



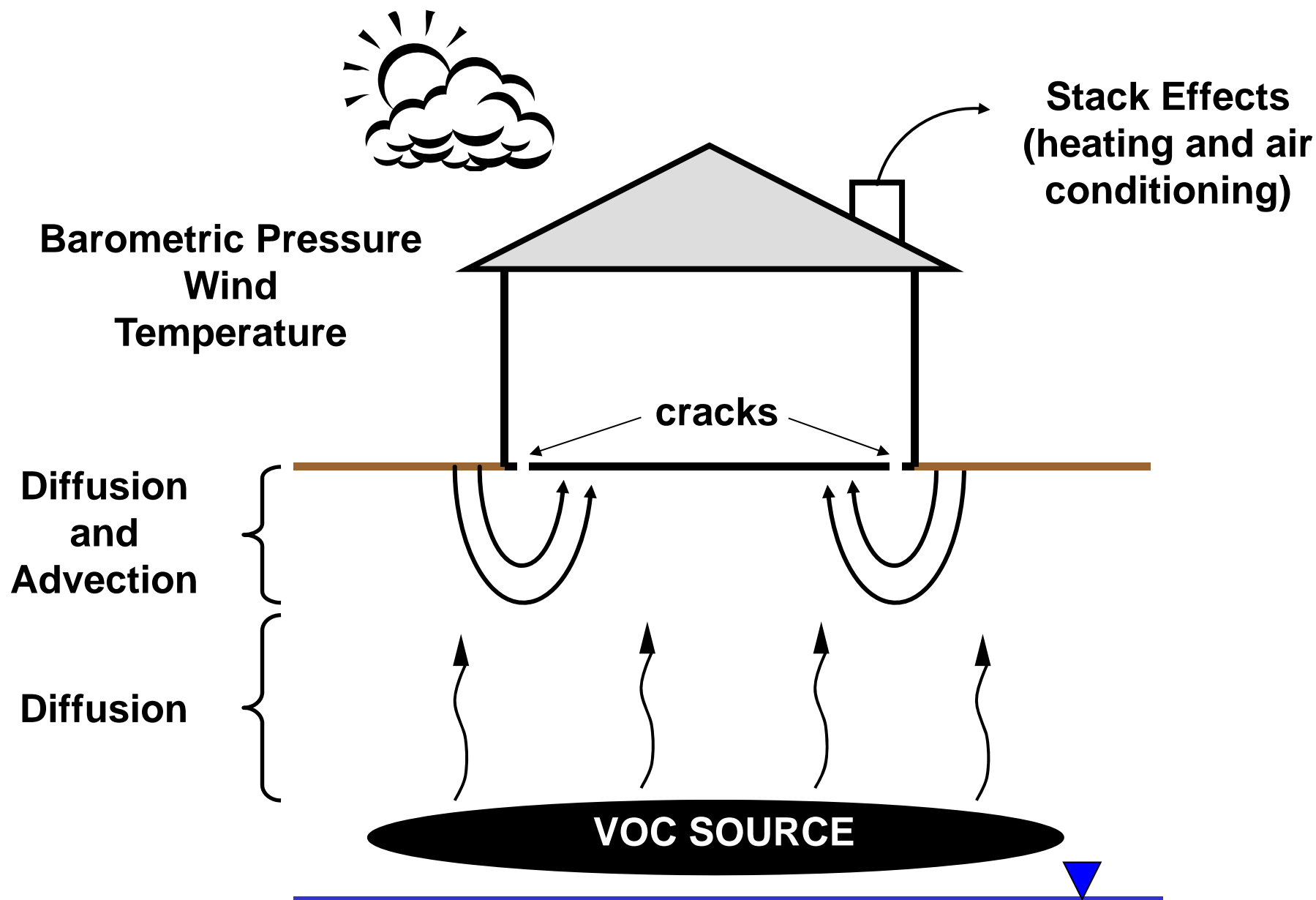
**DEPARTMENT
OF
TOXIC SUBSTANCES CONTROL**

**DTSC Investigation
Autumnwood Development
Wildomar, CA**

January 17, 2014

**Bill Bosan, PhD, Theo Johnson, CEG
and Marina Perez, PPS**

Vapor Intrusion – Conceptual Model



File Date: 12/02/2013 12:52:07 PM; Plotted by: pshenoy@amec.com; Y:\NB1016075P\AC\01_T\000_SAMPLING LOCATIONS.DWG; Figure 2; Proposed Sample Locations



