fines; medium plasticity; alluvial soil; black hard clay (mud crack).		
,	K					CLAYEY SAND: brown; wet; about 60% subangular fine to coarse Sand; about 40% Fines; low plasticity; alluvial soil.		

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	ION:		Carro	06 Au	npling	G&EE NO.: <u>11-032E</u> INS	SPECTOR:	
DRILLII	NG M	ETHO	D/EQUI	PMEN ⁻	Г: <u>вес</u>	C50PM-1	ILLER:	
DRILLII		GENC' EN TH	Y: ICKNE:	B SS·	EC		TAL DEPTH:	<u>8.75 m</u>
COORD	DINAT	ES: N	3,983,2	296.4 E	: 447,	800.2 GROUND ELEV.: 50.16 m DA		MSL
groun Type c	ND CC DF HO)VER: LE: [Weed Piezon	neter	🖾 Mon		other _Direct push sa	Implina hole
	T ~		l	T	T			1
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
50- 0	S1				FILL	SILTY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand	%Recovery = 100 PID = 1.8ppm	
-						(max.4.8mm); about 25% Fines; no plasticity; fill material (SM).	FC = F3 %Recovery = 100 PID = 2.6 - 2.8ppm	
9-1	52 X						(10 - 2.0 - 2.0pm)	
82						About 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no gravels.	%Recovery = 77 PID = 4.8 - 14.0ppm	
					FILL	SANDY LEAN CLAY: reddish brown; moist; about 35% Subangular fine to medium Sand (max.2mm); about 65% Fines; medium plasticity; fill material (CL).		
73						SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; fill material (SM).		
-	S3 (Moist to wet; about 3% subrounded fine to coarse gravel (max.3cm); about 72% subangular fine to coarse Sand (max.4.8mm); about 25% Fines.		
<u>;</u> 4						About 75%; about 25% Fines; no gravels.		
	× ×				sc	CLAYEY SAND: reddish brown to grayish brown; moist; about 10% subangular fine gravel (max.2cm); about 60%		
6					CL	subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; alluvial soil; no gravels at 4.6m to		
				1		5.0m. SANDY LEAN CLAY: grayish brown; wet; about 40% subangular fine to medium Sand (max.2mm); about 60% Fines; medium plasticity; alluvial soil.	%Recovery = 70 PID = 2.7 - 12.3ppm	
6				- -	SC	CLAYEY SAND: grayish brown; moist; about 60% subangular fine to coarse Sand (max.4.8mm); about 40% Fines; medium plasticity; alluvial soil.		
-7	54				SM	SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil. Granite texture.		
						Hard pushing of sampler at 8.5-8.75m; HDP (Hydraulic Down Pressure) = 1000 psi.		

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<u>Union</u>		Engin	leers			HOLE NO. E11-185	Di	istrict
LOCAT DATE DRILLI DRILLI OVERE COORI	TON: STAR NG M NG A BURD DINAT	Camp TED: ETHOI GENCY EN THI 'ES: N:	0 Carro D/EQUI 7: ICKNE 3,983,3	II 06 Au PMEN [™] B SS: 304.7 E	g 11 Г: <u>ВЕС</u> ЕС :: 447,8	FINISHED: 06 Aug 11 DR 50PM-1 HOLE DIAMETER: 5.5 cm TO DEPTH DRILLED: 8.8 m WA 806.0 GROUND ELEV.: 50.97 m DA	TER DEPTH:	2.0 m; AD
GROUI TYPE (ND CC DF HC	DVER: DLE: []	<u>Grass</u>] Piezon	neter	Mon	CONTAMINATION:	other <u>Direct push sa</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
0	si				FILL.	CLAYEY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to	%Recovery = 100 PID = 2,4ppm	
0	52				FILL	coarse Sand (max.4.8mm); about 25% Fines; medium plasticity; fill material (SC). <u>SILTY SAND</u> : brown; moist; about 5% subangular fine gravel (max.1cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM). About 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no gravels; encountered clayey sand layer at 1.8m to 1.9m.	FC = F3 %Recovery = 93 PID = 2.8 - 2.9ppm FC = F3	
92 					FILL	CLAYEY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; medium plasticity; fill material (SC).	%Recovery = 87 PID = 2.6 - 3.5ppm	
в——-з						Wet soil at 3.0m to 3.2m.		
74	S3				FILL	SILTY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM). Wet.		
					CL.	SANDY LEAN CLAY: grayish brown; moist; about 40% subangular fine to medium Sand (max.2mm); about 60%		
)					SC	Fines: medium plasticity; alluvial soil. CLAYEY SAND: grayish brown; moist; about 60% subangular fine to medium Sand (max.2mm); about 40% Fines; medium plasticity; alluvial soil.	%Recovery = 63 PID = 0.6 - 4.2ppm	
;6 					СН	FAT CLAY with Sand: grayish brown; moist; about 20% subangular fine Sand (max.0.43mm); about 80% Fines; high plasticity; alluvial soil. Grayish brown to gray; about 20% subangular fine to medium Sand (max.2mm); about 80% Fines.		
7	S4					Encountered clayey sand layer (5cm).		
				-	SC	CLAYEY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; residual soil; disturbed granite texture.		
[SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil; granite texture;. Hard pushing of sampler at 8.55-8.8m; HDP (Hydraulic Down		
						Pressure) = 1000 psi;. Penetration refusal depth = 8.8m (Penetration speed = 1cm /		

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DRILLI	ng me Ng Ag	ETHOE GENCI)/EQUI /:	IPMEN' B	T: <u>BEC</u> EC	C50PM-1 HOLE DIAMETER: 5.5 cm TO	SPECTOR:	8.0 m
OVERB	URDE NNATI ID CO	EN THI ES: N: VER:	CKNE: 3,983,2 <u>Weed</u>	SS: <u>296.6</u> E	: 447,8	DEPTH DRILLED: 8.0 m WA 822.8 GROUND ELEV.: 52.43 m DA CONTAMINATION:	TER DEPTH:	MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
2	51				Fill	SILTY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM); encountered clayey sand layer.	%Recovery = 100 PID = 3.6ppm FC = F3 %Recovery = 88 PID = 1.1 - 1.5ppm	
					FILL	CLAYEY SAND: reddish brown; moist to wet; about 5% subangular fine gravel (max.2cm); about 60% subangular fine to coarse Sand (max.4.8mm); about 35% Fines; medium plasticity; fill material (SC). Brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered silty sand layer at 2.5m to 2.6m. Brown to reddish brown; about 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered silty sand layer at 3.3m to 3.5m. Moist to wet.	%Recovery = 90 PID = 2.3 - 4.2ppm	
	3				CL SC CH SC	SANDY LEAN CLAY: gravish brown; moist; about 40% subangular fine to coarse Sand (max.4.8mm); about 60% Fines; medium plasticity; alluvial soil; with organics. CLAYEY SAND: dark brown; moist; about 35% Fines; high plasticity; alluvial soil. SANDY_FAT_CLAY: dark brown; moist; about 30% subangular fine to coarse Sand (max.4.8mm); about 30% subangular fine to coarse Sand (max.4.8mm); about 70% Fines; high plasticity; alluvial soil.	%Recovery = 62 PID = 2.6 - 3.5ppm	
						plasticity; residual soil; disturbed granite texture. Hard pushing of sampler at 7.7-8.0m; HDP (Hydraulic Down Pressure) = 1000 psi. Penetration refusal depth = 8.0m (Penetration speed = 5cm / 1min).		

	TON:	Camn	Carro	<u>Soil Sai</u> oll		G&EE NO.: 11-032E IN	SPECTOR:	
DATE	STAR	TED: .	••••••	<u>05 Au</u>	g 11	FINISHED:05 Aug 11 DF	RILLER:	
DRILLI DVERI	NG A BURD	GENC) EN TH	/: ICKNE	<u>B</u> SS:	EC	C50PM-1 HOLE DIAMETER: <u>5.5 cm</u> TC DEPTH DRILLED: <u>10.0 m</u> W/ 829.9 GROUND ELEV.: <u>54.91 m</u> DA	DTAL DEPTH: ATER DEPTH:	5.27 m; AD
GROU	ND CO	OVER:	Grass	neter		CONTAMINATION:	other _Direct push s	
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
0	51				FILL	SILTY SAND: brown; moist; about 10% subangular fine gravel (max.2cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material	%Recovery = 100 PID = 1.2ppm	
						(SM).	FC = F3 %Recovery = 97 PID = 1.1 - 1.8ppm	
	S2				-	About 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered clayey sand layer.		
2							%Recovery = 93 PID = 0.8 - 2.0ppm	
	\$3				FILL	CLAYEY SAND: reddish brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC).		
					FILL	SILTY SAND: dark brown; moist; about 5% subangular fine to coarse gravel (max.3cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM).		
5 	¥					Brown; moist to wet; about 3% subangular fine gravel (max.icm); about 72% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered fat clay with sand layer at 5.8m to 5.9m.	%Recovery = 88 PID = 0.3 - 2.3ppm	
6 						Moist to wet; about 3% subangular fine gravel (max.2cm); about 72% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered clayey sand layer.		
7	S4			*	SC	CLAYEY SAND: dark brown; moist to wet; about 70% subangular fine to medium Sand (max.2mm); about 30% Fines; alluvial soil; encountered fat clay layer at 7.0m to 7.1m.		
				-	СН	FAT CLAY: dark gray; moist; about 10% fine Sand (max.0.43mm); about 90% Fines; high plasticity; alluviał soil.		
9				F	SC	CLAYEY SAND: brown; moist to wet; about 80% subangular fine to coarse Sand (max.4.8mm); about 20% Fines; medium plasticity; alluvial soil.		
-						Wet. Easy pushing of sampler at 9.0-10.0m; HDP (Hydraulic Down Pressure) ≃ 100 psi.		

PROJE	CT:	Phase	II Site	<u>Soil Sa</u>	npling			
	ION: STAR	<u>Camp</u> TED:	DICATTO	05 Au	g 11		SPECTOR:	
DRILLI OVERE COORI	NG A BURD DINA1	GENCI EN TH ES: N	r: ICKNE 3,983,	<u>B</u> SS: 322.2 E	EC	HOLE DIAMETER: <u>5.5 cm</u> TO DEPTH DRILLED: <u>9.58 m</u> WA 341.8 GROUND ELEV.: <u>55.03 m</u> DA CONTAMINATION:	TUM:	<u>aved (0.5m); A</u> D <u>MSL</u>
		1 1	}	neter T	LI Mon	itoring Well Test Pit Auger Hole K	other <u>Direct push sa</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
50	\$1				FILL	SILTY SAND: brown; moist; about 10% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 2.5ppm FC = F3 %Recovery = 100	
₄	\$2				FILL	About 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines.	PID = 3.8 - 4.2ppm	
32					FILL	CLAYEY SAND: reddish brown; moist; about 5%; about 65% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill materiał (SC). SILTY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand	%Recovery = 94 PID = 1.4 - 3.9ppm	
3					FILL	(max.4.8mm); about 25% Fines; no plasticity; fill material (SM).		
	S3					5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; medium plasticity; fill material (SC); encountered silty sand layer.		
4				-	FILL	SILTY SAND: brown; moist; about 5% subangular fine gravel (max.2cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill material (SM).		
- -5					FILL	CLAYEY SAND: reddish brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC).	%Recovery = 76 PID = 0.9 - 3.2ppm	
6				-	SC CL	CLAYEY SAND: gray; moist; about 60% subangular fine to coarse Sand (max.4.8mm); about 40% Fines; medium plasticity; alluvial soif; with organics.		
					SM	LEAN CLAY with Sand: gray; moist; about 25% subangular (ine to medium Sand (max.2mm); about 75% Fines; medium [plasticity; alluvial soil. <u>SILTY SAND</u> : grayish brown; wet; about 80% subangular fine to medium Sand (max.2mm); about 20% Fines; no		
7	84				SC	CLAYEY SAND: dark brown; moist; about 20% Pirtes; no CLAYEY SAND: dark brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; alluvial soil; encountered fat clay layer at 7.7m to 7.8m.		
9	24				SM	SILTY SAND: brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; no plasticity; residual soil; granite texture. Hard pushing of sampler at 9.3-9.58m; HDP (Hydraulic Down Pressure) = 1000 psi.		

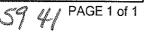
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Concession of				neers			HOLE NO. E11-189	U	istrict
				II Site p Carro				SPECTOR:	
	E ST/	ART	TED:	J Carre	05 Au	g 11		RILLER:	
RIL	ING	i MI	ETHC	D/EQU	IPMEN	Г: <u>вес</u>	C50PM-1		
DRIL	ING	i AC	GENC	Y:	B	EC	HOLE DIAMETER: <u>5.5 cm</u> TC	TAL DEPTH: _	
				ICKNE				ATER DEPTH:	
				: <u>3,983,</u> Weed			835.5 GROUND ELEV.: <u>54.81 m</u> DA CONTAMINATION:	TUM:	MSL
				Piezor				other Direct push s	ampling hole
ELEVATION / DEPTH (meters)	AMPI F TYPF /	NUMBER	GRAPHIC LOG	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
200 0	0	Z	010		ΰź	50			
		51				FILL	SILTY SAND: brown; moist; about 3% subangular fine gravel (max.1cm); about 72% subangular fine to coarse Sand	%Recovery = 100 PID = 1.8ppm	
							(max.4.8mm); about 25% Fines; no plasticity; fill material (SM).	FC = F3 %Recovery = 93	/
54	5	52					About 10% subangular fine to coarse gravel (max.3cm); about 65% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered clayey sand layer. No clayey sand layer.	PID = 2.6 - 2.8ppm	
2	-							%Recovery = 90	
2								PID = 4.8 - 14.0ppm	
	s	3					About 5% subangular fine to coarse gravel (max.5cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines.		
0-4		*****					About 5% subangular fine gravel (max.1cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; encountered clayey sand layer at 4.8m to 5.0m.		
* 		Ţ					Moist to wet; about 75%; about 25% Fines; no gravels; encountered clayey sand layer at 5.3m to 5.4m.	%Recovery = 90 PID = 2,7 - 12,3ppm	
-6							Moist to wet; encountered clayey sand fayer.		
8	54					CL. CH	SANDY LEAN CLAY: gray to brown; moist; about 30% subangular fine to coarse Sand (max.4.8mm); about 70% /Fines; medium plasticity; alluvial soil; with organics. FAT CLAY: dark brown; moist; about 10% subangular fine to		
-8							medium Sand (max.2mm); about 90% Fines; high plasticity; alluviał soil.		
						СН	FAT CLAY with Sand: brown to light gray; moist; about 5% subangular fine gravel (max.2cm); about 15% subangular fine to coarse Sand (max.4.8mm); about 80% Fines; high		
10						SM	plasticity; alluvial soil. About 25% fine Sand (max.0.43mm); about 75% Fines; no gravels.		
				L	.	t	SILTY SAND: light brown; moist; about 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; residual soit; granite texture. Hard pushing of sampler at 9.7-10.0m; HDP (Hydraulic Down Pressure) = 800 psi. Penetration refusal depth =10.0m (Penetration speed = 5cm /		L

ENVIRO-EXPLORATION LOG 11-032E-PHASE2-FINAL.GPJ USACE SKOREA.GDT 8/22/11

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Ref. (

LOCAT	ION:	Camp ED: _	Carro	ll 08 Au	<u>g 11</u>	G&EE NO.: <u>11-032E</u> IN	SPECTOR:	
DRILLI OVERE COORI	NG AG BURDE DINATE ND CO	ENCY N THI ES: N: VER:	: CKNES <u>3,983,3</u> <u>Grass</u>	<u>B</u> SS: 571.5 E	EC	HOLE DIAMETER: <u>5.5 cm</u> TC DEPTH DRILLED: <u>10.0 m</u> W. 663.9 GROUND ELEV.: <u>49.61 m</u> DA CONTAMINATION:	DTAL DEPTH: 10.0 ATER DEPTH: Caved (4. ATUM: MSL	<u>8m); A</u>
ELEVATION / DEPTH (meters)	YPE /	GRAPHIC LOG CONTAMINATED	ELOW COUNT	SPT N-VALUE	USCS/ STRATA	Itoring Well Test Pit Auger Hole	other <u>Direct push sampling ho</u>	DATA
48-	S1 52				FILL	SILTY SAND with Gravel: brown; moist; about 25% subangular fine to coarse gravel (max.3cm); about 55% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM).	%Recovery = 100 PID = 0.6ppm FC = F3 %Recovery = 93 PID = 2.8 - 3.8ppm	
-2						SILTY SAND: moist; about 20% subrounded fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand; about 20% Fines; no plasticity.	%Recovery = 57 PID = 1.6 - 3.5ppm	
464	53 ×				FILL	CLAYEY SAND: reddish brown; moist to wel; about 60% fine to medium Sand; about 40% Fines; low plasticity; fill material (SC). Water encountered at 4.8m.		
6				****	Fill.	<u>SILTY SAND</u> : brown; wet; about 70% subangular fine to coarse Sand; about 30% Fines; fill material (SM).	%Recovery = 53 PID ≈ 1.9 - 2.7ppm	
2	34			-	FILL CH SC	CLAYEY SAND: brown; moist; about 60% fine Sand; about 40% Fines; low to medium plasticity; fill material (SC); coarse angular gravel (4.5cm) encountered at 7.4m. FAT CLAY with Sand: dark brown to reddish brown; moist; about 20% fine Sand; about 80% Fines; high plasticity; residual soli.		
0					30	CLAYEY SAND: reddish brown; moist; about 55% fine to medium Sand; about 45% Fines; residual soil; granite texture. End of direct push sampling at 10.0m; Confirmed depths of		

F

LOCAT DATE S DRILLII	NG METHO	Ineers II Site : p Carro	Soil Sar Il 09 Au	g <u>11</u> Г: <u>BEC</u>	G&EE NO.: <u>11-032E</u> IN FINISHED: <u>09 Aug 11</u> DF C 50PM-2		East strict
OVERE COORE GROUN	URDEN TH	HICKNE: 1: <u>3,983,;</u> : <u>Grass</u>	SS: <u>367.8</u> E	: 447,0	DEPTH DRILLED: 7.7 m W/ 600.8 GROUND ELEV.: 43.61 m DA CONTAMINATION:	ATER DEPTH:	4.42 m; AD MSL
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER GRAPHIC LOG	CONTAMINATED BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	51 52 53			FILL	SILTY SAND: brown; moist; about 10% angular to subangular fine to coarse gravel (max.3cm); about 60% subangular fine to coarse Sand; about 30% Fines; no plasticity; fill material (SM). SILTY SAND with Gravel: brown to dark gray; moist; about 20% subangular to angular fine to coarse gravel (max.4cm); about 55% subangular fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM). SILTY SAND: light brown; moist; about 60% fine to medium Sand (max.3mm); about 40% Fines; residual soil; Granite texture. Light brown.	%Recovery = 100 PID = 2.7ppm FC = F3 %Recovery = 100 PID = 1.2 - 3.3ppm FC = F3 FC = F3 %Recovery = 100 PiD = 2.3 - 4.5ppm %Recovery = 100 PID = 2.3 - 4.6ppm	
	S4 ∑				Brown; granite texture. water encountered at 6.4m while sampling; wet sample at 6.4-6.5m. Brown; wet; more silty; granite texture. Hard pushing of sampler at 7.6-7.7m; HDP (Hydraulic Down Pressure) = 1500 psi, Penetration refusal depth = 7.7m (Penetration speed = 2cm / 1min).		

