Vapor Intrusion at Your Brownfields Site

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The starting point: Phase I ESA

- Enter the MPCA's Voluntary Investigation and Cleanup (VIC) program
- Need a Phase I environmental site assessment (ESA)
  - Current standard: ASTM E1527-13
    - Approved in November 2013

What changed re: vapor intrusion

- Vapor as a release pathway explicitly acknowledged
  - Appendices X1 (X1.1.1 Release or Threatened Release)
- Migrate/migration definition added
  - Section 3.2.56
- Soil vapor addressed in activity and use limitations (AUL)
  - Section 3.2.2

What you might identify

Your property is…

- Adjacent to a current or former petroleum UST site or leak site
- Above or near shallow, VOC-contaminated groundwater
- Adjacent to a landfill, historic dump or manure piles
- Connected by utility conduits to a known or suspected site with vapors
- Has residual VOC-contaminated soil

City of Edina: former office building

City of Edina: former office building (cont.)

- Phase I ESA identified three recognized environmental conditions (RECs):
  1. Undocumented fill
  2. Former dry cleaner
  3. Offsite upgradient dry cleaner with known release
- Previous Phase I ESA (1996) did **not** identify any RECs
- Following building demolition, future use:
  - Short-term: parking lot
  - Long-term: commercial at or below grade with multi-story parking garage
- Need to perform Phase II investigation

Next step: Phase II investigation

- Soil vapor is a potential release pathway
  - Collect soil-gas samples
    - Soil probes to collect subsurface soil-gas samples
    - Sub-slab vapor pins or vapor ports to collect soil-gas samples
    - Passive soil-gas samples
  - Collect indoor air samples

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  - Collect indoor air samples
  - **Collect soil and groundwater samples**

How to evaluate sub-slab soil-gas results

www.pca.state.mn.us/index.php/view-document.html?gid=3021

Minnesota Pollution Control Agency

Intrusion Screening Values (ISVs) for the Petroleum Remediation Program

Intrusion Screening Values (ISVs) for Vapor Intrusion Risk Evaluation - February 2009 Version

Refer to PRP Guidance Document 4-01a or the Remediation Division Vapor Intrusion Technical Support Document for guidance in applying the ISVs and the 10X and 100X ISV multiples.
Note: 10X and 100X ISV multiples are used for evaluating soil gas and sub-slab data.

Chemical	CAS #	Residential ISVs (µg/m3)	Basis	Source	Residential 10X ISVs (µg/m3)	Residential 100X ISVs (µg/m3)	Industrial Intrusion Screening Values (ISVs)	Industrial 10X ISVs	Industrial 100X ISVs	Acute Intrusion Screening Values (µg/m3)	Source
Acetone	67-64-1	31,000	NC	A	310,000	3,100,000	87,000	870,000	8,700,000	60,000	A
Benzene	71-43-2	4.5	C	M	45	450	13	130	1,300	1,000	M
Benzyl chloride	100-44-7	1	NC	E	10	100	3	30	300	240	C
Bromodichloromethane	75-27-4	NA			NA	NA	NA	NA	NA	NA	
Bromoform	75-25-2	9	C	I	90	900	30	300	3,000	NA	
Bromomethane (Methyl bromide)	74-83-9	5	NC	M	50	500	10	100	1,000	2,000	M

Tetrachloroethylene (PCE)

Chemical	CAS #	Residential ISVs (µg/m3)	Basis	Source	Residential 10X ISVs (µg/m3)	Residential 100X ISVs (µg/m3)	Industrial Intrusion Screening Values (ISVs)	Industrial 10X ISVs	Industrial 100X ISVs	Acute Intrusion Screening Values (µg/m3)	Source
2-Hexanone	591-78-6	NA			NA	NA	NA	NA	NA	NA	
Mercury (Inorganic)	7439-97-6	0.3	NC	I	3	30	1	10	100	1.8	C
4-Methyl-2-pentanone (Methyl isobutyl ketone, MIBK)	108-10-1	3,000	NC	I	30,000	300,000	8,000	80,000	800,000	NA	
Methylene Chloride (Dichloromethane)	75-09-2	20	C	M	200	2,000	60	600	6,000	10,000	M
2-Methylnapthalene	91-57-6	NA			NA	NA	NA	NA	NA	NA	
Methyl-tert-butyl ether (MTBE)	1634-04-4	3,000	NC	I	30,000	300,000	8,000	80,000	800,000	7,000	A
Naphthalene	91-20-3	9	NC	M	90	900	30	300	3,000	NA	
Polychlorinated biphenyls (PCBs)	1336-36-3	0.1	C	I	1	10	0.3	3	30	NA	
2-Propanol (Isopropyl alcohol)	67-63-0	7,000	NC	C	70,000	700,000	20,000	200,000	2,000,000	3,200	C
Propylene (Methylethylene)	115-07-1	3,000	NC	C	30,000	300,000	8,000	80,000	800,000	NA	
Styrene	100-42-5	1,000	NC	M	10,000	100,000	3,000	30,000	300,000	21,000	M
1,1,2,2-Tetrachloroethane	79-34-5	0.2	C	I	2	20	1	10	100	NA	
Tetrachloroethylene (PCE)	127-18-4	20	C	M	200	2,000	60	600	6,000	20,000	M

September 25, 2014: Revised Tetrachloroethylene (PCE, PERC) Interim ISVs

ISV Land Use Category	Current ISV (µg/m3)	Basis	Revised Interim ISV (µg/m3)	Basis
Residential	20	Cancer	**2**	Cancer
Industrial	60	Cancer	**30**	Cancer

New toxicity values released by MDH in July 2014 result in a decrease in both the residential and industrial tetrachloroethylene (PCE, PERC) ISVs. The "Interim ISV" values listed in the table above should be used for Remediation Vapor Intrusion Investigations until the ISV spreadsheet can be fully revised.

Intrusion Screening Values (ISVs): Industrial/Commercial

remember to look for updates!

For sub-slab soil-gas concentrations

- Evaluate worst-case concentrations
  - Worst-case concentration < 10 x ISV = no further VI actions required
  - 10 x ISV < worst-case concentration < 100 x ISV = further characterization required
  - Worst-case concentration > 100 x ISV = building-specific investigation required

The rest of the story…

- Eight more soil probes within the building to define soil contamination
- Contamination appears to be limited to northeast corner
- Response Action Plan (RAP) recommends excavation

During demolition/excavation


Proposed Excavation
W 49th 1/2 St


Actual Excavation
S1
2 ft
B6
4 ft
S4
6 ft
B5
6 ft
B3
6 ft
S2
5 ft
B2
16 ft
B7
12 ft
S7
12 ft
S5
10 ft
B1
16 ft
B4
16 ft
S6
8 ft
S3
7 ft
W 49th 1/2 St

But what if you can't dig your way out…

…and vapor intrusion remains a potential risk pathway?