Explanation:

- Soil Gas sample location
- Sub-slab sample location
- Soil/Soil Gas sample location
- Soil/Soil Gas/Groundwater sample location

----- Limits of project area

All locations are approximate

Basemap modified from ESRI World Imagery 2013

SAMPLE LOCATIONS
Autumnwood Development
Wildomar, California

By: jpd	Date: 12/02/2013	Project No. NB1016075P
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Figure **2**

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Explanation:

- Soil Gas sample location
 - Sub-Slab sample location
 - Soil/Soil Gas sample location
 - Soil/Soil Gas/Groundwater sample location
- Limits of Study Area

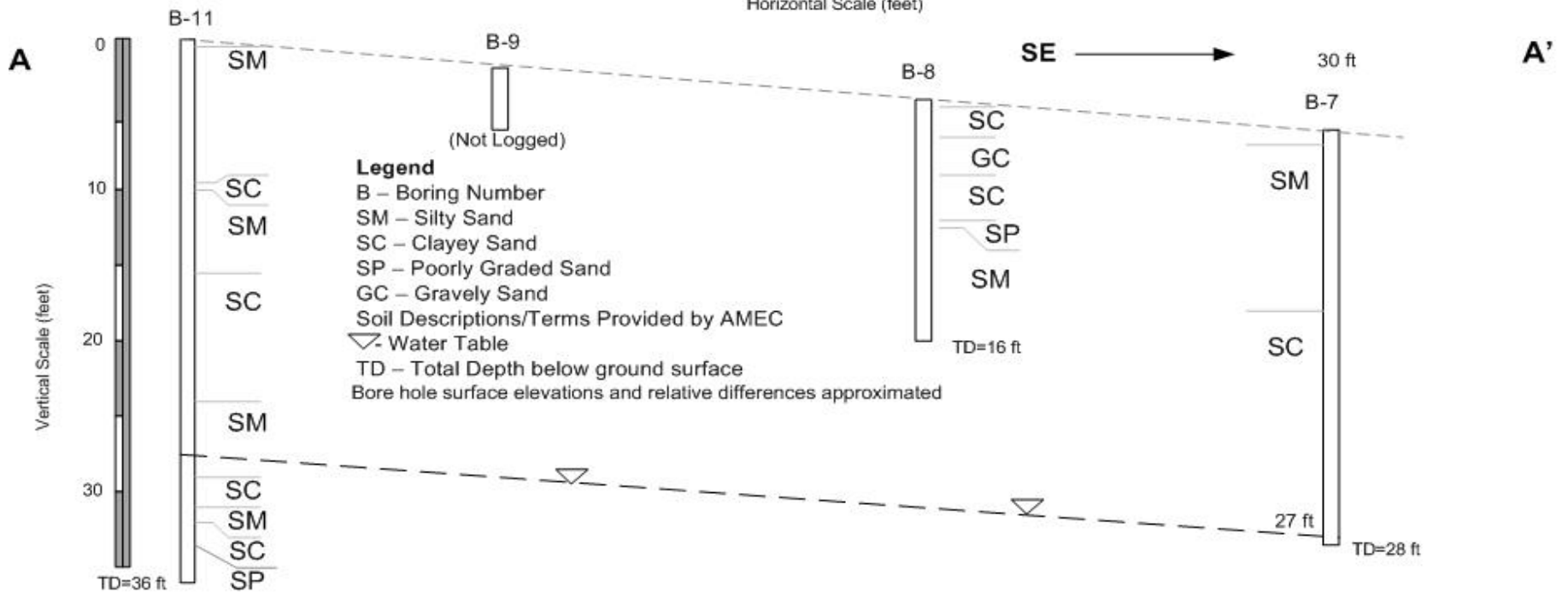
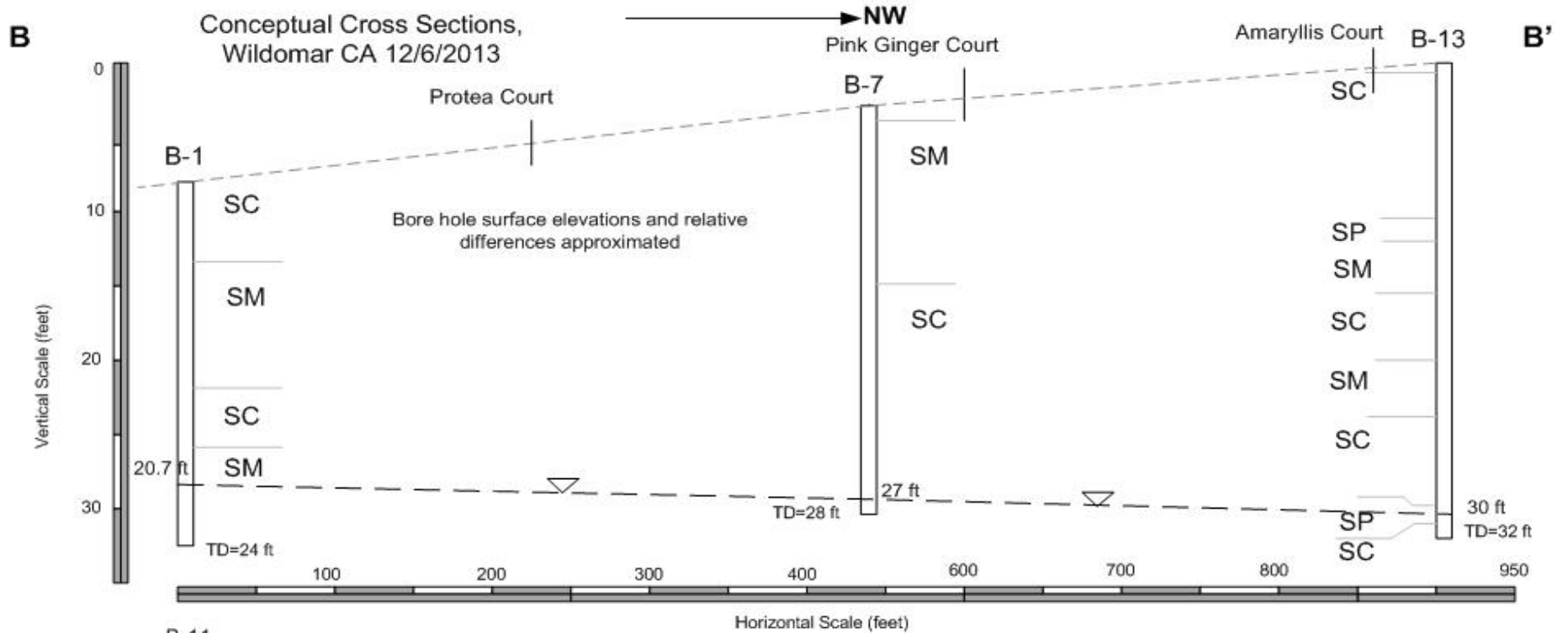
All locations are approximate