1. 1. Years

ENVIRO-EXPLORATION LOG 11-032E-PHASE2-FINAL.GPJ USACE SKOREA.GDT 8/22/11

PROJE LOCAT	ECT: ION:	Camp	I Site Carro	11		HOLE NO. E11-192	SPECTOR:	istrict
DATE S	STAR	TED: _		<u>12 Au</u>	<u>g 11</u>			
DRILLI OVERE	NG A BURD DINAT	GENCY EN THI FES: N:	: CKNE <u>3,983,</u>	<u> </u>	EC	HOLE DIAMETER: <u>5.5 cm</u> TC DEPTH DRILLED: <u>12.0 m</u> WA 599.4 GROUND ELEV.: <u>49.96 m</u> DA	OTAL DEPTH: ATER DEPTH: ATUM:	······································
TYPE C	DF HC	DLE:] Piezor		other <u>Direct push s</u>	ampling hole		
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS/ STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
	S1				FILL	SILTY SAND: brown; moist; about 10% angular to subangular fine to coarse gravel (max.3cm); about 70% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM); grass roots at 0-0.05m.	%Recovery = 100 PID = 0.4ppm √FC = F3 %Recovery = 77	/
	S2				FILL	SILTY SAND with Gravel: grayish brown to brown; moist to wet; about 35% subangular fine to coarse gravel (max.4.5cm); about 50% angular to subangular fine to coarse Sand; about 15% Fines; no plasticity; fill material (SM).	PID = 4.4 - 8.0ppm FC = F3	
482							%Recovery = 51 PID = 2.8 - 3.3ppm	
	53					Subrounded to subangular fine to coarse gravels (max 3.5cm) at 3-4m.		
464				-		Subangular fine gravels (max. 1cm) at 4-5m.		
446					ML	SANDY SILT: reddish brown to brown; moist; about 40% fine to medium Sand; about 60% Fines; no plasticity; residual soil; granite texture.	%Recovery = 63 PID = 1.5 - 3.8ppm	
428	S4 -			ļ	ML	SILT: red grades to reddish brown; moist; about 100% Fines; low plasticity; residual soil.		
	- - - - -				SM	SILTY SAND: grayish brown; moist; about 60% angular to subangular fine to coarse Sand; about 40% Fines; no to low plasticity; residual soil; granite texture.		
40				****		Brown mottled with white; granite texture.		
						Light brown to brown; moist; about 70% angular to subangular fine to coarse Sand; about 30% Fines; no plasticity; granite texture.		

ENVIRO-EXPLORATION LOG 11-032E-PHASE2-FINAL.GPJ USACE SKOREA.GDT 8/22/11

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LOCAT	CT: ION:	Phase Cam	<u>II Site</u> 5 Carro	<u>Soil Sai</u> M	npling	G&EE NO.: 11-032E INS	PECTOR:	
DATE S	STAR	TED:		<u>12 Au</u>	g 11	FINISHED: 12 Aug 11 DR	ILLER:	
						C50PM-1 HOLE DIAMETER: <u>5.5 cm</u> TO	TAL DEPTH:	8.6 m
OVERE	URD	EN TH	ICKNE	SS:		DEPTH DRILLED: <u>8.6 m</u> WA	TER DEPTH:	
COORE		ES: N	: <u>3,983,</u> Grass	<u>345.7</u> E	. 447,	659.5 GROUND ELEV.: 43.32 m DA	TUM:	MSL
GROUND COVER: Grass TYPE OF HOLE: Piezometer							other _Direct push s	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
 0					FILL	SILTY SAND: brown; moist; about 5% subangular fine to	%Recovery = 60	·
43	S1					coarse gravel (max.3cm); about 70% subangular fine to coarse Sand (max.4.8mm); about 25% Fines; no plasticity; fill	PID = 2.5ppm FC = F3	
-					Fill	Wet; about 75% subangular fine to coarse Sand (max.4.8mm); about 25% Fines,	%Recovery = 100 PID = 3.4 - 3.5ppm	
-1	S 2				FILL	CLAYEY SAND: reddish brown; moist to wet; about 70% subangular fine to coarse Sand (max.4.8mm); about 30%	FC = F3 FC = F2	
42					FILL	Fines; medium plasticity; fill material (SC).		
2						coarse Sand (max.4.8mm); about 15% Fines; no plasticity; fill material (SM).		
µ1−−1 [−]					FILL	CLAYEY SAND: reddish brown to brown; moist; about 65% Subangular fine to coarse Sand (max.4.8mm); about 35%	%Recovery = 69 PID = 1.5 - 2.6ppm	
-					SC	Fines; medium plasticity; fill material (SC). SILTY SAND: brown; wet; about 85% subangular fine to medium Sand (max.2mm); about 15% Fines; no plasticity; fill	FC = F2	
-3						material (SM). CLAYEY SAND: reddish brown; moist; about 65%		
o						subangular fine to medium Sand (max.2mm); about 35% Fines; medium plasticity; residual sol; granite texture.		
	S3							
-4								
9								
5				ŀ	SM	SILTY SAND: brown; moist; about 60% subangular fine to medium Sand (max.2mm); about 40% Fines; low plasticity;	%Recovery = 75 PID = 1.5 - 5.5ppm	
8						residual soil; granite texture.	and a rige probhin	
6								
7						Reddish brown to yellowish brown; no to low plasticity; with blackish rock fragments.		
$\left \right $	Ì	調査						
7	S4					Vollovich herver hunder (* *		
3	ļ	181				Yellowish brown; low plasticity.		
	, i							
-8		制				About 70% subangular fine to medium Sand (max.2mm);		
<u>;-</u>						about 30% Fines. Hard pushing of sampler at 8.4-8.6m; HDP (Hydraulic Down		
- I		<u> 8 E I I I</u>		I.	l	Pressure) = 1000 psi. Penetration refusal depth = 8.6m (Penetration speed = 2cm /		

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LOCAT DATE DRILLI	ing me	<u>Camp</u> ED: THOE	Carro	II 13 Au PMEN	ig 11 T: <u>BE</u> C	G&EE NO.: <u>11-032E</u> IN FINISHED: <u>13 Aug 11</u> DF C50PM-2	SPECTOR:	
OVERI COOR	BURDE DINATI	EN THI ES: N:	CKNE: 3,983,3	SS: <u>353.8</u> E	E: <u>447</u> ,	DEPTH DRILLED: 10.0 m W. 607.8 GROUND ELEV.: 42.98 m DA	DTAL DEPTH: _ ATER DEPTH: ATUM:	
TYPE (-E; [] Piezon	neter	□ Mon	itoring Well	l other <u>Direct push s</u>	ampling hole
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
42	S1				AC FILL FILL	Asphalt concrete pavement thickness = 10cm. Poorly-graded GRAVEL with Silt and Sand: gray to dark gray; dry to moist; about 75% angular to subangular fine to coarse gravel (max.3.5cm); about 15% subangular fine Sand; about 10% Fines; fill material (GP-GM); Base course material. SILTY SAND: reddish brown to brown; moist; about 75% angular to subangular fine to coarse Sand; about 25% Fines; no plasticity; fill material (SM).	FC = F1 VFC = F3 VRecovery = 100 PID = 0ppm VRecovery = 100 PID = 5.4ppm	,
2					SM	SILTY SAND: reddish brown to brown; moist; about 65% angular to subangular fine to coarse Sand; about 35% Fines; no plasticity; residual soil; granite texture.	%Recovery = 66 PiD = 4.9 - 8.4ppm	
104	S3					Light brown grades to brown; about 70% subangular fine to coarse Sand; about 30% Fines. Light brown; granite texture.		
8—							%Recovery = 69 PID = 0.7 - 9.6ppm	
6						Brown; wet sample at 6.8m.		
5	S4			-	ML	Light brown to pinkish brown; w/ rock fragments; dense at 7- 7.4m (sampler penetration speed = 6cm/ 1min).	-	
					SM	about 75% Fines; low plasticity; residual soil; granite texture. <u>SILTY SAND</u> : gravish brown; moist; about 70% subangular fine to coarse Sand; about 30% Fines; no plasticity; residual soil; granite texture.		
10						Hard pushing of sampler at 9.8-10.0m; HDP (Hydraulic Down Pressure) ≈ 1500 psi. Penetration refusal depth = 10m (Penetration speed = 5cm /		

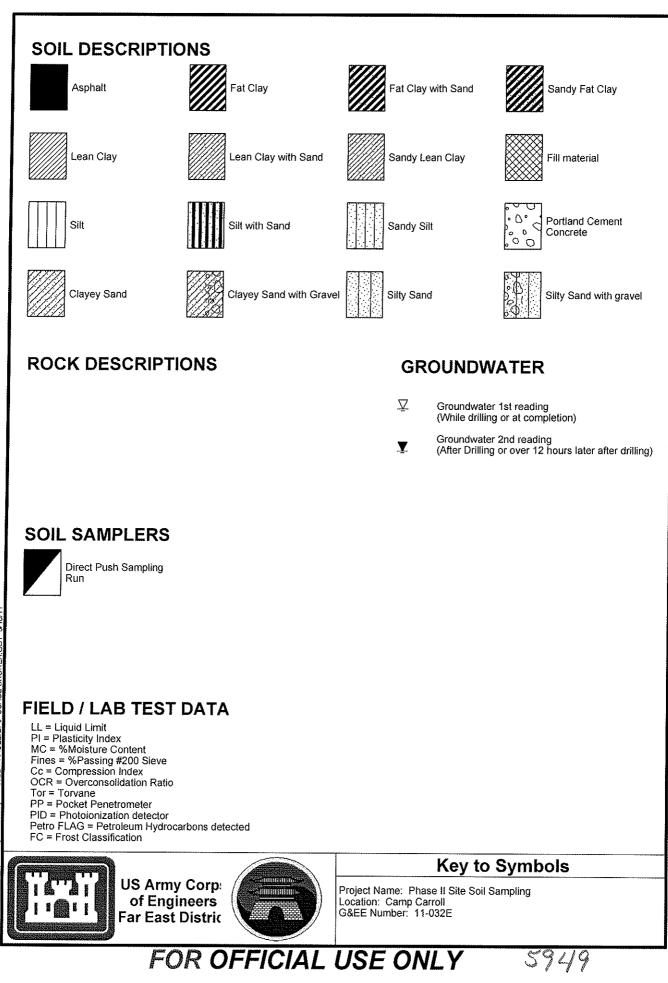
n anna 1970. M

LOCA DATE DRILL	TION: STAR ING M	<u>Cam</u> TED: ETHC	p Carr D/EQU	<u>13 Au</u> IIPMEN	ig 11 T: <u>BE</u> O	G&EE NO.: <u>11-032E</u> IN FINISHED: <u>13 Aug 11</u> DF C50PM-2	SPECTOR:									
OVER COOF GROL	BURD RDINAT JND CO	EN TH TES: N DVER	HCKNE 1: <u>3,983</u> : <u>Gras</u>	ESS: , <u>347.7</u> E s	E: <u>447</u> ,	DEPTH DRILLED: 11.0 m W/ 630.8 GROUND ELEV.: 42.91 m DA CONTAMINATION:	DTAL DEPTH: ATER DEPTH: ATUM:	No water; AD								
TYPE	OF HC	DLE:	Piezo	meter	Mor	itoring Well Test Pit Auger Hole	other <u>Direct push</u>	sampling hole								
ELEVATION / DEPTH (meters)	SAMPLE TYPE / NUMBER	GRAPHIC LOG		SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA								
420	S1				AC FILL FILL	Asphalt concrete pavement thickness = 7cm. Poorly-graded GRAVEL with Silt and Sand; gray to dark gray; dry to moist; about 75% subangular to angular fine to coarse gravel (max.3cm); about 15% fine Sand; about 10% Fines; fill material (GP-GM); Base course material.	FC = F1 FC = F3 %Recovery = 100 PID = 3.2ppm %Recovery = 100									
-2	S2				FILL	SILTY SAND: brown; moist; about 5% angular fine gravel (max.1.2cm); about 75% subangular fine to coarse Sand; about 20% Fines; no plasticity; fill material (SM). No gravels below 1m. Dark gray sands at 1.8-2.0m. CLAYEY SAND: reddish brown; moist; about 55% fine Sand;	PID = 4.5ppm									
10					SC	about 45% Fines; medium plasticity; fill material (SC). CLAYEY SAND: reddish brown; moist; about 55%; about	PID = 1.9 - 5.2ppm									
-4	S3										СН	45% Fines; medium plasticity; residual soil; reddish brown mottled w/black at 3.8-4m. <u>SANDY FAT CLAY</u> : reddish brown; moist; about 30% fine Sand; about 70% Fines; high plasticity; residual soil,				
8														ML SC	SANDY SILT: yellowish brown; moist; about 35% angular to subangular fine to coarse Sand; about 65% Fines; low plasticity; residual soil; granite texture.	/ %Recovery = 65 PID = 1.3 - 2.7ppm
-6					SM	Siller Sand Sand Sand Sand Sand Sand Sand Sand										
5	S4					Grayish brown; about 60% angular to subangular fine to coarse Sand; about 40% Fines.										
-8						About 70% angular to subangular fine to coarse Sand; about 30% Fines; at 7-11m; granite texture.										
10						Yellowish brown; granite texture.										

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JS Army	Corps			EXPLORATION LOG		East
Of Engine	eers			HOLE NO. E11-196	D	strict
N: <u>Camp</u> RTED: METHOD/ AGENCY: DEN THIC ATES: N: <u>3</u> COVER: <u>0</u>	Carroll /EQUIPI CKNESS 3,983,34 Grass	I <u>3 Aug</u> MENT BF S: 0.5 E:	<u>g 11</u> : <u>BEC</u> EC : <u>447,6</u>	G&EE NO.: 11-032E INS FINISHED: 13 Aug 11 DR '50PM-1	NILLER: TAL DEPTH: ATER DEPTH: TUM:	1.77 m; AD MSL
	Piezomet	ter	LI Moni	toring Well Test Pit Auger Hole X	other <u>Direct push sa</u>	ampling hole
NUMBER GRAPHIC LOG CONTAMINATED	BLOW COUNT	SPT N-VALUE	USCS / STRATA	DESCRIPTION OF MATERIALS	FIELD DATA	LAB DATA
			AC fill Fill Fill	Asphalt concrete pavement thickness = 5cm. Peorly-graded GRAVEL with Sand: about 70%; about 25%; about 5% Fines; fill material (GP); base course material. CLAYEY SAND: reddish brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; medium plasticity; fill material (SC). Moist to wet; about 3% subangular fine gravel (max.1cm); about 40% Fines; encountered sandy clay layer at 1.1m to 1.2m; perched water at 0.8m to 1.0m. Moist. Brown; no gravels. EAT_CLAY: reddish brown; moist; about 5% fine Sand (max.0.43mm); about 95% Fines; high plasticity; residual soil; disturbed granite texture. SILTY SAND: reddish brown; moist; about 70% subangular fine to coarse Sand (max.4.8mm); about 30% Fines; low plasticity; residual soi?; granite texture. Brown; no to low plasticity. No plasticity.	%Recovery = 60 PID = 2.9ppm FC = F3 %Recovery = 73 PID = 4.6 - 5.2ppm %Recovery = 78 PID = 4.2 - 5.8ppm %Recovery = 91 PID = 2.8 - 7.0ppm	
				Hard pushing of sampler at 10.2-10.3m; HDP (Hydraulic Down Pressure) ≖ 1000 psi.		
		Phase II Site So N: Camp Carroll RTED: METHOD/EQUIP AGENCY: DEN THICKNESS ATES: N: 3.983,34 COVER: Grass HOLE: Piezome UNHADOO MOT NHADOO MOT NHADOO MOT NHADOO MOT	Phase II Site Soil Sam RTED: 13 Aug METHOD/EQUIPMENT AGENCY: BI DEN THICKNESS: ATES: N: 3,983,340.5 E COVER: Grass HOLE: Piezometer UPHABOO BI UPHABOO BI	Phase II Site Soil Sampling N: Camp Carroll RTED: 13 Aug 11 METHOD/EQUIPMENT: BEC AGENCY: BEC DEN THICKNESS: ATES: N: 3,983,340.5 E: ATES: N: 3,983,340.5 E: HOLE: Piezometer MOLE: Piezometer	Instant 200 Instant 200	Phase II Site Soil Sampling INSECTOR: INSPECTOR: RTED: 13 Aug 11 FINISHED: I1-032E INSPECTOR: METHOD/EQUIPMENT: BEC50PM-1 Addition of the second of

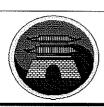
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- 1. The dates of drilling/penetration and type of equipment used are shown on the logs. All soils were classified in accordance with ASTM D 2488. Results of tests conducted on recovered samples are shown on the logs.
- 2. Borehole locations and elevations were determined using GPS RTK and/or Traverse methods. Equipments used are Trimble GPS RTK and/or Sokkia Total Stations. Survey Datum is WGS84, UTM Zone 52 and Elevations are Mean Sea Level (MSL).
- 3. The groundwater table is representative of boring location and time of drilling/sampling , and may change according to seasonal precipitation.
- 4. The exploration logs are subject to the limitations, conclusions, and recommendations provided in the report. Some variation in the subsurface conditions and depth to specific soil strata between boring locations can be expected.
- 5. Soil and rock conditions and associated stratigraphic features as depicted in the boring logs are specific for the particular drilling/sampling location, and may vary between boreholes.
- 6. Penetration refusal depth on the logs is based on achieving an penetration speed within dense to very dense residual soil or decomposed bedrock above groundwater table or no water conditions.
- 7. When direct push sampling system used, some gravely soils may have the potential to provide poor sample recovery or erroneous penetration speed due to the coarse size of the particles, as compared to the size of the sampler (35mm ID).



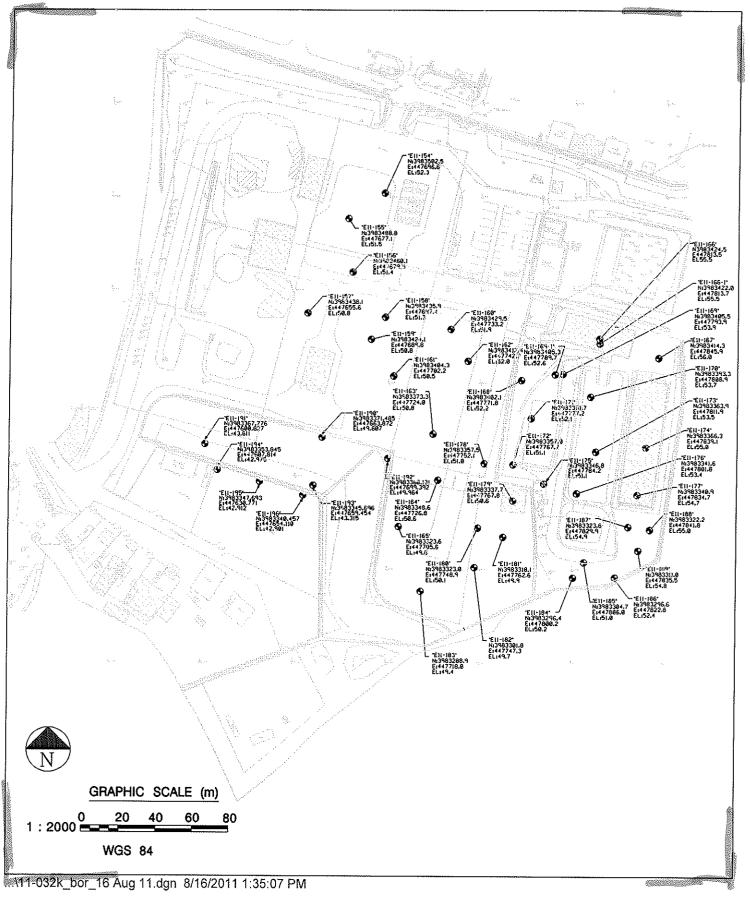
CAMP CARROLL 11-032E-PHASE2.GPJ USACE SKOREA.GDT



Note

Project Name: Phase II Site Soil Sampling Location: Camp Carroll G&EE Number: 11-032E

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HHRA No. 39-DA-0ESM-11, Camp Carroll, Teagu, South Korea, 15 Jun through 16 Aug 11

APPENDIX G

RESULTS OF THE JOHNSON AND ETTINGER ONLINE MODEL RUNS

5952

SEPA Low Loan relief Prosidion

Ecosystems Research Division

EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration

Backward Calculation full uncertainty analysis

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Background

Migration of volatile chemicals from the subsurface into overlying buildings is called vapor intrusion (VI). Volatile organic chemicals in contaminated soils or groundwater can emit vapors, which may migrate through subsurface soils and may enter the indoor air of overlying buildings. Building depressurization may cause these vapors to enter the home through cracks in the foundation. Depressunzation can be caused by a combination of wind effects and stack effects, which are the result of heating within the building and/or mechanical ventilation. In extreme cases, the vapors may accumulate in dwellings to levels that may pose near-term safety hazards, such as explosion. Typically, however, vapor concentrations are present at low levels, to which long-term exposure may pose increased risk for chronic health effects.

This on-tine calculator implements the Johnson and Ettinger (J&E) (Johnson and Ettinger, 1991) simplified model to evaluate the vapor intrusion pathway into buildings. This J&E model replicates the implementation that the US EPA Office of Solid Waste and Emergency Response (OSWER) used in developing its graft vepor intrusion guidance, but includes a number of enhancements that are facilitated by web implementation: temperature dependence of Henry's Law Constants and gaseous diffusivities, automatic sensitivity analysis of certain parameters, and others described on the background page.

The results you obtain from this OnSite implementation of the Johnson and Ettinger model may differ from other versions of the Johnson & Ettinger Model, in addition to the OSWER implementation that was used for the draft vapor intrusion guidance, EPA Office of Emergency Response and Remediation (OERR) distributes a set of spreadsheet implementations of the model. The differences among these implementations is described in detail on the results page. Beyond these differences the on-line version includes a simplified uncertainty analysis the other implementations lack.

	(Click For an Exam	ple			
Enter Site Nat	ne (optional):		Industrial W	orker - Phase II		
Enter sample	concentration, units and media type		1,68	μg/L	Ground V	Vater
	pth of the soil gas sample or ground water ta contamination)?(LT)	able (for		7	m	eters
This value car	a change by +/-			1	m	eters
What is your co	ntaminant of concern (COC)?		Vinyl chloride	(chloroethene)		
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	il is beneath the building?				Łoam	
What is the ave	rage soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		75014			
	Molecular Weight (MW)		62.5	(g/mole)		
	Henry's Law Constant at ground water tem	perature (H)	0.802131	6 [unitless]		
	Free-Air Diffusion Coefficient (Da)		0.1060	[cm2/s]		
	Diffusivity in Water (Dw)		1.230e-5	[cm²/s]		
	Unit Risk Factor (URF)		8.80e-6	[(µg/m³)-1]		
	Reference Concentration (RfC)		0.100	[mg/m3]		
Soli Properties						
	Total Porosity (n)		0.399	[unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-Entr	y Pressure	0.332	[unitless]		
	(O w.cap)					
	Height of Capiliary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil)		5.00	[L/min]		
Building Properties						
	Air Exchange Rate (Es)		0.250	(hr-1)		
	Building Mixing Height (He)		2.44	[m]		
	Building Footprint Area (FB)		100.0	[m²]		
	Subsurface Foundation Area (AB)		106.0	[m²]		

http://www.epa.gov/athens/learn2model/part-two/onsite/JnE_lite_forward.html

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	Building C								0038	[unitless]			
	Building F	oundation	Slab Thio	kness (l.	.crack}			0.1	00	[m]			
Exposure Parameter													
	Exposure			• •	•			25		[years]			
	Exposure			-				250	-	(days/year	3		
	Averaging							70 25		[years]			
	Exposure	Exposure Duration for Non-Carcinogens (EDnc)								[years]			
	Exposure	Exposure Frequency for Non-Carcinogens (EFnc)								(days/year	1		
	Averaging	Averaging Time for Non-Carcinogens (ATnc)								(years]			
				Ĺ	CAL	CULATE F	RESULTS)					
RESULTS													
	Unsaturate	Unsaturated Zone Effective Diffusion Coefficient (Deff)							06672	[cm²/s]			
	Unsaturated + Capillary Zone Effective Diffusion Coefficient (DT							0.001289 [cm²/s]					
	eff)												
	<u>"A" F</u>	arameter				1	.152e-4			rameter a E mechani			
	<u>"B" F</u>	Parameter				3	10.1			hrough so			
	<u>"C" F</u>	arameter				C	0.004918			ocess for Dathway.	the sub	surface	to
	3	Johnson	& Ettinge	r Attenu	ation Fac	tor (a)							1.126e-4
	INDOOR A	IR RESU	LTS FOR	GROUN	D WATER	R SA	MPLE DA1	`A					
	Low Predic	tion			8est Estir	nate			High Pre	diction2			
Indoor Air Concentration	0.08613	[µg/m³]	0.03372	[ppbv]	0.1517	(µg/m3	0.05939	(ppbv)	0.1729	[µg/m3]	0.06767	(ppbv)	
Cancer Risk		1.854e-	7			3.2666	ı 9-7		***********	3.721e	•7		
Hazard Quotient		5,899e	· · · · · · · · · · · · · · · · · · ·			0.0010	39			0.0011	84		
I <u></u>	1												
1 "Low Prediction" con contamination.	centration pr	oduced w	ith HIGHE	ST		moisture	content and	DEEPE	ST	de	pth to		
² "High Prediction" cor contamination.	centration p	roduced w	ith LOWE	ST		moisture	content and	SHALL	OWEST	d	epth to		

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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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		Click For an Exam	iple			
Enter Site Na	me (optional):		Industrial Wo	rker - phase II		
Enter sample	concentration, units and media type		1.01 e -1	µg/L	Ground	Water
	apth of the soil gas sample or ground water contamination)?(LT)	table (for		7	г	neters ·
This value car	1 change by +/-			1	r	neters
What is your co	ntaminant of concern (COC)?		alpha-HCH (a	lpha-BHC)		•
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	il is beneath the building?				1.oam	· ·
What is the ave	rage soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		319846			
	Molecular Weight (MW)		290.83	[g/mole]		
	Henry's Law Constant at ground water te	mperature (H)	0.0000988	16 [unitless]		
	Free-Air Diffusion Coefficient (Da)		1.420e-2	[cm²/s]		
	Diffusivity in Water (Dw)		7.340 e -6	[cm ² /s]		
	Unit Risk Factor (URF)		1.80e-3	[(µg/m3)-1]		
	Reference Concentration (RfC)		0.	[mg/m³]		
Soil Properties						
	Total Porosity (n)		0.399	{unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitless)	
	(C w)		0.148			
	Capillary Zone Moisture Content at Air-Er (&w,cap)	ntry Pressure	0.332	[unitless]		
	Height of Capillary Zone (CZa)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qso	11)	5.00	[L/min]		
Building Properties						
	Air Exchange Rate (Ep)		0.250	(hr-1)		
	Building Mixing Height (He)		2.44	[m]		
	Building Footprint Area (Fe)		100.0	[m ²]		
	Subsurface Foundation Area (AB)		106.0	[m²]		

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Backward Calculation full uncertainty analysis

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s

	Building Crack Ratio ((q)			0.0	0038	(unitiess)			
	Building Foundation S		.crack)		0,1	00	[m]			
Exposure Parameter	-		•							
	Exposure Duration for	Carcinogens (E	Dc)		25		[years]			
	Exposure Frequency	for Carcinogens ((EFc)		250	}	(days/year	1		
	Averaging Time for Cr	arcinogens (ATc)	 		70		[years]			
	Exposure Duration for	Non-Carcinoger	is (EDnc)		25		[years]			
	Exposure Frequency (for Non-Carcinog	ens (EFnc)		· 250)	(days/year)	ł		
	Averaging Time for No	on-Carcinogens ((ATnc)		25		(years]			
		ſ	CALCULAT	E RESULTS						
RESULTS		~								
	Unsaturated Zone Effe	ective Diffusion C	Coefficient (Dem)		0.0	01699	[cm²/s]			
	Unsaturated + Capilia	ry Zone Effective	Diffusion Coeffic	ient (DT	0.0	01780	[cm2/s]			
	eff)									
	"A" Parameter			1.591e-4			ameter a mechani			
	"B" Parameter			1218.	Diffus	ion th	rough so	il is th	e overs	all rate-
	"C" Parameter			0.004918			cess for athway.	the sub	surface	e to
	Johnson &	Ettinger Attenu	ation Factor (o)			-	-			1.541e-
	INDOOR AIR RESULT	IS FOR GROUN	D WATER	SAMPLE DAT	ГА					
	Low Prediction1		Best Estimate			ligh Pre	diction2			
Indoor Air Concentration	1.344e-6 [µg/m3]1.	131e-7 [ppbv]	1.539e-6 (µg/i	m3) 1.295e-7	[ppbv]	4.188 0 -6	δ [μg/m³]	3.523e-7	(ppbv)	
		0	6.77	6e-10			1.844e	-9		
Cancer Risk	5.9188-1									
	5.918a-1 0.		0.				0,			

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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Backward Colculation full uncertainty analysis

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Background

Migration of volatile chemicals from the subsurface into overlying buildings is called vapor intrusion (VI). Volatile organic chemicals in contaminated soils or groundwater can emit vapors, which may migrate through subsurface soils and may enter the indoor air of overlying buildings. Building depressurization may cause these vapors to enter the home through cracks in the foundation. Depressurization can be caused by a combination of wind effects and stack effects, which are the result of heating within the building and/or mechanical ventilation. In extreme cases, the vapors may accumulate in dwellings to levels that may pose near-term safety hazards, such as explosion. Typically, however, vapor concentrations are present at low levels, to which long-term exposure may pose increased risk for chronic health effects.

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	Click For an I	Example			
Enter Site Name (optional):		Industrial We	orker - phase II		
Enter sample concentration, units and m	nedia type	.835	µg/L	- Ground V	Nater
What is the depth of the soil gas sample ground water contamination)?(LT)	or ground water table (for		7	m	eters
This value can change by +/-			1	m	eters
What is your contaminant of concern (CO	C)?	gamma-HCH	(Lindane)		Ç.
What type of building are you investigating	g at your site?			Slab-on-Grade	х:
What type of soil is beneath the building?				Loam	
What is the average soli/ground water tem	iperature?			55	Farenheit
Chemical Properties					
CAS Number		58899			
Molecular Weight (MW)		290.83	[g/mole]		
Henry's Law Constant al	t ground water temperature (H)	0.000130	57 (unitless)		
Free-Air Diffusion Coeffi	cient (Da)	1.4208-2	[cm2/s]		
Diffusivity in Water (Dw)		7.340e-6	[cm ² /s]		
Unit Risk Factor (URF)		3.71e-4	[(µg/m³)·1]		
Reference Concentration	n (RfC)	1.05e-3	[mg/m³]		
Soil Properties					
Total Porosity (n)		0.399	[unitless]		
Unsaturated Zone Moist	ure Content Low 0.0610	Best Estimate	High 0.240	(unitless)	
(0 w)		0.148			
Capillary Zone Molsture	Content at Air-Entry Pressure	0.332	[unitless]		
(Ow,cap)					
Height of Capiliary Zone		0.375	(m)		
Soil-gas Flow Rate Into t	ne Building (Qsoll)	5.00	[L/min]		
Building Properties					
Air Exchange Rate (EB)		0.250	{hr-1]		
Building Mixing Height (•	2.44	[m]		
Building Footprint Area (•	108.0	[m²]		
Subsurface Foundation	Area (AB)	106.0	[m²]		

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	Building Cr	ack Ratio) (ŋ)					0.0	00038	[unitless]			
	Building Fo	undation	Siab Thick	kness (L	crack)			0.1	100	[m]			
Exposure Parameter	s												
	Exposure D	Juration f	or Carcino	gens (El	Dc)			25		[years]			
	Exposure F	requency	y for Carcin	nogens (EFc)			25	0	[days/yea	1		
	Averaging	l'ime for (Carcinoger	ns (ATc)				70		[years]			
	Exposure ()uration f	or Non-Ca	rcinoger	ns (EDnc)			25		[years]			
	Exposure F	requency	y for Non-C	Carcinog	ens (EFnc)	ļ		25	0	(days/year	7)		
	Averaging	Time for I	Non-Carcir	nogens (ATnc)			25		(years)			
				ſ	CALC	ULATE F	ESULTS						
RESULTS				*-									
	Unsaturate	d Zone E	ffective Dif	ifusion C	oefficient (Deff)		0.0	01503	[cm²/s]			
	Unsaturated + Capillary Zone Effective Diffusion Coefficient (DT						0,0	01573	[cm²/s]				
	eff)												
	<u>"A" P</u>	<u>arameter</u>				1	.406e-4				nalysis: .sm acros		
	"B" P	arameter				1	376.	Diffu	sion th	rough so	il is th	e overa	ll rate-
	<u>"C" P</u>	arameter				0	.004918			cess for athway.	the sub	surface	to
	<u>با</u> ر	ohnson (& Ettinger	Attenu	ation Fact	<u>or (</u> a)				-			1.367e-
	INDOOR A	RRESU	LTS FOR	GROUN	D WATER	SA	MPLE DAT	ΓA					
	Low Predic	ioni			Best Estin	ate			High Pre	diction2			
Indoor Air Concentration	1.301e-5	[µg/m³]	1.095e-6	(ppbv)	1.490e-5	[µg/m3]	1.254e-6	(ppbv)	3.584e-5	[hð\w ₃	3.015e-6	(ppbv)	
Cancer Risk	1	1.181e-	9			1.353e	-9			3.252e	-9		
Hazard Quotient		8.488e-	6			9.7228	-6			2.338e	⊦5		
"Low Prediction" cond	centration pro	duced w	ith BEST I	ESTIMA	TE r	noisture o	ontent and	DEEPE	ST	de	apth to		

contamination.