Basemap modified from ESRI World Imagery 2013

SAMPLE LOCATIONS
Autumnwood Development
Wildomar, California
(Cross Section Locations Added by DTSC)

By: jbd Date: 12/02/2013 Project No. NB101607SP







Grading Information

- Prior to construction, site soils were excavated and re-compacted to reduce settlement from low density soils
- Excavation depths ranged from a minimum of 10 feet to a maximum of 15 feet
- Development landscape is at a higher elevation than the residences, requiring area drainage to divert irrigation water



Soil Types and Groundwater Levels

- Soil types encountered during geotechnical and DTSC sampling were predominately silty and clayey sands (also classified as sandy clayey loam)
- Groundwater was encountered between 20 and 30 feet below ground surface



Soil and Groundwater Sampling Results

- All metals are within background
- No organochlorine pesticides (OCPs) were detected
- No Polychlorinated Biphenyls (PCBs) were detected
- Only one semi-volatile organic compound (SVOC), bis-2ethylhexylphthalate, was detected at the detection limit (2.6 mg/kg)
- No volatile organic compounds (VOCs) were detected in groundwater
- No formaldehyde was detected in groundwater



Soil Gas Results

Concentrations reported in micrograms per liter (µg/L)

Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Tetrachloroethene	Chloroform	Benzene	Toluene	Ethylbenzene	m, p-Xylene	O-Xylene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Naphthalene	p-Isopropyltoluene	Methanol	Tracer 1,1-Difluoroethane (LCC)
		CHHSL	(µg/L)	0.47	0.42	0.09	320	1	800	740	3.65	3.65	0.09	210		
1-SV	5	1-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	5-Rep	1-SV-5-Rep	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	10	1-SV-10	11/15/13	ND	ND	0.03	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
2-SV-1PV	5	2-SV-5	11/14/13	ND	ND	ND	ND	0.19	ND	ND	ND	ND	ND	ND	--	ND
2-SV-3PV			ND	ND	0.02	ND	ND	0.21	ND	ND	ND	ND	ND	ND	--	ND
2-SV-10PV			ND	0.04	0.02	ND	ND	0.27	ND	ND	ND	ND	ND	ND	--	ND
2SV	15	2-SV-15	11/14/13	ND	ND	0.08	0.25	ND	0.26	ND	0.10	ND	0.20	ND	--	ND
4-SV	15	4-SV-15	11/15/13	ND	ND	0.10	0.29	ND	0.30	ND	ND	ND	ND	ND	--	ND
	5	4-SV-5	11/15/13	ND	ND	0.02	ND	ND	ND	ND	ND	ND	ND	ND	--	1.1
5-SV	15	5-SV-15	11/14/13	ND	ND	0.03	ND	ND	0.27	ND	0.17	ND	ND	ND	--	0.27
	5	5-SV-5	11/14/13	ND	0.04	ND	ND	ND	0.14	ND	ND	ND	ND	ND	--	ND
6-SV	15	6-SV-15	11/14/13	ND	ND	0.02	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	15-Rep	6-SV-15-Rep	11/14/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	3	6-SV-3	11/15/13	ND	ND	0.02	ND	ND	0.18	ND	ND	ND	ND	ND	--	ND
7-SV	5	7-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
	15	7-SV-15	11/15/13	ND	ND	0.08	0.23	0.25	1.5	0.42	0.13	ND	ND	0.15	--	ND



Soil Gas Results

Concentrations reported in micrograms per liter (µg/L)

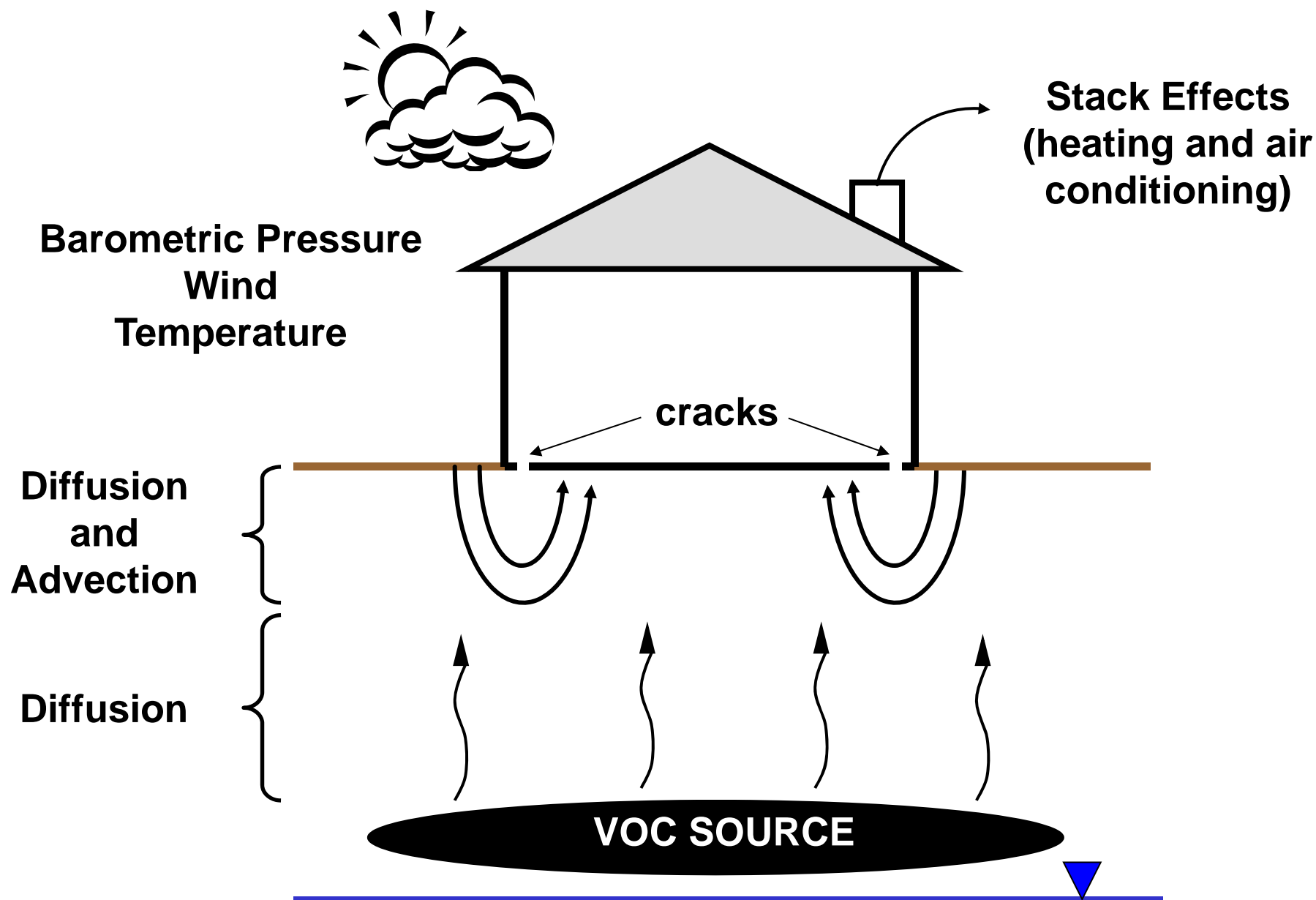
Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Tetrachloroethene	Chloroform	Benzene	Toluene	Ethylbenzene	m, p-Xylene	O-Xylene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Naphthalene	p-Isopropyltoluene	Methanol	Tracer 1,1 Difluoroethane (LCC)	
		CHHSL	(µg/L)	0.47	0.42	0.09	320	1	800	740	3.65	3.65	0.09	210			
8-SV	3	8-SV-3	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
	15	8-SV-15	11/15/13	ND	ND	0.08	ND	0.13	0.71	0.20	0.14	ND	ND	0.22	--	ND	
9-SV	15	9-SV-15	11/15/13	ND	ND	0.03	ND	ND	0.24	ND	0.37	0.14	ND	ND	--	ND	
	5	9-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
11-SV	15	11-SV-15	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
	5	11-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
12-SV-1PV	15	12-SV-15	11/13/13	ND	ND	0.06	0.26	ND	0.33	0.12	ND	ND	0.02	ND	--	0.70	
12-SV-3PV				ND	ND	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND
12-SV-10PV				ND	ND	0.02	ND	ND	0.13	ND	ND	ND	ND	ND	ND	ND	--
12-SV	5	12-SV-5	11/14/13	ND	ND	0.02	ND	ND	0.11	ND	0.11	ND	ND	ND	--	0.89	
13-SV	15	13-SV-15	11/14/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
	5	13-SV-5	11/14/13	ND	0.02	0.06	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
15-SV	15	15-SV-15	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	
	5	15-SV-5	11/15/13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	



Soil Gas Sampling Results

- Benzene, ethylbenzene, toluene, and xylene (BETX) and fuel-related VOCs detected in soil gas
- One detection of benzene above its soil gas California Human Health Screening Level (CHHSL)
- One detection of naphthalene above its soil gas CHHSL
- No evidence of a subsurface source or soil gas plume
- VOCs detected in soil gas appear to be ambient or background

Vapor Intrusion – Conceptual Model





Soil Gas Risk and Hazard

Volatile Organic Compound	Maximum Measured Soil Gas Concentration ($\mu\text{g}/\text{m}^3$)	Soil Gas Depth (feet)	Maximum Calculated Indoor Air Risk	Maximum Calculated Indoor Air Hazard
Benzene	100	15	3.5E-07	9.4E-04
Chloroform	40	5	7.3E-08	1.1E-04
Ethylbenzene	250	15	6.6E-08	6.1E-05
p-Isopropyltoluene	220	15	NC	1.2E-04
Naphthalene	200	15	5.7E-07	1.3E-02
Toluene	290	15	NC	2.7E-04
1,2,4-Trimethylbenzene	370	15	NC	1.1E-02
1,3,5-Trimethylbenzene	140	15	NC	4.7E-03
m,p-Xylene	1,500	15	NC	3.8E-03
o-Xylene	420	15	NC	1.2E-03
Total			1.E-06	0.04