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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	C	Click For an Exam	ple			
Enter Site Na	me (optional):		Industrial Wo	rker - phase li		
Enter sample	concentration, units and media type		4.36e-3	իՖ/Ր	· Ground V	Vater
	apth of the soil gas sample or ground water to	able (for		7	m	eters
•	contamination)?(LT) 1 change by +/-			1	m	eters
What is your co	ntaminant of concern (COC)?		Heptachlor			
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	•
What type of so	il is beneath the building?				Loam	
What is the ave	rage soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		76448			
	Molecular Weight (MW)		373.32	[g/móle]		
	Henry's Law Constant at ground water term	perature (H)	16.77690	[unitiess]		
	Free-Air Diffusion Coefficient (Da)		1.120e-2	[cm²/s]		
	Diffusivity in Water (Dw)		5.690e-6	[cm²/s]		
	Unit Risk Factor (URF)		1.30e-3	[(µg/m3)-1]		
	Reference Concentration (RfC)		1.75e-3	[mg/m³]		
Soil Properties						
	Total Porosity (n)		0.399	[unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitiess]	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-Entr	ry Pressure	0.332	(unitless)		
	(Ow,cap)					
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil)	•	5.00	(L/min)		
Building Properties						
	Air Exchange Rate (EB)		0.250	[hr-1]		
	Building Mixing Height (Ha)		2.44	[m]		
	Building Footprint Area (FB)		100.0	[m²]		
	Subsurface Foundation Area (AB)		106.0	[m²]		

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	Building Cn	ack Rati	o (ŋ)				0.0	00038	[unitless]		
	Building Fo	undation	1 Slab Thic	kness (L	crack)		0.1	100	[m]		
Exposure Parameter	s .										
,	Exposure D	aration	for Carcino	gens (E	Dc)		25		[years]		
	Exposure F	requenc	y for Carci	nogens i	EFc)		25	0	[days/year]		
	Averaging 1	lime for	Carcinoge	ns (ATc)			70		(years)		
	Exposure D	uration t	for Non-Ca	rcinoger	is (EDac)		25		(years)		
	Exposure Frequency for Non-Carcinogens (EFnc)							0	[days/year]		
	Averaging Time for Non-Carcinogens (ATnc)								[years]		
				ſ	CALC	ULATE RESULTS	ĭ				
RESULTS				۰.							
	Unsaturated	1 Zone E	ffective Di	ffusion C	oefficient (Detr}	0.0	007050	[cm²/s]		
	Unsaturated + Capillary Zone Effective Diffusion Coefficient (DT						0.0	001337	(cm ² /s)		
	off)		-								
	"A" Parameter 1.194e-5								ameter analysis:		
	<u>"8" Pa</u>	rameter	:			2935.	Diffu	sion th	: mechanism acros prough soil is th	e overal	l rate-
	<u>"C" Pe</u>	arameter	I.			0.004918			cess for the sub athway.	surface	to
	ېل.	hnson	& Ettinger	Attenu	ation Facto	(α) <u>τ</u> α		-	-		1.192e-5
	INDOOR AI	R RESU	LTS FOR	GROUN	D WATER	SAMPLE DAT	FA				
	Low Predict	lon1			Best Estim	ale		High Pre	diction2		
Indoor Air Concentration	4.943e-4	(µg/m³)	3.240e-5	[ppbv]	8.716e-4	[µg/m³] 5.712e-5	[ppbv]	9.934e-	[≰] [μg/m³]6.510e-5	[ppbv]	
Cancer Risk		1.572e	-7			2.772e-7			3.159e-7		
Hazard Quotient	-	1.935e	-4			3.411e-4			3.888e-4		
1 "Low Prediction" con	centration pro	duced w	ith HIGHE	ST	r	moisture content and	f DEEPE	ST	depth to		
contamination. ² "High Prediction" con contamination.	centration pro	oduced v	with LOWE	ST	I	moisture content an	d SHALL	OWEST	depth to		

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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		For an Example	ì				
Enter Site Name (optional):	المربيس ريب يستند و مروره		Industrial Wc	rker - phase II			
Enter sample concentration, units	and media type	2.9	1e-1	yg/L	Ground	Water	
What is the depth of the soil gas s ground water contamination)?(LT)				7	r	neters	
This value can change by +/-				1	meters		
What is your contaminant of concer	n (COC)?		alpha-HCH (a	lpha-BHC)		ι.	
What type of building are you invest	ligating at your site?				Slab-on-Grade	4	
What type of soil is beneath the buil	lding?				Loam		
What is the average soil/ground wa	ter temperature?				55	Farenheit	
Chemical Properties							
CAS Number			319846				
Molecular Weight	• •		290.83	(g/mole)			
-	tant at ground water temperatur	e (H)		16 (unitiess)			
Free-Air Diffusion	• •		1.420e-2	[cm²/s]			
Diffusivity in Wate			7.340e-6	[cm²/s]			
Unit Risk Factor (I	JRF)		1.80e-3	[(µg/m³)-1}			
Reference Concer	ntration (RfC)		0.	[mg/m3]	•		
Soil Properties							
Total Porosity (n)			0.399	(unitiess)			
Unsaturated Zone	Moisture Content Lov		Best Estimate	High 0.240	[unitless]		
(0 w)			0.148				
	isture Content at Air-Entry Press	sure	0.332	[unitl e ss]			
(B w,cap)	Tere (07.)		0.075	[m]			
Height of Capillary			0.375	[m]			
•	a Into the Building (Qsoil)		5.00	(L/min)			
Building Properties Air Exchange Rate	(Fp)		0.250	{hr-1}			
Building Mixing Ha			2.44	(m)			
Building Footprint			100.0	j] [m²]			
Subsurface Found	• •			(m²) (m²)			
Subsuitace Found	auon Alea (AB)		106.0	hu=1			

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ente:

	Building Cra	, .,						00038	[unitless]			
	•	Indation Slab Thi	ckness (L	.crack)			0.	100	[m]			
Exposure Parameter				D .)			26		(years)			
	•	uration for Carcin		-								
	•	equency for Card					25	-	[days/year]	I		
		ime for Carcinog					70		(years)			
	•	uration for Non-C					25		(years)			
	Exposure Fr	equency for Non	Carcinog	iens (EFnc)			25	-	[days/year]			
	Averaging T	ime for Non-Carc	inogens (ATnc)			25		[years]			
			C	CALC	ULATE	RESULTS	\square					
RESULTS												
	Unsaturated Zone Effective Diffusion Coefficient (Dem)											
	Unsaturated + Capiliary Zone Effective Diffusion Coefficient (DT						0.0	01780	[cm ² /s]			
	eff)											
	<u>"A" Pa</u>	rameter				1.591e-4			rameter a: : mechani.			
	<u>"B" Pa</u>	rameter				1218,			rough so.			
	<u>"C" Pa</u>	rameter				0.004918			ocess for bathway.	the sub:	surface	to
	Jo	hnson & Ettinge	r Attenu	ation Facto	<u>or (</u> a)			-	_			1.541e-
	INDOOR AIF	RESULTS FOR	GROUN	ID WATER	S	AMPLE DA	ſΑ					
	Low Prediction	วกร		Best Estim	ate			High Pre	idiction ²			
Indoor Air Concentration	3.872e-6	[µg/m3] 3.257e-7	[ppbv]	4.434e-6	[µg/m	3] 3.730e-7	(ppbv)	1.207e-	5 (µg/m³)	1.0158-6	[ppbv]	
Cancer Risk		1.7058-9			1.95	2e-9			5.313e	.9		
Hazard Quotient		0.			0.				0.			
1 "Low Prediction" con	centration proc	duced with BEST	ESTIMA	TE I	noisture	content and	I DEEPE	ST	de	pth to		
contamination. ² "High Prediction" cor contamination.					moisture	e content an	y Shali	.OWEST	de	epth to		

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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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	ſ	Click For an Exam	ple)				
Enter Site Na	me (optional):		Industrial Wo	rker - phase II			
Enter sample	concentration, units and media type		2.96e-1	μg/L ·	Ground Water		
	epth of the soil gas sample or ground water i contamination)?(i.T)	table (for		7	n	neters	
•	n change by +/-			m	meters		
What is your co	ntaminant of concern (COC)?		alpha-HCH (a	lpha-BHC)		х	
What type of bu	uilding are you investigating at your site?			:	Slab-on-Grade		
What type of so	if is beneath the building?				Loam		
What is the <u>ave</u>	rage soil/ground water temperature?				55	Farenheit	
Chemical Properties							
	CAS Number		319846				
	Molecular Weight (MW)		290.83	[g/mole]			
	Henry's Law Constant at ground water ten	nperature (H)		6 [unitless]			
	Free-Air Diffusion Coefficient (Da)		1.420e-2	[cm ² /s]			
	Diffusivity in Water (Dw)		7.340e-6	[cm²/s]			
	Unit Risk Factor (URF)		1,80e-3	{(µg/m³)-1]			
	Reference Concentration (RfC)		0.	[mg/m³]			
Soil Properties							
	Total Porosity (n)		0.399	(unitiess)			
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitiess]		
	(0 w)		0.148				
	Capillary Zone Moisture Content at Air-En	try Pressure	0.332	[unitiess]			
	(O w,cap)						
	Height of Capillary Zone (CZh)		0.375	[m]			
	Soil-gas Flow Rate Into the Building (Qsoil)	5.00	[L/min]			
Building Properties							
	AIr Exchange Rate (Es)		0.250	[hr-1]			
	Building Mixing Height (HB)		2.44	(m)			
	Building Footprint Area (FB)		100.0	[m²]			
	Subsurface Foundation Area (As)		106.0	(m²)			

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Backward Calculation full uncertainty analysis

	Building Crack Ratio	(л)	0.0	00038	(unitiess)						
	Building Foundation §	Slab Thickness (L	0.	100	(m)						
xposure Parameters	3										
• • • •	Exposure Duration fo	r Carcinogens (E	Dc)			25		[years]			
	Exposure Frequency	for Carcinogens ((EFc)			25	0	(days/year			
	Averaging Time for C	arcinogens (ATc)	•			70		[years]			
	Exposure Duration fo	r Non-Carcinoger	is (EDnc)			25		[years]			
	Exposure Frequency	for Non-Carcinog	ens (EFnc)			25	0	[days/year	İ		
	Averaging Time for N	on-Carcinogens (ATnc}			25		(years)			
		ſ	CALC	ULATE	RESULTS]					
ESULTS											
	Unsaturated Zone Eff	ective Diffusion C	oefficient (Deff)		0.0	01699	[cm²/s]			
	Unsaturated + Capilla	ry Zone Effective	Diffusion C	oefficie	nt (DT	0.0	01780	[cm2/s]			
	ett)										
	"A" Parameter				1.591e-4	Based on parameter analysis: Advection is					
	"8" Parameter				1218.	the dominant mechanism across foundation. Diffusion through soil is the overall rate-					
	"C" Perameter				0.004918	limiting process for the subsurface to indoor-air pathway.					
	Johnson &	Ettinger Attenu	ation Facto	<u>or (</u> α)				•			1.541e-4
	INDOOR AIR RESUL	TS FOR GROUN	0 WATER	S	AMPLE DAT	A					
	Low Prediction1		Best Estim	ate		High Prediction ²					
Indoor Air Concentration	3.939e-6 (µg/m³)3	.313e-7 (ppbv)	4.510e-6	[µg/m	3] 3.794e-7	(ppbv)	1.227e-5	i [µg/m³]	1.033e-6	(ppbv)	
Cancer Risk	1.734e-9)	1,986e-9				5.405e-9				
Hazard Quotient	0,		0.			0.					
							1				
"Low Prediction" conc Intamination.	centration produced wit	h BEST ESTIMA	TE n	noisture	content and	DEEPE	ST	de	pih to		
"High Prediction" con	centration produced will	th HIGHEST	1	noisture	content and	shali	OWEST	đ	epth to		

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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	ſ	Click For an Exam	ple					
Enter Site Na	me (optional):	Industrial Worker - phase li						
Enter sample	concentration, units and media type	1.11e-1	µg/L	- Ground V	Vater			
ground water	What is the depth of the soil gas sample or ground water table (for ground water contamination)?(L⊤) This value can change by +/-			7		eters		
What is your co	ntaminant of concern (COC)?		Dieldrin					
What type of bu	ilding are you investigating at your site?				Slab-on-Grade			
What type of so	il is beneath the building?				Loam			
What is the <u>ave</u>	What is the average soli/ground water temperature?				55	Farenheit		
Chemical Properties								
	CAS Number		60571					
	Molecular Weight (MW)		380.91	[g/mole]				
	Henry's Law Constant at ground water terr	nperature (H)	0.0001098	9 [unitiess]				
	Free-Air Diffusion Coefficient (Da)		1.250e-2	[cm²/s]				
	Diffusivity in Water (Dw)		4.7408-6	[cm²/s]				
	Unit Risk Factor (URF)		4.60e-3	[(µg/m³)-1]				
	Reference Concentration (RfC)		1.75e-4	[mg/m3]				
Soil Properties								
	Total Porosity (n)		0.399	[unitiess]				
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]			
	(G w)		0.148					
	Capillary Zone Moisture Content at Air-Ent (0w.cap)	ry Pressure	0.332	[unitiess]				
	Height of Capillary Zone (CZh)		0.375	[m]				
	Soil-gas Flow Rate Into the Building (Qsoif)	5.00	(L/min)				
Building Properties		•		•				
	Air Exchange Rate (EB)		0.250	[hr-1]				
	Building Mixing Height (Ha)		2.44	[m]				
	Building Footprint Area (FB)		100.0	[m²]				
	Subsurface Foundation Area (AB)		106.0	[m²]				

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	Building Cr	rack Ratio (ŋ)					0.00038	(unitiess)			
	Building Fo	oundation Stab Thic	0.100	[m]							
Exposure Parameter	s										
	Exposure (Duration for Carcino	gens (El	Dc)			25	(years)			
	Exposure F	requency for Carci	nogens (EFc)			250	[days/yea	1		
	Averaging	Time for Carcinoge	ns (ATc)				70	[years]			
	Exposure (Duration for Non-Ca	rcinogen	s (EDnc)			25	[years]			
	Exposure F	Frequency for Non-O	Carcinog	ens (EFnc)		250	[days/year	1		
	Averaging	Time for Non-Carcin	nogens (ATnc)			25	[years]			
			C	CALC	ULATE RESULT	\$					
RESULTS											
	Unsaturate	d Zone Effective Di	fusion C	oefficient (Deff)		0.001254	[cm²/s]			
	Unsaturate	d + Capillary Zone I	ffective	Diffusion	Coefficient (DT		0.001312	[cm²/s]			
	eff)										
	<u>"A" P</u>	arameter			1.172e-4			arameter a int mechani			
	<u>"8" P</u>	arameter			1649.			through so			
	<u>"Ç" P</u>	arameter			0.004918		limiting p indcor-air	rocess for pathway	the sub	surface	to
	Å	ohnson & Ettinger	Attenu	tion Fact	<u>or (</u> a)						1.145e
	INDOOR A	IR RESULTS FOR	GROUN	D WATER	SAMPLE D	DATA	۹				
	Low Predic	tion1		Best Estin	nate		Hign f				
Indoor Air Concentration	1.219e-6	[µg/m3] 7.829e-8	[ppbv]	1.397e-6	[µµ/m3] 8.972e	-8	[ppbv] 3.151	e-6 (µg/m3	2.0240-7	[ppbv]	
Cancer Risk	1	1.372e-9			1.572e-9			3,5456	-9		
Hazard Quotient	4.771e-6 5.467e-6						1.2339-5				
"Low Prediction" con ontamination.	centration pro	oduced with BEST	ESTIMA	TE	moisture content a	and	DEEPEST	d	əplih to		
"High Prediction" cor contamination.	centration pr	oduced with HIGHE	ST		moisture content	and	SHALLOWE	ST d	epth to		

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

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		Click For an Exam	ple			
Enter Site Nar	ne (optional):		adult resider	it - Phase Ií		
Enter sample	concentration, units and media type		1.6	իმ\Ր	Ground V	Valer -
	pth of the soil gas sample or ground wate	r table (for		7	m	eters
•	contamination)?(LT) I change by +/-			1	m	eters
What is your co	ntaminant of concern (COC)?		Benzene			
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	l is beneath the building?				Loam	
What is the aver	age soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		71432			
	Molecular Weight (MW)		78.11	[g/mole]		
	Henry's Law Constant at ground water to	0.1316031	[unitless]			
	Free-Air Diffusion Coefficient (Da)		8.800e-2	[cm²/s]		
	Diffusivity in Water (Dw)		9.800e-6	[cm²/s]		
	Unit Risk Factor (URF)		7.80e-6	((µg/m³)-1]		
	Reference Concentration (RfC)		0.	[mg/m3]		
Soil Properties						
	Total Porosity (n)		0.399	[unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitless)	
	(0 w)		0.148	-		
	Capillary Zone Moisture Content at Air-E	ntry Pressure	0.332	(unitless)		
	(Ow,cap)					
	Height of Capiliary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qso	HI)	5.00	[Umin]		
Building Properties						
	Air Exchange Rate (EB)		0.250	{hr-\$]		
	Building Mixing Height (He)		2.44	(m)		
	Building Footprint Area (Fs)		100.0	[m²]		
	Subsurface Foundation Area (AB)		105.0	[m²]		

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Backward Calculation full uncertainty analysis

	Building Crack Ratio (ŋ)		0.00038	[unitiess]			
	Building Foundation Slab Thickness (Lcrack)	0.100	(m)			
Exposure Parameter	8						
	Exposure Duration for Carcinogens (#	EDc)	30	[years]			
	Exposure Frequency for Carcinogens	(EFc)	350	[days/year]			
	Averaging Time for Carcinogens (ATe)	70	[years]			
	Exposure Duration for Non-Carcinoge	ns (EDnc)	30	(years)			
	Exposure Frequency for Non-Carcino	gens (EFnc)	365	[days/year]			
	Averaging Time for Non-Carcinogens	(ATnc)	30	[years]			
	l	CALCULATE RESULTS)				
RESULTS							
	Unsaturated Zone Effective Diffusion	Condicient (Dem)	0.005540	(cm²/s)			
	Unsaturated + Capillary Zone Effective	Dilfusion Coofficient (DT	0.001190	01190 [cm²/s]			
	eff)						
	"A" Parameter	1.064e-4		rameter analysis: Advect			
	"8" Parameter	373,4	the dominant machanism across foundation. Diffusion through soil is the overall rate- limiting process for the subsurface to indoor-air pathway.				
	"C" Parameter	0.004918					
	Johnson & Ettinger Attenu	ation Factor (0)			1.041e-4		
[INDOOR AIR RESULTS FOR GROUP	ND WATER SAMPLE DAT	A				
	Low Prediction1	Best Estimate	High Pr	ediction?			
Indoor Air Concentration	0.01188 [µg/m³]0.003721 [ppbv	0.02192 [µg/m³] 0.006866	[ppbv] 0.02538	3 [µg/m³]0.007950 [ppbv]			
Cancer Risk	3.608e-8	7.027e-8		8.136e-8			
Hazard Quotient	0.	0.		0.			
1 "Low Prediction" con contamination.	centration produced with HIGHEST	moisture content and	DEEPEST	depth to			
² "High Prediction" con contamination.	centration produced with LOWEST	moisture content and	I SHALLOWEST	depth to			

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	C	Click For an Exam	ple								
Enter Site Name (optic	Enter Site Name (optional):				aduit resident - Phase II						
Enter sample concentr	ration, units and media type		.316	hðvr	Ground V	Vater					
,	e soil gas sample or ground water ta	able (for		7	m	eters ·					
ground water contamin This value can change	, . ,			1	m	eters					
What is your contaminar	it of concern (COC)?		1,4-Dichlorol	benzene							
What type of building are	e you investigating at your site?				Slab-on-Grade						
What type of soil is bene	ath the building?				Loam						
What is the average soil	ground water temperature?				55	Farenheit					
Chemical Properties											
CAS N	umber		106467								
Molecu	ılar Weight (MW)		147	[g/mole]							
Henry's	s Law Constant at ground water tem	perature (H)	0.045435	60 [unitiess]							
Free-A	ir Diffusion Coefficient (Da)		6.900e-2	[cm²/s]							
Diffusiv	/ity in Water (Dw)		7.900e-6	[cm²/s]							
Unit Ri	sk Factor (URF)		0.	[(µg/m³)·1]							
Refere	nce Concentration (RfC)		0.800	[mg/m3]							
Soli Properties											
Total P	orosity (n)		0.399	[unitless]							
Unsatu	rated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitiess)						
(0 w)			0.148	•	• •						
Capillar	ry Zone Moisture Content at Air-Entr	ry Pressure	0.332	(unitiess)							
(Ow,cap)										
Height	of Capillary Zone (CZh)		0.375	[m]							
Soil-ga	s Flow Rate Into the Building (Qsoil)	Ì	5.00	(L/min)							
Building Properties											
Air Exc	hange Rate (EB)		0.250	[hr-\$]							
Building	g Mixing Height (HB)		2.44	(m)							
Building	g Footprint Area (F8)		100.0	[m²]							
Subsur	face Foundation Area (AB)		106.0	[m²]							

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Backward Calculation full uncertainty analysis

	Bullding Crack Ratio (ŋ) Bullding Foundation Slab Thickness (Lerack)							0.00038 [unitless] 0.100 [m]					
Exposure Parameter	5			,	•					• •			
•	Exposure (Duration f	or Carcino	gens (E	Dc)			30		[years]			
	Exposure F	Frequenc	y for Carch	nogens (EFc)			35)	[days/year	1		
	Averaging	Time for	Carcinoge	ns (ATc)				70		[years]			
	Exposure [Duration f	or Non-Ca	rcinoger	is (EDnc)			30		[years]			
	Exposure F	requency	y for Non-O	Carcinog	ens (EFnc)			36	5	[days/year]		
	Averaging	Time for I	Von-Carcir	nogens (ATnc)			30		[years]			
				C	CALC	JLATE F	RESULTS)					
RESULTS													
	Unsaturate	d Zone E	ffective Dil	fusion.C	oefficient (C)eff)		0.0	04345	[cm²/s]			
	Unsaturate	d + Capil	ery Zone I	Sflective	Dilfusion C	oefficien	t (DT	0.0	01140	[cm²/s]			
	eff)												
	<u>"A" P</u>	arameter				1	.018e-4			ameter a			
	<u>"B" P</u>	arameter				4	76.1	the dominant mechanism across foundation. Diffusion through soil is the overall rate-					
	<u>"C" P</u>	arameter				c	0.004918	limiting process for the subsurface to indoor-air pathway.					e to
	Ţ	ohnson i	& Ettinger	Attenu	ation Facto	<u>r (</u> α)				•			9.977e-5
	NDOOR A	IR RESU	LTS FOR	GROUN	D WATER	SA	MPLE DAT	ГА					
	Low Predic	tion1			Best Estim	ate		High Prediction2					
Indoor Air Concentration	7.075e-4	(µg/m³j	1.1778-4	(ppbv)	0.001432	[µg/m³	2.384e-4	(ppbv)	0.001719	9 [µg/m³]	2.860e-4	(ppbv)	
Cancer Risk		0,				0.				0.			
Hazard Quotient	8.843e-7 1.79						s-6			2.148e	-6		
1 "Low Prediction" cond contamination. 2 "High Prediction" con contamination.							content and				pih to apih to		

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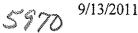
What do these results mean?

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Ecosystems Research Division

EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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	[Click For an Example	•			
Enter Site Na	me (optional):		adult resider	at - Phase II		
Enter sample	concentration, units and media type		2.91	µg/L	· Ground W	ater
	epth of the soil gas sample or ground water ta contamination)?(LT)	bie (for		7	me	lers
•	n change by +/-			1	me	ters
What is your co	ntaminant of concern (COC)?		1,1-Dichioroe	lhane		
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	It is beneath the building?				Loam	
What is the <u>ave</u>	rage soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		75343			
	Molecular Weight (MW)		98.96	[g/mole]		
	Henry's Law Constant at ground water temp	perature (H)	0.1399030) [unitiess]		
	Free-Air Diffusion Coefficient (Da)		7.420e-2	[cm²/s]		
	Diffusivity in Water (Dw)		1.050e-5	[cm²/s]		
	Unit Risk Factor (URF)		0.	[(µg/m³)-1]		
	Reference Concentration (RfC)		0.500	[mg/m³}		
Soil Properties						
	Total Porosity (n)		0.399	(unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-Entry	/ Pressure	0.332	[unitiess]		
	(0w,cap)					
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil)		5.00	[L/min]		
Building Properties						
	Air Exchange Rate (Es)		0.250	[hr-1]		
	Building Mixing Height (He)		2.44	[m]		
	Building Footprint Area (FB)		100.0	(m²)		
	Subsurface Foundation Area (As)		106.0	[m²]		

http://www.epa.gov/athens/learn2model/part-two/onsite/JnE lite forward.html

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Backward Calculation full uncertainty analysis

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Foundation Slab Thick a Duration for Carcino a Frequency for Carcin g Time for Carcinoger a Duration for Non-Car	gens (ED logens (E lis (ATc)	ic)		0.100 30 350	(m) (years) (days/year					
e Frequency for Carcir g Time for Carcinoger e Duration for Non-Car	nogens (E ns (ATc)									
e Frequency for Carcir g Time for Carcinoger e Duration for Non-Car	nogens (E ns (ATc)									
g Time for Carcinoger Duration for Non-Ca	ns (ATc)	EFc)		350	friessehone					
Duration for Non-Ca	• •				faaysysea					
	rcinogens			70	(years)					
	anadeus	3 (EDnc)		30	[years]					
Frequency for Non-C	arcinoge	ns (EFnc)		365	[days/year	[days/yea/]				
g Time for Non-Carcin	iogens (A	(Tnc)		30	[years]					
	1	CALCULAT	E RESULTS							
	۰ <u>ـــ</u>			³						
ted Zone Effective Dif	lusion Co	anticient (Deff)		0.004671	[cm ² /s]					
ted + Capillary Zone F	Hisclive f	Dilfusion Coeffic	ent (DT	0.001027	[cm ² /s]					
Parameter			9.175e-5							
Parameter			442.9							
Peremeter				limiting p	COCEBB for					
	• • • • • • • • • • • • • • • • • • • •		0.004010	indoor-air	pathway.					
Johnson & Ettinger	Attenua	tion Factor (a)						9.006e-5		
AIR RESULTS FOR	GROUND) WATER	SAMPLE DAT]			
[µɑ/m³]0.004857	[ppbv][).03667 [µg/r	m3 0.009065	[ppbv]0.0426	3 [µg/m3]	0.01054	[ppbv]			
0.		0.			0.					
	ited Zone Effestive Dif ited + Capjilary Zone E Parameter Parameter Parameter Johnson & Ettinger AIR RESULTS FOR O liction1	Itod Zone Effective Diffusion Cr Itod Zone Effective Diffusion Cr Parameter Parameter Peremeter Johnson & Ettinger Attenuar AIR RESULTS FOR GROUND Indion 1	ited Zone Effective Diffusion Coefficient (Deff) ited + Capillary Zone Effective Diffusion Coeffic Perameter Parameter Johnson & Ettinger Attenuation Factor (α) AIR RESULTS FOR GROUND WATER itelion1 Best Estimate	CALCULATE RESULTS Lied Zone Effective Diffusion Coefficient (Deff) Ided + Capiliary Zone Effective Diffusion Coefficient (DT Parameter 9.175e-5 Parameter 9.175e-5 Parameter 442.9 Perameter 0.004918 Johnson & Ettinger Attenuation Factor (a) Intervention factor (bit for the formation factor for the formation fa	CALCULATE RESULTS Inded Zone Effective Diffusion Coefficient (Deff) 0.004671 Inded + Capillary Zone Effective Diffusion Coefficient (DT 0.001027 Perameter 9.175e-5 Based on puthe dominant parameter Parameter 9.175e-5 Based on puthe dominant parameter 11mitting function for parameter Perameter 0.004918 11mitting function for parameter 11mitting function for parameter Johnson & Ettinger Attenuation Factor (a) AIR RESULTS FOR GROUND WATER SAMPLE DATA liction1 Best Estimate High Parameter	CALCULATE RESULTS Ind Zone Effective Diffusion Coefficient (Deff) 0.004671 [cm²/s] Ind Zone Effective Diffusion Coefficient (DT 0.001027 [cm²/s] Parameter 9.175e-5 Based on parameter a the dominant mechani Parameter 442.9 Diffusion through so Parameter 0.004918 limiting process for indoor-air pathway. Johnson & Ettinger Attenuation Factor.(a) AIR RESULTS FOR GROUND WATER SAMPLE DATA liction1 Best Estimate High Prediction2	CALCULATE RESULTS Ided Zone Effective Diffusion Coefficient (Deff) 0.004671 [cm2/s] ded + Capillary Zone Effective Diffusion Coefficient (DT Parameter 9.175e-5 Based on parameter analysis: the dominant mechanism across Parameter 442.9 Diffusion through soil is thi indoor-air pathway. Johnson & Ettinger Attenuation Factor (a) Jain Etinger Attenuation Factor (a) AIR RESULTS FOR GROUND WATER SAMPLE DATA lingh Prediction2 High Prediction2	CALCULATE RESULTS Ind Zone Effective Diffusion Coefficient (Deff) 0.004671 [cm²/s] Ind Zone Effective Diffusion Coefficient (DT 0.001027 [cm²/s] Parameter 9.175e-5 Based on parameter analysis: Advective dominant mechanism across found Diffusion through soil is the overal Parameter Parameter 0.004918 Imating process for the subsurface indoor-air pathway. Johnson & Ettinger Attenuation Factor.(a) AIR RESULTS FOR GROUND WATER SAMPLE DATA High Prediction2		

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What do these results mean?

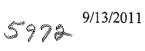
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Phase I Data

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Forward Calculation of Indoor Air Concentration Background

Backward Calculation full uncertainty analysis

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	ĺ	Click For an Exam	ple			
Enter Site Na	me (optional):	n - In Search - In Addressen and Annale - In and Annale - Search - Search - Search - Search - Search - Search -	Industrial wo	rker		
Enter sample	concentration, units and media type		0.0698	µg/L	Ground W	/ater
	apth of the soil gas sample or ground water t contamination)?(Lt)	table (for		7	ma	aters
•	change by +/-			1	me	aters
What is your co	ntaminant of concern (COC)?		alpha-HCH (e	lpha-BHC)		
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	il is beneath the building?				Loam	
What is the ave	rage soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		319846			
	Molecular Weight (MW)		290.83	[g/mole]		
	Henry's Law Constant at ground water ten	nperature (H)		36 [unitless]		
	Free-Air Diffusion Coefficient (Da)		1.420e-2	[cm²/s]		
	Diffusivity in Water (Dw)		7.340e-6	[cm²/s]		
	Unit Risk Factor (URF)		1.80e-3	{(µg/m³)-1]		
	Reference Concentration (RfC)		0.	[mg/m3]		
Soil Properties						
	Total Porosity (n)		0.399	(unitless)		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-En	try Pressure	0.332	(unitless)		
	(0 w,cap)					
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoit)	5.00	[L/min]		
Building Properties	Air Fuchanana Data (En)			14 - 43		
	Air Exchange Rate (Es)		0.250	(hr-1)		
	Building Mixing Height (He)		2.44	[m] ()]		
	Building Foolprint Area (FB)		100.0	[m²]		
	Subsurface Foundation Area (Aa)		106.0	[m²]		

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	Building C	rack Rati	o (ŋ)					0.00	038	(unitless)			
	Building Fo	oundation	n Slab Thic	kness (L	-crack)			0.10	00	{m]			
Exposure Parameter	6												
	Exposure	Duration	for Carcine	igens (E	Dc)			25		(years)			
	Exposure I	Frequenc	y for Carci	nogens	(EFc)			250		[days/yea	v7]		
	Averaging	Time for	Carcinoge	ns (ATc)	•			70		years			
	Exposure I	Duration	for Non-Ca	rcinoger	ns (EDnc)			25		[years]			
	Exposure I	Frequenc	y for Non-(Carcinog	ens (EFnc))		250		[days/yea	ır]		
	Averaging	Time for	Non-Carci	nogens (ATnc)			25		[years]			
				ſ	CALC	ULATE	RESULTS						
RESULTS				I.,				»					
	Unsaturate	Insaturated Zone Effective Diffusion Coefficient (Derr)							1699	[cm²/s]			
	Unsaturate	Insaturated + Capillary Zone Effective Diffusion Coefficient (DT						0.00	1780	[cm²/s]			
	eff)												
	"A" P	arameter					1.591a-4				analysis		
	<u>"B" P</u>	arameter					1218.				ism acros oil is th		
	<u>"C" P</u>	arameter				(0.004918			cess fo athway.	r the sub	osurface	to
	7	lohnson	& Ettinger	Attenu	ation Fact	<u>or (</u> α)			-	·			1.541e-4
	INDOOR A	IR RESU	LTS FOR	GROUN	ID WATER	S/	MPLE DAT	A					
	Low Predic	tion1			Best Estin	vate		н	igh Pre	diction?			
Indoor Air	9.288e-7	[µg/m ^s]	7.8136-8	[ppbv]	1.064e-6	[µg/m³	8.947e-8	[ppbv] 2	.8949-6	[µg/m ³	2.435e-7	(ppbv)	
Concentration							l						
Cancer Risk		4.090e	10		Ĺ	4.6836	9-10			1.274	e-9		
Hazard Quotient		0.				0.				0.			
"Low Prediction" con ontamination.	centration pro	oduced w	ith BEST I	estima	TE r	noisture	content and	DEEPES	т	d	epth to		
"High Prediction" con Intamination.	centration pr	oduced v	ith HIGHE	ST	I	moislure	content and	SHALLC	WEST	G	lepth to		