Soil Gas Summary

- No formaldehyde detected in soil gas
- VOCs detected in soil gas do not pose an indoor air risk or hazard
- Soil gas does not pose a vapor intrusion threat



Sub-Slab Soil Gas Results

Concentrations reported in micrograms per liter ($\mu\text{g/L}$)

Sample Location	Sample Identification	Sample Date	Tetrachloroethene	Chloroform	Benzene	Toluene	Ethylbenzene	m, p-Xylene	O-Xylene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene	Naphthalene	p-Isopropyltoluene	Methyl tert-butyl ether	Methylene Chloride	Methanol	Tracer 1,1 Difluoroethane (LCC)
3B (bedroom)	3B-SV	11/14/2013	ND	ND	0.02	0.06	0.02	0.05	0.02	0.02	ND	ND	ND	ND	ND	0.54	0.008
3G (garage)	3G-SV	11/14/2013	0.02	0.01	0.06	0.14	0.03	0.07	0.02	0.01	ND	ND	ND	ND	0.01	0.1	0.008
10L (living room)	10L-SV	11/14/2013	0.02	ND	0.02	0.08	0.02	0.03	0.01	0.01	ND	ND	ND	ND	ND	ND	0.019
10B (bedroom)	10B-SV	11/14/2013	ND	ND	0.01	0.02	ND	0.02	0.01	0.01	ND	ND	ND	ND	0	0.23	1
10B duplicate	10B-SV-Rep	11/14/2013	ND	ND	0.01	0.01	ND	0.01	0.01	0.01	ND	ND	ND	ND	ND	0.19	0.12
14G (garage)	14G-SV	11/14/2013	ND	ND	0.03	0.06	0.01	0.03	0.01	0.02	ND	ND	ND	ND	ND	0.1	0.02
14B (bedroom)	14B-SV	11/14/2013	0.01	ND	0.11	0.16	0.04	0.08	0.03	0.02	ND	ND	ND	0.01	ND	0.04	0.012



Sub-Slab Soil Gas Summary (Benzene and Methanol)

- Maximum estimated indoor air concentration of benzene would be $5 \mu\text{g}/\text{m}^3$
 - Consistent with measured indoor air concentrations
 - Within the median range of background for homes without vapor intrusion (EPA Background)
- Maximum estimated indoor air concentration of methanol would be $27 \mu\text{g}/\text{m}^3$
 - Well below the chronic REL ($4,000 \mu\text{g}/\text{m}^3$) and acute REL ($28,000 \mu\text{g}/\text{m}^3$)



Sub-Slab Soil Gas Summary (Formaldehyde)

Concentrations reported in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

Sample Location	Sample Depth (feet bgs)	Sample Identification	Sample Date	Formaldehyde
2-SV	5	2-SV-5	11/14/13	ND
6-SV	15	6-SV-15	11/14/13	ND
6-SV Dup	15	60-SV-15	11/14/13	ND
8-SV	3	8-SV-3	11/14/13	ND
12-SV	15	12-SV-15	11/14/13	ND
13-SV	15	13-SV-15	11/14/13	ND
3B-SV	sub-slab	3B-SV	11/14/13	6.53
10L-SV	sub-slab	10L-SV	11/14/13	6.64
14B-SV	sub-slab	14B-SV	11/14/13	8.10
Blank	--	Blank	11/14/13	ND