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	C	Click For an Exam	ple)				
Enter Site Na	ame (optional):		Industrial Wo	orker			
Enter sample	econcentration, units and media type		2.726	μg/L	Ground	Water	
	lepth of the soll gas sample or ground water t	able (for		7	n	neters	
-	contamination)?(LT) In change by +/-						
This value ca	in change by #-			1	ĥ	eters	
What is your ce	ontaminant of concern (COC)?		gamma-HCH (Lindane)				
What type of b	uilding are you investigating at your site?				Slab-on-Grade		
What type of se	oil is beneath the building?				Loam		
What is the <u>ave</u>	arage soil/ground water temperature?				55	Farenheit	
Chemical Properties							
	CAS Number		58899				
	Molecular Weight (MW)		290.83	[g/mole}			
	Henry's Law Constant at ground water tem	perature (H)	0.0001305	i7 (unilless)			
	Free-Air Diffusion Coefficient (Da)		1.420e-2	[cm²/s]			
	Diffusivity in Water (Dw)		7.340e-6	[cm²/s]			
	Unit Risk Factor (URF)		3.71e-4	{(µg/m³)-1]			
	Reference Concentration (RfC)		1.05e-3	[mg/m3]			
Soll Properties							
	Total Porosity (n)		0.399	[unitiess]			
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitiess]		
	(O w)		0.148				
	Capillary Zone Moisture Content at Air-Entr	ry Pressure	0.332	[unitiess]			
	(6w,cap)						
	Height of Capillary Zone (CZh)		0.375	(m)			
	Soll-gas Flow Rate Into the Building (Qeoil)		5.00	[L/min]			
Building Properties	Air Fuchanna Data (Fal						
	Air Exchange Rate (EB)		0.250	(hr-1)			
	Building Mixing Height (HB)		2.44	[m]			
	Building Footprint Area (FB)		100.0	[m²]			
	Subsurface Foundation Area (AB)		106.0	(m²]			

	Building C	rack Reti	o (ŋ)					0.	00038	[unitless]			
	Building F	oundation	n Slab Thio	kness (L	.crack)			0.	100	[m]			
Exposure Paramete	rs												
	Exposure	Duration	for Carcine	ogens (E	Dc)			29	5	[years]			
	Exposure	Frequenc	y for Carci	nogens	(EFc)			25	i0	[days/year)		
	Averaging	Time for	Carcinoge	ns (ATc))			70)	[years]			
	Exposure	Exposure Duration for Non-Carcinogens (EDnc)							5	[years]			
	Exposure Frequency for Non-Carcinogens (EFnc)							25	0	[days/year]			
	Averaging	Time for	Non-Carci	nogens (ATnc}			25	i	(years)			
				ſ	CALC	ULATE R	ESULTS]					
RESULTS				۰.									
	Unsaturate	Unsaturated Zone Effective Diffusion Coefficient (Deff)							0.001503 [cm²/s]				
	Unsaturate	Unsaturated + Capillary Zone Effective Diffusion Coefficient (DT						0.0	001573	[cm²/s]			
	eff)												
	<u>"A" E</u>	Parameter	<u>r</u>			1.	406e-4			ameter a			
	<u>"B" F</u>	arameter				13	376.			mechaní rough so			dation. all rate-
	<u>"C" F</u>	Parameter	5			0.	004918		ing pro r-air p	cess for	the sub	surface	e to
		Johnson	& Ettinger	Attenu	ation Fact	o <u>r (</u> a)			- 444 P	activaj :			1.367
<u></u>	INDOOR A	NR RESU	LTS FOR	GROUN	D WATER	SA	MPLE DAT	A	·		·· · ·		
	Low Predic	tion			Best Estim	ate			High Pred	liction2			
Indoor Air	4.248e-5	[µg/m³]	3.574e-6	(ppbv)	4.866e-5	[µg/m3]	4.093e-6	[ppbv]	1.170e-4	[µg/m3]	9.842e-6	(ppbv)	
Concentration												1	
Cancer Risk		3.855e	-9			4.4169-	9			1.062e	8		
Hazard Quotient		2.771e	.5			3.174e-	5			7.632e-	5		
"Low Prediction" con	centration pr	oduced w	ith BEST I	ESTIMA	TE r	noisture co	ontent and	DEEPE	ST	de	pth to		
ontamination.													
"High Prediction" cor				· ~ -		moisture c							

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	C	Click For an Exampl	e					
Enter Sile Na	me (optional):		Industrial Wo	orker				
Enter sample	concentration, units and media type		0.29	µg/L	Ground \	Vater		
	epth of the soil gas sample or ground water ta contamination)?(L _T)	ble (for		7	m	eters		
-	n change by +/-			1	នា	elers		
What is your co	ntaminant of concern (COC)?		alpha-HCH (alpha-BHC)					
What type of bu	ilding are you investigating at your site?				Slab-on-Grade			
What type of so	is beneath the building?				Loam			
What is the ave	rage soil/ground water temperature?				55	Farenheit		
Chemical Properties								
	CAS Number		319846					
	Molecular Weight (MW)		290.83	(g/mole)				
	Henry's Law Constant at ground water temp	perature (H)	0.000988	6 [unitless]				
	Free-Air Diffusion Coefficient (Da)		1.4208-2	[cm²/s]				
	Diffusivity in Water (Dw)		7.340e-6	[cm²/s]				
	Unit Risk Factor (URF)		1.80e-3	[(µg/m³)·1]				
	Reference Concentration (RfC)		0.	[mg/m ³]				
Soil Properties								
	Total Porosity (n)		0.399	(unitless)				
	Unsaturated Zone Molsture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]			
	(0 w)		0.148	-				
	Capillary Zone Moisture Content at Air-Entry	/ Pressure	0.332	[unitless]				
	(O w,cap)							
	Height of Capillary Zone (CZh)		0.375	[m]				
	Soil-gas Flow Rate Into the Building (Qsoil)		5.00	[L/min]				
Building Properties								
	Air Exchange Rate (Es)		0.250	[hr-1]				
	Building Mixing Height (HB)		2.44	[m]				
	Building Footprint Area (Fs)		100.0	[m²]				
	Subsurface Foundation Area (AB)		106.0	(m²)				

	Building C	rack Rati	ο (η)					0.	00038	[unitiess]			
	Building F	oundation	n Slab Thic	kness (L	crack)			Q.	100	(m)			
Exposure Parameter	rs												
	Exposure	Duration	for Carcino	gens (E	Dc)			25	i	(years)			
	Exposure	Frequenc	y for Carci	nogens	(EFc)			25	0	{days/year			
	Averaging	Time for	Carcinoger	ns (ATc)	r			70	•	[years]			
	Exposure I	Duration '	for Non-Ca	rcinoger	ns (EDnc)			25		(years)			
	Exposure	Exposure Frequency for Non-Carcinogens (EFnc) Averaging Time for Non-Carcinogens (ATnc)						25	0	[days/year]			
	Averaging	Time for	Non-Carcir	iogens (ATnc)			25		[years]			
				ſ	CALC	ULATE R	ESULTS]					
RESULTS				۰.									
	Unsaturate	saturated Zone Effective Diffusion Coefficient (Deff)						0.0	01699	[cm²/s]			
	Unsaturate	saturated + Capillary Zone Effective Diffusion Coefficient (DT						0.0	01780	[cm ² /s]			
	eff)	,											
	"A* P	arameter				1.	591e-4			ameter a			
	"B" P	arameter				12	218.	Diffu	sion th		il is th	e overa	ll rate-
	"C" P	arameter				0.	004918			cess for athway.	the sub	surface	to
	لد	lohnson	& Ettinger	Attenu	ation Facto	o <u>r (</u> a)							1.541e
	INDOOR A	IR RESU	LTS FOR	GROUN	D WATER	SA	VPLE DAT	ſA.					
	Low Predic	tion1			Best Estim	ate			High Pre	diction2		{	
Indoor Air	3.859e-6	[ug/m3]	3.246e-7	[ppbv]	4.4198-6	lug/m31	3.717e-7	[vdqq]	1.203e-5	[ua/m3]	1.012e-6	[ppbv]	
Concentration		11-11-1								1-4 1		"	
Cancer Risk		1.699e	9			1.9466	9			5.295e	9		
Hazard Quotient		0.				0.				0.			
	•							**************					

2 "High Prediction" concentration produced with HIGHEST moisture content and SHALLOWEST contamination.

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depth to

1.541e-4

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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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,	[Click For an Exampl	e				
Enter Site Na	me (optional):		Industrial Wo	rker			
Enter sample	concentration, units and media type		57.29	µg/L	Ground V	/ater	
	epth of the soll gas sample or ground water tat contamination)?(LT)	ole (for		7	meters		
•	n change by +/-			1	meters		
What is your co	ntaminant of concern (COC)?		Tetrachloroeth	iyləne			
What type of bi	ilding are you investigating at your site?				Slab-on-Grade		
What type of so	il is beneath the building?				Loam		
What is the <u>ave</u>	rage soil/ground water temperature?				55	Farenheit	
Chemical Properties							
	CAS Number		127184				
	Molecular Weight (MW)		165.83	[g/mole]			
	Henry's Law Constant at ground water temp	erature (H)	0.3934997				
	Free-Air Diffusion Coefficient (Da)		7.200e-2	[cm ² /s]			
	Diffusivity in Water (Dw)		8.200e-6	[cm ² /s]			
	Unit Risk Factor (URF)		3.00e-6	[(µg/m³)-1]			
	Reference Concentration (RfC)		0.	[mg/m³]			
Soil Properties							
	Total Porosity (n)		0,399	[unitiess]			
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitless)		
	(0w)		0.148				
	Capillary Zone Moisture Content at Air-Entry (0w.cap)	Pressure	0.332	[unitiess]			
	Height of Capillary Zone (CZh)		0.375	(m)			
	Soli-gas Flow Rate into the Building (Qsoll)		5.00	(L/min)			
Building Properties			0.00	framind			
	Air Exchange Rate (Ep)		0.250	[hr-1]			
	Building Mixing Height (HB)		2,44	[m]			
	Building Footprint Area (FB)		100.0	(m²)			
	Subsurface Foundation Area (AB)		106.0	[m²]			
			100.0	··· 1			

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Backward Calculation full uncertainty analysis

	Building Crack Ratio (n)			0.00038	[unitless]			
	Building Foundation Stab Thio	kness (Lorack)		0.100	(m)			
xposure Parameter	rs							
	Exposure Duration for Carcine	ogens (EDc)		25	(years)			
	Exposure Frequency for Carc	inogens (EFc)		250	[days/year]			
	Averaging Time for Carcinoge	ins (ATc)		70	[years]			
	Exposure Duration for Non-Ca	arcinogens (EDnc)		25	[years]			
	Exposure Frequency for Non-	Carcinogens (EFnc)		250	[days/year]			
	Averaging Time for Non-Carci	nogens (ATnc)		25	[years]			
		CALCULAT	ERESULTS					
ESULTS		R						
	Unsaturated Zone Effective D	iffusion Coefficient (Deff)		0.004532 [cm²/s]				
	Unsaturated + Capillary Zone	Effective Diffusion Coeffici	ent (DT	0.0008963	[cm2/s]			
	eff)							
	"A" Parameter		8.010e-5		trameter analysis t mechanism acro			
	"B" Parameter		456.5		hrough soil is t			
				limiting pr	beurface to			
	"C" Parameter		0.004918	indoor-air	pathway.	Dolliace co		
		r Attenuation Factor (a)	0.004918	indoor-air	pathway.	7.		
			SAMPLE DAT		pathway.			
	Johnson & Ettinge			ΓΑ	pathway. ediclion ²			
Indoor Air Concentration	Johnson & Ettinge INDOOR AIR RESULTS FOR	GROUND WATER Best Estimate		ΓΑ				
	Johnson & Ettinge INDOOR AIR RESULTS FOR Low Prediction1	GROUND WATER Best Estimate [ppbv] 1.777 (µg/r	SAMPLE DAT	FA High Pi	ediction2	7.		
Concentration	Johnson & Ettinge INDOOR AIR RESULTS FOR Low Prediction1 0.9959 [µg/m3] 0.1469	GROUND WATER Best Estimate [ppbv] 1.777 (µg/r	SAMPLE DAT	FA High Pi	ediction2 [µg/m3]0.3000	7.		

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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

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	ſ	Click For an Exam	ple			
Enter Site Name (optional):	-		Industrial We	orker		
Enter sample concentration,	units and media type		0.175	µg/L	Ground V	Valer
•	gas sample or ground water t	abie (for		7	m	eters
ground water contamination This value can change by +/				1	m	eters
What is your contaminant of c			Naphthalene			,
			rapitalatio			
What type of building are you	investigating at your site?				Slab-on-Grade	
What type of soil is beneath th	e building?				Loam	
What is the average soil/grour	d water temperature?				55	Farenheit
Chemical Properties						
CAS Numbe			91203			
Molecular W	- · ·		128,18	[g/mole]		
Henry's Law	Constant at ground water terr	nperature (H)	0.0081062	8 [unitless]		
Free-Air Diff	usion Coefficient (Da)		5.900e-2	[cm²/s]		
Diffusivity in	Water (Dw)		7.500e-6	[cm²/s]		
Unit Risk Fa	ctor (URF)		0.	[(µg/m³)-1]		
Reference C	oncentration (RfC)		3.00e-3	(mg/m³]		
Solf Properties						
Total Porosi	ly (n)		0.399	[unitless]		
Unsaturated	Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitiess]	
(0 w)			0.148			
• •	ne Moisture Content at Air-Ent	ry Pressure	0.332	[unitiess]		
(O w,cap)						
=	pillary Zone (CZh)		0.375	(m)		
-	v Rate Into the Building (Qsoil)	}	5.00	(L/min)		
Building Properties	.					
Air Exchange			0.250	[hr-1]		
=	ng Height (Ha)		2.44	(m)		
-	lprint Area (Fa)		100.0	[m²]		
Subsurface I	Foundation Area (As)		106.0	[m²]		

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Backward Calculation full uncertainty analysis

	Building C	rack Rati	ό (η)					0.	00038	(unitiess)			
	Building F	oundation	Siab Thic	kness (L	.crack)			0.	100	(៣)			
Exposure Parameter	15												
	Exposure	Duration	for Carcine	ogens (E	De)			28	i	[years]			
	Exposure	Frequenc	y for Carci	inogens	(EFc)			25	0	[days/year)		
	Averaging	Time for	Carcinoge	ins (ATc)	ł			70	i i	[years]			
	Exposure	Duration :	for Non-Ca	arcinoger	ns (EDnc)			25		[years]			
	Exposure	Frequenc	y for Non-(Carcinog	ens (EFac)	•		26	0	[days/year]			
	Averaging	Time for	Non-Carci	nogens (ATnc)			25		[years]			
				C	CALC	ULATE	RESULTS)					
RESULTS													
	Unsaturate	od Zone E	ffective Di	ffusion C	oefficient (Deff)		0,0	003724	[cm²/s]			
	Unsaturate	nsaturated + Capillary Zone Effective Diffusion Coefficient (DT						0.0	001883	[cm²/s]			
	eff)												
	<u>"A" F</u>	Parameter					1.683e-4			ameter a mechaní			
	<u>"B" F</u>	arameter	:				555.6	Diffu	sion th	rough so	il is th	e overa	ll rate-
	<u>"C" F</u>	Parameter	:				0.004918			cess for athway.	the sub	surface	to
	ذ	Johnson	& Ettinger	r Attenu	ation Fact	<u>or (</u> a)							1.627e-4
	INDOOR A	IR RESU	LTS FOR	GROUN	D WATER	S.	AMPLE DAT	A					
	Low Predic	stion1			Bast Estin	ate			High Pre	diction2			
Indoor Air Concentration	8.135e-5	(µg/m³)	1.553e-5	[ppbv]	2.308e-4	(µg/m	3] 4.406e-5	(ppbv)	3.3776-4	l (µg/m³)	6.447e-5	(ppbv)	
Cancer Risk		0.				0.			ļ	0.			
Hazard Quotient		1.857e	-5			5.270	18-5			7,711e	-5		
1 "Low Prediction" con contamination.	centration pr	oduced w	ith HIGHE	ST	г	noisture	content and	DEEP	ST	de	pth to		
² "High Prediction" cor contamination.	centration p	roduced v	with LOWE	ST		moisture	e content and	SHALI	.OWEST	de	epth to		

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Alr Concentration Background

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	٦	Click For an Exam	ple)			
Enter Site Name ((optional);		Adult residen	ıt		
Enter sample con	centration, units and media type		0.0698	µg/L	Ground	Water
•	of the soil gas sample or ground water t	able (for		7	m	neters ·
ground water cont This value can chi						
This value can on	ange by +/-			1	r	neters
What is your contain	ninant of concern (COC)?		alpha-HCH (al	pha-BHC)		
What type of buildin	g are you investigating at your site?				Slab-on-Grade	
What type of soil is	beneath the building?				Loam	
What is the average	soll/ground water temperature?				55	Farenheit
Chemical Properties						
••	AS Number		319846			
	olecular Weight (MW)		290.83	{g/mole}		
	anry's Law Constant at ground water tem	perature (H)	0.0000988	6 (unitiess)		
Fr	ee-Air Diffusion Coefficient (Da)		1.420e-2	[cm²/s]		
Di	ffusivity in Water (Dw)		7.340e-6	[cm²/s]		
Ur	hit Risk Factor (URF)		1.80e-3	[(µg/m³)-1]		
Re	ference Concentration (RfC)		0.	(mg/m³)		
Soil Properties						
To	tai Porosity (n)		0.399	[unitiess]		
Ur	saturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]	
(0 ,	•		0.148			
	spillary Zone Moisture Content at Air-Entr	ry Pressure	0.332	[unitless]		
	w,cap}					
	ight of Capillary Zone (CZh)		0.375	[m]		
	il-gas Flow Rate Into the Building (Qsoil)		5.00	[L/min]		
Building Properties						
	Exchange Rate (EB)		0.250	[hr-1]		
	ilding Mixing Height (HB)		2.44	[m]		
	ilding Footprint Area (FB)		100.0	[m²]		
Su	bsurface Foundation Area (AB)		106.0	[m²]		

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	Building C	rack Rat	io (ŋ)					0.0	0038	[unitless]			
	Building F	oundatio	n Slab Thic	kness (L	-crack)			0.1	00	(m)			
Exposure Parameter	rs												
	Exposure	Duration	for Carcino	igens (E	Dc)			30		(years)			
	Exposure	Frequen	cy for Carci	nogens i	(EFc)			36(C	[days/yeai	1		
	Averaging	Time for	Carcinoge	ns (ATc)	1			70		[years]			
	Exposure	Duration	for Non∗Ca	rcinoger	ns (EDac)			30		(years)			
	Exposure	Frequenc	y for Non-(Carcinog	iens (EFnc))		360	5	[days/year)		
	Averaging	Time for	Non-Carci	nogens ((ATnc)			30	i	[years]			
				ſ	CALC	ULATE	RESULTS	·····)					
ESULTS				٩									
	Unsaturate	enoZone	ffective Di	fusion C	cefficient (Deff)		0,0	01699	[cm²/s]			
	Unsaturate	ed + Capi	llary Zone I	Effective	Diffusion (Coefficie	<u>nt</u> (DT	0.0	01780	cm²/s]			
	off)												
	<u>"A" f</u>	aramele	Ċ				1.591e-4				nalysis:		
	<u>"8" F</u>	aramete	<u>r</u>				1218.				sm acros il is th		ation. 11 rate-
	<u>"C" F</u>	eramete	c				0.004918		ing prod -air pa		the sub	surface	to
	•	lohnson	& Ettinger	Attenu	ation Facto	<u>or (</u> a)							1.541e
	INDOOR A	IR RES	LTS FOR	GROUN	D WATER	S	AMPLE DAT	A	······	,			
	Low Predic	tion1			Best Estim	ale			-ligh Pred	iction2			
Indoor Air Concentration	9.288e-7	[µg/m³]	7.813e-8	(ppbv)	1.064e-6	(µg/m	3 8.947 0 -8	[ppbv]	2.894e-6	[µg/m³]	2.4350-7	(ppbv)	
Cancer Risk		6.871e	-10			7.867	e-10			2.141e	-9		
Hazard Quotient		0.				0.				0.			
	. I									-		J	
"Low Prediction" con	centration pr	oduced v	ith BEST I	ESTIMA	TE r	noisture	content and	DEEPE	ST	de	pth to		
ontamination.													

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

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	г	Click For an Exam	ple			
Enter Site Na	me (optional):		Adult residen	t		
Enter sample	concentration, units and media type		2.726	µg/L	Ground \	Vater
	epth of the soil gas sample or ground water ta contamination)?(Ltt)	able (for		7	m	eters
This value car	ר change by +/-			1	m	eters
What is your co	ntaminant of concern (COC)?		gamma-HCH	(Lindane)		
What type of bu	ilding are you investigating at your site?			-	Slab-on-Grade	
What type of so	il is beneath the building?				Loam	
What is the <u>ave</u>	rage soil/ground water temperature?		,		55	Farenheit
Chemical Properties						
	CAS Number		58899			
	Molecular Weight (MW)		290.83	[g/male]		
	Henry's Law Constant at ground water temp	perature (H)	0.0001305	- ,		
	Free-Air Diffusion Coefficient (Da)		1.420e-2	[cm²/s]		
	Diffusivity in Water (Dw)		7.340e-6	[cm²/s]		
	Unit Risk Factor (URF)	•	3.71e-4	[(µg/m³)·1]		
	Reference Concentration (RfC)		1.05e-3	[mg/m³]		
Soil Properties						
	Totai Porosity (n)		0.399	[unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitiess)	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-Entr	y Pressure	0.332	(unitless)		
	(O w,cap)					
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil)		5.00	(L/min)		
Building Properties	Als Evolutions Date (Ea)		0.055	0- 0		
	Air Exchange Rate (EB)		0.250	(hr-1)		
	Building Mixing Height (HB)		2.44	[m]		
	Building Foolprint Area (FB)		100.0	(m²)		
	Subsurface Foundation Area (AB)		106.0	[m²]		

	Building C	rack Rati	o (ŋ)					0.0	00038	[unitless]			
	Building F	oundation	n Slab Thic	kness (L	.crack)			0,1	100	[m]			
Exposure Parameter	s												
	Exposure	Duration	for Carcino	gens (Ei	Dc)			30	i.	(years)			
	Exposure	Frequenc	y for Carci	nogens (EFc)			35	0	(days/year)			
	Averaging	Time for	Carcinoge	ns (ATc)				70		(years)			
	Exposure	Duration :	for Non-Ca	ircinoger	s (EDnc)			30		(years)			
	Exposure	Frequenc	y for Non-(Carcinog	ens (EFnc)			36	5	[days/year]			
	Averaging	Time for	Non-Carci	nogens (ATnc)			30		(years)			
				ſ	CALC	ULATE	RESULTS						
RESULTS				. •									
	Unsaturate	d Zone E	ffective Di	ffusion C	oefficient (Deff)		0.0	01503	[cm²/s]			
	Unsaturate	id + Capi	lary Zone	Effective	Diffusion (Coefficier	<u>nt</u> (DT	0.0	01573	[cm²/s]			
	eff)												
	"A" F	Parameter	ŗ				1.406в-4				nalysis:		
	"B" F	arameter	:				1376.				sm acros il is th		ation. 11 rate-
	<u>"C" F</u>	arameter	[(0.004918	limit		cess for	the sub:		
	,	Johnson	& Ettinger	Attenua	tion Fact	or (a)		11000	r-arr yr	tenway.			1.367e
	INDOOR A	RRESU	TS FOR	GROUN	D WATER	<u></u>		Γ Α				}	
	Low Predic				Best Estim				High Pred	liction2			
Indoor Air	4.248e-5	រប្រា/៣ទីរ	3.574e-6	·	4,866e-5		4.093e-6		1.170e-4		9.842e-6	[ppbv]	
Concentration		19-9-11-1		164.4		(P8/11-		(222)		(1997)	010.20 0	(pport)	
Cancer Risk		6.477e	-9			7.419	e-9			1.784e	8		
Hazard Quotient		4.046e	-5			4.634	8-5			1.114e-	4		
												J	
"Low Prediction" con	centration pr	oduced w	ith BEST I	ESTIMA	re ,	noisture	content and	DEEPE	ST	de	pth to		
ostamination.	-										•		

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	C	Click For an Exam	ple			
Enter Site Na	me (optional):		Adult Reside	int		
Enter sample	concentration, units and media type		0.29	μg/L	Ground \	Vater ·
	epth of the soil gas sample or ground water ta	able (for		7	m	eters
•	contamination)?(Lт) n change by +/-			1		
1113 40100 02				*	11	eters
What is your co	antaminant of concern (COC)?		alpha-HCH (a	lpha-BHC)		÷
What type of bi	aliding are you investigating at your site?				Slab-on-Grade	
What type of so	if is beneath the building?				Loam	
What is the ave	rage soil/ground water temperature?				55	Farenheit
Chemical Properties				·		
	CAS Number		319846			
	Molecular Weight (MW)		290.83	[g/mole]		
	Henry's Law Constant at ground water tem	perature (H)	0.0000986	36 [unitiess]		
	Free-Air Diffusion Coefficient (Da)		1.420e-2	[cm²/s]		
	Diffusivity in Water (Dw)		7.340e-6	[cm²/s]		
	Unit Risk Factor (URF)		1.80e-3	[(µg/m³)-1]		
	Reference Concentration (RfC)		0.	(mg/m³)		
Soll Properties						
	Total Porosity (n)		0.399	[unitless]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitless)	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-Entr	y Pressure	0.332	[unitless]		
	(Øw,cap)					
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soll-gas Flow Rate into the Building (Qsoll)		5.00	(L/min)		
Building Properties	Air Evelopee Date (Ee)		A 0.54	76 4 3		
	Air Exchange Rate (EB)		0.250	{hr·1]		
	Building Mixing Height (HB)		2.44	(m)		
	Building Footprint Area (FB)		100.0	(m²)		
	Subsurface Foundation Area (AB)		106.0	[m²]		

	Building Cr	Building Crack Ratio (ŋ)						0.0	0038	[unitless]			
	Building Fo	undation	Slab Thic	kness (L	crack)			0,1	100	[m]			
Exposure Parameters	;												
-	Exposure D	ouration f	or Carcino	gens (El	De}			30		[years]			
	Exposure F	requenc	y for Carcl	nogens (EFc)			35	0	[days/year)		
	Averaging	Time for	Carcinoge	ns (ATc)				70		[years]			
	Exposure D	Juration t	or Non-Ca	rcinogen	is (EDnc)			30		(years)			
	Exposure F	requenc	y for Non-(Carcinog	ens (EFnc)			36	5	[days/year)		
	Averaging 1	Fime for	Non-Carci	nogens (ATnc)			30		[years]			
				ſ	CALC	ULATE F	ESULTS)					
RESULTS													
	Unsaturated	d Zone E	ffective Di	flusion C	oefficient (l	Deff)		0.0	01699	[cm²/s]			
	Unsaturated	d + Capil	lary Zone i	Effective	Diffusion C	oefficien	t (DT	0.0	01780	[cm²/s]			
	eff)												
	<u>"A" P</u>	arameter				1	.591e-4			ameter a mechani			
	<u>"B* Pa</u>	arameter				1	218,	Diffu	sion th	rough so	il is th	e overa	all rate-
	"C" P:	arameter	:			0	.004918			cess for athway.	the sub	surface	to to
	<u>يل</u>	ohnson	& Ettinger	Attenu	ation Facto	<u>οτ (</u> α)							1.541e-4
[INDOOR AI	R RESU	LTS FOR	GROUN	D WATER	SA	MPLE DAT	A					
	Low Predict	lion1			Best Estim	ate			High Pre	diction2			
Indoor Air Concentration	3.859e-6	(µg/m³)	3.2460-7	(ppbv)	4.419e-8	[µg/m3]	3.717e-7	[ppbv]	1.203e-t	[µg/m³]	1.012e-6	[ppbv]	
Cancer Risk	1	2.855e	-9			3.269e	-9			8.896e	-9		
Hazard Quotient	İ	0.				0.				0.			
1 "Low Prediction" conc contamination.	entration pro	oduced w	ith BEST	ESTIMA			content and			de	⊧pth to		
2 "High Prediction" conc contamination.	centration pro	oduced v	with HIGHE	≗ST	t	noislure	content and	i Shall	.OWEST	dı	epth to		

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Background

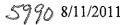
Migration of volatile chemicals from the subsurface into overlying buildings is called vapor intrusion (VI). Volatile organic chemicals in contaminated soils or groundwater can emit vapors, which may migrate through subsurface soils and may enter the indoor air of overlying buildings. Building depressurization may cause these vapors to enter the home through cracks in the foundation. Depressurization can be caused by a combination of wind effects and stack effects, which are the result of healing within the building and/or mechanical ventilation. In extreme cases, the vapors may accumulate in dwellings to levels that may pose near-tarm safety hazards, such as explosion. Typically, however, vapor concentrations are present at low levels, to which long-term exposure may pose increased risk for chronic health effects.

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	([*]	Click For an Exam	ple			
Enter Site Nat	ne (optional):		Adult Resider	n		
Enter sample	concentration, units and media type		57.29	µg/L	· Ground V	Vater
	epth of the soil gas sample or ground water t contamination)?(LT)	able (for		7	m	eters
This value car	change by +/-			1	m	eters
What is your co	ntaminant of concern (COC)?		Tetrachloroeth	ylene		-
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	il is beneath the building?				Loam	5
What is the ave	rage soil/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		127184			
	Molecular Weight (MW)		165.83	[g/mole]		
	Henry's Law Constant at ground water ten	nperature (H)	0.3934997	• •		
	Free-Air Diffusion Coefficient (Da)		7.200e-2	[cm²/s]		
	Ditfusivity in Water (Dw)		8.200e-6	[cm²/s]		
	Unit Risk Factor (URF)		3.00e-6	{(µg/m³)-1]		
	Reference Concentration (RfC)		0.	[mg/m³]		
Soil Properties						
	Total Porosity (n)		0.399	(unitess)		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitiess)	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-En (6w,cap)	try Pressure	0.332	(unitiess)		
	Height of Capiliary Zone (CZh)		0.375	(m)		
	Soil-gas Flow Rate Into the Building (Qsoil	1}	5.00	{L/min}		
Building Properties						
	Air Exchange Rate (EB)		0.250	(hr-1)		
	Building Mixing Height (He)		2.44	(m)		
	Building Footprint Area (FB)		100.0	(m²)		
	Subsurface Foundation Area (AB)		106.0	[m²]		

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	Building (rack Ratio	(ŋ)					0.0	0038	(unitless)			
	Building F	Building Foundation Slab Thickness (Lerack)						0.1	00	[m]			
Exposure Parameters	•												
	Exposure	Duration fo	or Carcino	ogens (EC	Dc)			30		[years]			
	Exposure	Frequency	for Carci	inogens (i	Efc}			35	0	[days/year			
	Averaging	Time for C	Carcinoge	ins (ATc)				70		(years)			
	Exposure	Duration fo	or Non-Ca	arcinogen	s (EDnc)			30		[years]			
	Exposure	Frequency	for Non-	Carcinoge	ens (EFnc)			36	5	[days/year			
	Averaging	Time for N	lon-Carci	inogens (/	ATnc)			30		[years]			
				C	CALC	ULATE R	ESULTS)					
RESULTS													
	Unsaturat	ed Zone Ef	fective D	iffusion C	cefficient (Deff)		0.0	04532	[cm²/s]			
	Unsaturat	ed + Capill	ary Zone	Effective	Diffusion (Coefficient	(DT	0.0	008963	[cm²/s]			
	eff)												
	<u>"A"</u>	Parameter				8	.010e-5			rameter a t mechani			
	"B"	Parameter				4	56.5	Diffu	sion th	hrough so	il is th	he overa	ll rate-
	"C"	Parameter				0	.004918			ocess for pathway.	the sul	bsurface	to
		Johnson 8	<u>Ettinge</u>	r Attenua	tion Fact	or (a)							7.882e-5
	INDOOR /	AIR RESUL	TS FOR	GROUN	D WATER	SA	MPLE DA	TA					
	Low Predi	ction1			Best Estin	nate			High Pro	ediction2			
Indoor Air Concentration	0.9959	[µg/m3]	0,1469	[ppbv]	1.777	[µg/m³]	0.2622	[ppbv]	2.033	(µg/m³)	0.3000	[vdqq]	
Cancer Risk		1.228e-	В			2.191e	-6			2.507e	-6		
Hazard Quotient		0.				0.				0.]	
1 "Low Prediction" conc contamination.	entration p	roduced wi	th HIGH	EST	ł	moisture c	content an	d DEEPE	ST	de	pth to		
2 "High Prediction" con- contamination.	centration ş	produced w	ith Lown	EST		moisture	content ar	nd SHALL	OWEST	F di	epth to		

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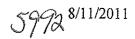
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		Click For an Exam	ple]			
Enter Site Na	me (optional):		Adult Reside	nt		
Enter sample	concentration, units and media type		0.175	μg/L	Ground	Water
	epth of the soil gas sample or ground water ta contamination)?(LT)	abie (for		7	m	neters
This value car	i change by +/-			1	'n	neters
What is your co	ntaminant of concern (COC)?		Naphthalene			
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	il is beneath the building?				Loam	
What is the <u>ave</u>	rage soll/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		91203			
	Molecular Weight (MW)		128.18	[g/mole]		
	Henry's Law Constant at ground water tem	perature (H)	0.0081062	8 (unitless)		
	Free-Air Diffusion Coefficient (Da)		5.900e-2	(cm²/s)		
	Diffusivity in Water (Dw)		7.500e-8	[cm²/s]		
	Unit Risk Factor (URF)		0.	[(µg/m³)-1]		
	Reference Concentration (RfC)		3.00e-3	(mg/m³)		
Soil Properties						
	Total Porosity (n)		0.399	(unitiess]		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]	
	(θ _w)		0.148			
	Capillary Zone Moisture Content at Air-Entry	y Pressure	0.332	(unitless)		
	(θw,cap)					
	Height of Capillary Zone (CZh)		0.375	(m)		
	Soll-gas Flow Rate Into the Building (Qsoil)		5.00	(L/min)		
Building Properties						
	Air Exchange Rate (EB)		0.250	(hr·1)		
	Building Mixing Height (Ha)		2.44	[65]		
	Building Footprint Area (FB)		100.0	(m²)		
	Subsurface Foundation Area (Aa)		106.0	(m²)		

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	Building Ci	rack Ratio	o (ŋ)					0.0	0038	[unitless]			
	Building Fo	oundation	Slab Thick	knéss (L	.crack)			0.1	100	[m]			
Exposure Parameters	;												
	Exposure i	Duration f	or Carcino	gens (E	Dc)			30		[years]			
	Exposure I	Frequenc	y for Carcin	nogens	(EFc)			35	0	(days/year	6		
	Averaging	Time for	Carcinoger	ns (ATc)	ł.			70		[years]			
	Exposure I	Duration 1	or Non-Ca	rcinoger	s (EDnc)			30		(years)			
	Exposure I	Frequenc	y for Non-C	Carcinog	ens (EFac)	I		36	5	[days/year]		
	Averaging	Time for	Non-Carcir	nogens (ATnc)			30		[years]			
				ſ	CALC		RESULTS	1					
RESULTS				ť,	<u> </u>	00.12.							
ALCOLIC	Unsaturate	d Zone E	ffective Dif	tusion (cefficient (Deff)		0.0	03724	[cm ² /s]			
	Unsaturate						(DT		01883	[cm2/s]			
	eff)			•						• •			
	-	arameter				1	.683e-4			rameter a			
	"B" P	arameter				e	55.6			t mechani hrough so			
							.004918			cess for			
		arameter				-	004910	indoo	r-air g	pathway.			
	7	lohnson	& Ettinger	Attenu	ation Facto	<u>or (</u> a)							1.627e-4
	INDOOR A	IR RESU	LTS FOR	GROUN	ID WATER	SA	MPLE DAT	A					
	Low Predic	tion1			Best Estim	ate			High Pre	diction2			
Indoor Air	8.135e-5	[µg/m³]	1.553e-5	[ppbv]	2.308e-4	(µg/m³	4.408e-5	(ppbv)	3.377 e	4 [µg/m³]	8.447e-5	[թւնզ]	
Concentration													
Cancer Risk		0.				0.				0.			
Hazard Quotient		2.712e	-5			7.695e	⊱5			1.126e	-4		
1 "Low Prediction" conc contamination. 2 "High Prediction" conc							content and				epth to apth to		
Contamination.													