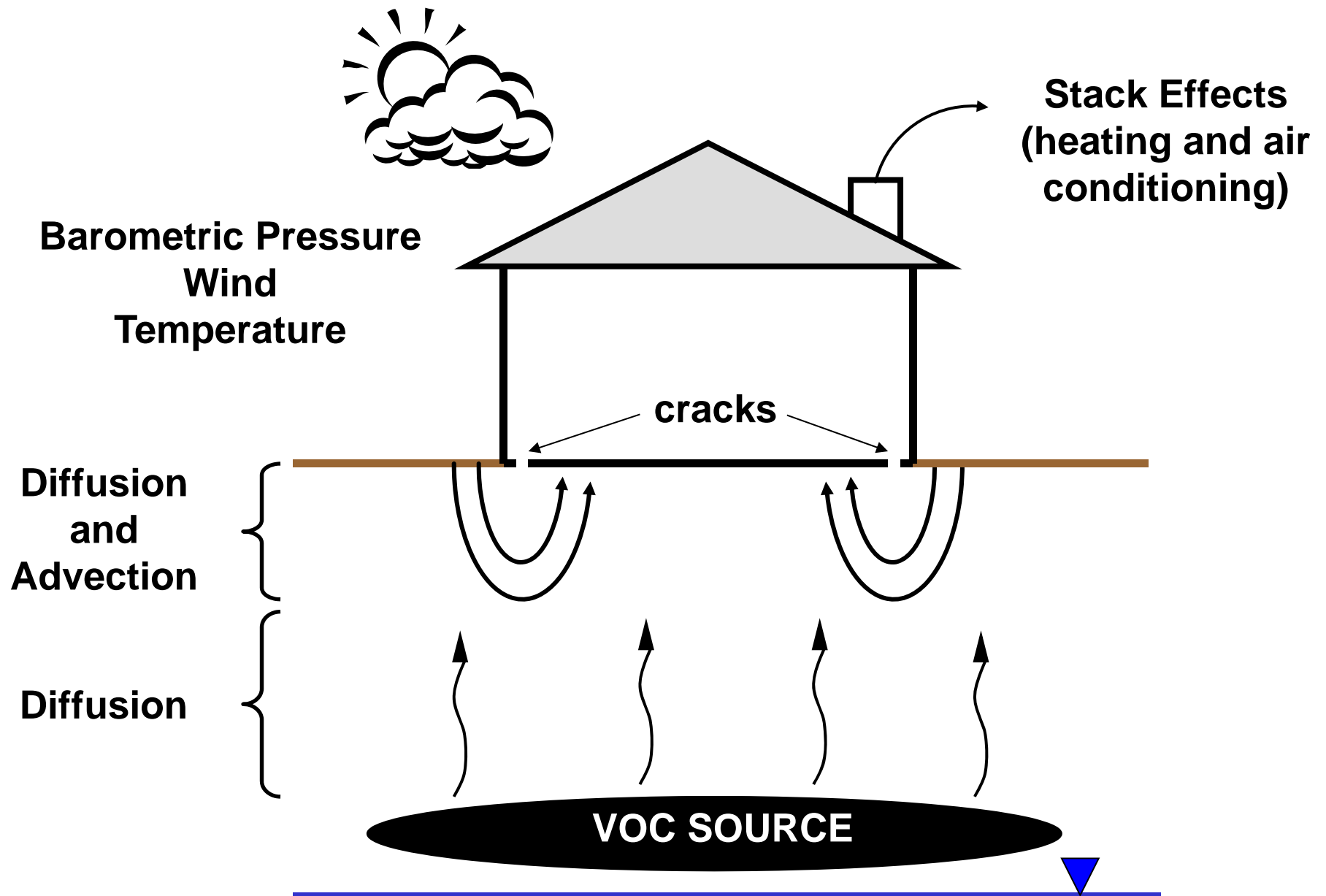


Sub-Slab Soil Gas Summary

Formaldehyde

- Low levels of formaldehyde detected in sub-slab soil gas (6 – 8 $\mu\text{g}/\text{m}^3$)
 - Likely from indoor air
- Indoor air concentrations of formaldehyde ranged from 23 – 82 $\mu\text{g}/\text{m}^3$
 - For vapor intrusion to be occurring:
 - The sub-slab soil gas concentration would have to be 460 – 1,640 $\mu\text{g}/\text{m}^3$
 - The soil gas concentration would have to be 11,500 – 41,000 $\mu\text{g}/\text{m}^3$

Vapor Intrusion – Conceptual Model





DTSC Contact Information

For site documents and information, visit the DTSC website, Autumnwood Development Quick Link:
<http://www.dtsc.ca.gov/>

To contact DTSC staff regarding these investigation activities:

- **Dr. Bill Bosan**, Senior Toxicologist, (714) 484-5399, william.bosan@dtsc.ca.gov
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- **Marina Perez**, Public Participation Specialist, (818) 717-6569 or toll-free, 1-866-495-5651, marina.perez@dtsc.ca.gov
- **Russ Edmondson**, Public Information Officer, (916) 323-3372, russ.edmondson@dtsc.ca.gov