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Background

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		Click For an Examp	ole)			
Enter Site Nan	ne (optional):		adult residen	t - Phase II		
Enter sample of	concentration, units and media type		83.5	µg/L	Ground	Water
	pth of the soil gas sample or ground water ta contamination)?(L⊤)	ble (for		7	ก	neters
This value can				i	n	neters
What is your cor	nteminant of concern (COC)?		cis-1,2-Dichlo	roethylene		· .
What type of bui	Iding are you investigating at your site?				Slab-on-Grade	
What type of sol	I is beneath the building?				Loam	:
What is the aver	age soll/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		156592			
	Molecular Weight (MW)		96,94	[g/mole]		
	Henry's Law Constant at ground water temp	erature (H)	0.0994872	1 (unitiess)		
	Free-Air Diffusion Coefficient (Da)		7.360e-2	[cm2/s]		
	Diffusivity in Water (Dw)		1.130e-5	[cm²/s]		
	Unit Risk Factor (URF)		0.	{(µg/m³)-1]		
	Reference Concentration (RfC)		3.50e-2	[mg/m³]		
Soil Properties						
	Total Porosity (n)		0.399	(unitiess)		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unilless]	
	(0 w)		0.148			
	Capillary Zone Moisture Content at Air-Entry (0w,cap)	Pressure	0.332	[unitiess]		
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil)		5.00	[Umin]		
Building Properties						
	Air Exchange Rate (EB)		0.250	(hr-1)		
	Suilding Mixing Helght (HB)		2.44	(m)		
	Building Footprint Area (Fs)		100.0	[m²]		
	Subsurface Foundation Area (AB)		106.0	[m²]		

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	Building	Crack Rati	io (ŋ)					0.00	038	[unitiess]			
	Building	Foundation	n Slab Thi	ckness (L	.crack)			0.10	0	[m]			
Exposure Parameter	r\$												
	Exposure	Duration	for Carcin	ogens (E	Dc)			30		(years)			•
	Exposure	Frequence	cy for Caro	lnogens	(EFc)			350		[days/year	1		
	Averagin	g Time for	Carcinoge	ens (ATc))			70		[years]			
	Exposure	Duration	for Non-C	arcinoger	ns (EDac)			30		[years]			
	Exposure	Frequenc	y for Non-	Carcinog	iens (EFno	:)		365		(days/year	1		
	Averaging	g Time for	Non-Carc	inogens ((ATnc)			30		(years)			
				C	CAL	CULATE	RESULTS]					
RESULTS													
	Unsaturat	ed Zone (ffective D	illiusion C	oefficient	(Deff)		0.004	4634	[cm²/s]			
	Unsaturat	ed + <u>Capi</u>	llary Zone	Effective	Offusion	Coefficien	gt (DT	0.00	1090	[cm²/s]			
	eff)												
	<u>"A"</u>	Parameter	C				9,743e-5			rameter a			
	"B "	Parameter	t i				446.4			t mechani hrough so			
	<u>"C*</u>	Parameter	Ĺ			4	0.004918			cess for	the sul	osurface	to
		Johnson	& Ettinge	r Attenu	ation Fac	t <u>or (</u> a)							9.553e-5
	INDOOR	AIR RESU	LTS FOR	GROUN	D WATER	۲ S/	AMPLE DA	TA					
	Low Pred	ction1			Best Estin	nate		H	igh Pre	diction2			
Indoor Air Concentration	0.4124	(hð\w ₃)	0.1041	[ppbv]	0.7936	[µg/mi	0.2003	[ppbv] 0.	9331	[µg/m³]	0.2355	(ppbv)	
Cancer Risk		0.	haasoo			0.		1		0.			
Hazard Quotient	-	0.0117	8			0.022	37			0.0266	6		
· · · ·													
1 "Low Prediction" con contamination.	centration p	roduced w	ith HIGH	EST		moisture	content an	d DEEPES	r	de	pth to		
2 "High Prediction" con contamination.	centration p	produced v	vith LOWE	EST		moisture	content an	d SHALLO	WEST	de	apth to		

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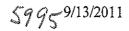
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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

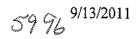
Migration of volatile chemicals from the subsurface into overlying buildings is called vapor intrusion (VI). Volatile organic chemicals in contaminated soils or groundwater can emit vapors, which may migrate through subsurface soils and may enter the indoor air of overlying buildings. Building depressurization may cause these vapors to enter the home through cracks in the foundation. Depressurization can be caused by a combination of wind effects and stack effects, which are the result of heating within the building and/or mechanical ventilation. In extreme cases, the vapors may accumulate in dwellings to levels that may pose near-term safety fazards, such as explosion. Typically, however, vapor concentrations are prosent at low levels, to which long-term exposure may pose increased risk for chronic health effects.

This on-line calculator implements the Johnson and Ettinger (J&E) (Johnson and Ettinger, 1991) simplified model to evaluate the vapor intrusion pathway into buildings. This J&E model replicates the implementation that the US EPA Office of Solid Waste and Emergency Response (OSWER) used in developing its <u>draft vapor intrusion guidance</u>, but includes a number of enhancements that are facilitated by web implementation: temperature dependence of Henry's Law Constants and gaseous diffusivities, automatic sensitivity analysis of certain parameters, and others described <u>on the background page.</u>

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	ſ	Click For an Exampl	e]			
Enter Site Na	me (optional):		adult resident	- Phase II		
Enter sample	concentration, units and media type		.377	µg/L	Ground V	Vater
	epth of the soil gas sample or ground water ta contamination)?(LT)	ble (for		7	m	eters ·
This value car	n change by +/-			1	m	eters
What is your co	ntaminant of concern (COC)?		Ethylbenzene			
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	
What type of so	il is beneath the building?				Loam	
What is the <u>ave</u>	rage soll/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		100414			
	Molecular Weight (MW)		106.17	[g/mole]		
	Henry's Law Constant at ground water temp	oerature (H)	0.1613978	[unitiess]		
	Free-Air Diffusion Coefficient (Da)		7.500e-2	[cm²/s]		
	Diffusivity in Water (Dw)		7.800e-6	[cm²/s]		
	Unit Risk Factor (URF)		1.10e-6	[(µg/m3)-1]		
	Reference Concentration (RfC)		1.00	[mg/m3]		
Soil Properties						
	Total Porosity (n)		0.399	(unitless)		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitess)	
	(θw)		0.148	•	•	
	Capiliary Zone Moisture Content at Air-Entry	/ Pressure	0.332	(unitless)		
	(O w,cap)					
	Height of Capiliary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil)		5.00	[L/min]		
Building Properties						
	Air Exchange Rate (Ea)		0.250	{hr-1}		
	Building Mixing Height (He)		2.44	[m]		
	Building Footprint Area (FB)		100.0	(m²)		
	Subsurface Foundation Area (AB)		106.0	[m²]		

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Backward Calculation full uncertainty analysis

	Building Crack Ratio (ŋ)					0.	00038	(unitiess)			
	Building Foundation Slab Thicknes	ndation Slab Thickness (Lcrack)				0.	100	[m]			
Exposure Parameter	\$										
•	Exposure Duration for Carcinogens (EDc)					30)	[years]			
	Exposure Frequency for Carcinogens (EFc)					35	50	[days/year]			
	Averaging Time for Carcinogens (Tc)				70	}	[years]			
	Exposure Duration for Non-Carcino	gens ((EDnc)			30)	[years]			
	Exposure Frequency for Non-Carc	nogen	s (EFnc)			36	55	[days/year)		
	Averaging Time for Non-Carcinoge	is (AT	nc)			30)	(years)			
		(CALCU	LATE	RESULTS						
RESULTS											
	Unsaturated Zone Effective Diffusion	n Coe	fficient (De	eff)		0.	004721	[cm²/s]			
	Unsaturated + Capillary Zoria Effec	ive Di	ffysion Co	efficier	ni (DT	0.0009855 [cm²/s]					
	eff)										
	"A" Parameter			4	3.807e-5	Based on parameter analysis: Adve- the dominant mechanism across foun					
	"B" Parameter				38.2	Diffusion through soll is the over					
	C Parameter 0.004918			limiting process for the subsurfac indoor-air pathway.					to		
Johnson & Ettinger Attenuation Factor (a)										8.652e-5	
	INDOOR AIR RESULTS FOR GRO	UND	WATER	S/	MPLE DAT	`A					
	Low Prediction ¹	Best Estimate					High Prediction ²				
indoor Air Concentration	0.002885 [µg/m³]6.647e-4 [p	bv] 0.(005265	(µg/m³	0.001213	(ppbv)	0.00607	1 [µg/m³]	0.001399	(ppbv)	
Cancer Risk	1.3046-9		2.380e-9				2.7458-9				
Hazard Quotient	2.885e-6 5.265e			9-6	6.071e+6						
		•									
1 "Low Prediction" con contamination.	centration produced with HIGHEST		mo	isture	content and	DEEP	:51	de	pth to		
-	centration produced with LOWEST		ma	oisture	content and	SHALI	LOWEST	d	epth to		
contamination.											

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EPA On-line Tools for Site Assessment Calculation

Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration

Backward Calculation full uncertainty analysis

Background

Migration of volatile chemicals from the subsurface into overlying buildings is called vapor intrusion (VI). Volatile organic chemicals in contaminated soils or groundwater can emit vapors, which may migrate through subsurface soils and may enter the indoor air of overlying buildings. Building depressurization may cause these vapors to enter the home through cracks in the foundation. Depressurization can be caused by a combination of wind effects and stack effects. which are the result of heating within the building and/or mechanical ventilation. In extreme cases, the vapors may accumulate in dwellings to levels that may pose near-term safety hazards, such as explosion. Typically, however, vapor concentrations are present at low levels, to which long-term exposure may pose increased risk for chronic health effects.

This on-line calculator implements the Johnson and Ettinger (J&E) (Johnson and Ettinger, 1991) simplified model to evaluate the vapor intrusion pathway into buildings. This J&E model replicates the implementation that the US EPA Office of Solid Waste and Emergency Response (OSWER) used in developing its draft vapor intrusion guidance, but includes a number of enhancements that are facilitated by web implementation: temperature dependence of Henry's Law Constants and gaseous diffusivities, automatic sensitivity analysis of certain parameters, and others described on the background page.

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		Click For an Exam	ple			
Enter Site Na	me (optional):		adult resider	nt - Phase II		
Enter sample	concentration, units and media type		7	µg/L	Ground	Water
What is the depth of the soil gas sample or ground water table (for ground water contamination)?(LT)				7	n	neters
This value car		ş	ก	eters		
What is your co	Naphthalene					
What type of bu	ilding are you investigating at your site?				Slab-on-Grade	`
What type of so	What type of soil is beneath the building?				Loam	
What is the <u>ave</u>	rage soll/ground water temperature?				55	Farenheit
Chemical Properties						
	CAS Number		91203			
	Molecular Weight (MW)		128.18	(g/mole)		
	Henry's Law Constant at ground water ter	0.0081062	28 (unitless)			
	Free-Air Diffusion Coefficient (Da)		5.900e-2	[cm2/s]		
	Diffusivity in Water (Dw)		7.500e-6	[cm ² /s]		
	Unit Risk Factor (URF)		0.	[(µg/m³)-1]		
	Reference Concentration (RfC)		3.00e-3	[mg/m3]		
Soil Properties						
	Total Porosity (n)		0.399	(unitless)		
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	[unitless]	
	(0 w)		0.148	_		
	Capillary Zone Moisture Content at Air-En (0w.cop)	lry Pressure	0.332	(unitless)		
	Height of Capillary Zone (CZh)		0.375	[m]		
	Soil-gas Flow Rate Into the Building (Qsoil	1)	5.00	(L/min)		
Building Properties						
	Air Exchange Rate (EB)		0.250	[hr-1]		
	Building Mixing Height (HB)		2.44	(m)		
	Building Footprint Area (FB)		100.0	[m²]		
	Subsurface Foundation Area (As)		106.0	[m²]		

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	Building Crack Ratio (ŋ)			0.	00038	[unitiess]				
	Building Foundation Stab Thickness	(Lerack)		0.	100	[m]				
Exposure Paramete	rs									
	Exposure Duration for Carcinogens (30	0 [years]							
	Exposure Frequency for Carcinogens	35	50	(days/yea	n)					
	Averaging Time for Carcinogens (AT	c)		70)	[years]				
	Exposure Duration for Non-Carcinoge	ans (EDnc)		30)	(years)				
	Exposure Frequency for Non-Carcino	gens (EFnc)		36	55	[days/year]				
	Averaging Time for Non-Carcinogens	(ATnc)		30)	[years]				
		CALCULA	ATE RESULTS]						
RESULTS										
	Unsaturated Zone Effective Diffusion	Coefficient (Deff)	0,0	003724	[cm²/s]				
	Unsaturated + Capillary Zone Effectiv	0.0	001883	3 [cm²/s]						
	eff)									
	"A" Parameter		1.683e-4		tion is					
	"B" Parameter		555.6				sm acros		lation. 111 rate-	
	"C" Parameter		0.004918	limiting process for the subsurface indoor-air pathway.				to		
	Johnson & Ettinger Atten	uation Factor (o	i)		-	•			1.627e-4	
	INDOOR AIR RESULTS FOR GROU	NO WATER	SAMPLE DAT	A						
	Low Prediction 1	.ow Prediction1 Best Estimate			High Prediction2					
Indoor Air Concentration	0.003254 [µg/m3]6.211e-4 (ppb)	/]0.009234 [μ	g/m³)0.001762	[ppbv]	0.01351	(µg/m³)	0.002579	[ppbv]		
Cancer Risk	0.	0.				0.	L			
Hazard Quotient	0.001085	0.		0.004503						
	<u> </u>	.i			L			J		
1 "Low Prediction" con contamination.	centration produced with HIGHEST	mois	ture content and	DEEPE	ST	de	epth to			
² "High Prediction" cor contamination.	centration produced with LOWEST	mois	ture content and	SHALL	OWEST	d	epth to			

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Screening Level Implementation of the Johnson and Ettinger Vapor Intrusion Model with two variable/uncertain parameters (source depth, moisture content)

Forward Calculation of Indoor Air Concentration Background

Backward Calculation full uncertainty analysis

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		Click For an Exan	nple 1				
Enter Site Na	me (optional):		adult residen	it - Phase II			
Enter sample	concentration, units and media type		161	µg/L	Ground V	Ground Water	
	What is the depth of the soil gas sample or ground water table (for ground water contamination)?(LT)			7 met			
-	This value can change by +/-			1			
What is your contaminant of concern (COC)?			Tetrachloroethylene				
What type of building are you investigating at your site?					Slab-on-Grade		
What type of so	il is beneath the building?				Loans		
What is the <u>ave</u>	rage soil/ground water temperature?				55	Farenheit	
Chemical Properties							
	CAS Number		127184				
	Molecular Weight (MW)		165.83	[g/mole]			
	Henry's Law Constant at ground water te	0.3934997	(unitless)				
	Free-Air Diffusion Coefficient (Da)	7.200e-2	[cm2/s]				
	Diffusivity in Water (Dw)		8.200e-6	[cm2/s]		•	
	Unit Risk Factor (URF)		3.00e-6	{(µg/m³)-1}			
	Reference Concentration (RfC)		0.	[mg/m³]			
Soil Properties							
	Total Porosity (n)		0.399	[unitless]			
	Unsaturated Zone Moisture Content	Low 0.0610	Best Estimate	High 0.240	(unitiess)		
	(0 w)		0.148	· .			
	Capillary Zone Moisture Content at Air-Ei (9w,cap)	ntry Pressure	0.332	[unitless]			
	Height of Capillary Zone (CZh)		0.375	[m]			
	Soil-gas Flow Rate Into the Building (Qso	ii)	5.00	(L/min)			
Building Properties	•••			·			
	Air Exchange Rale (Es)		0.250	[hr~1]			
	Building Mixing Height (Ha)		2.44	[m]			
	Building Footprint Area (FB)		100.0	(m ²)			
	Subsurface Foundation Area (AB)		106.0	[m²]			