A Systematic Approach to Evaluating Vapor Intrusion Risk at Legacy Sites in Minnesota

Cory Vowles
Project Manager

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Contributors/Collaborators:
Andri Dahlmeier, MPCA
Tim Grape, MPCA

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Objective

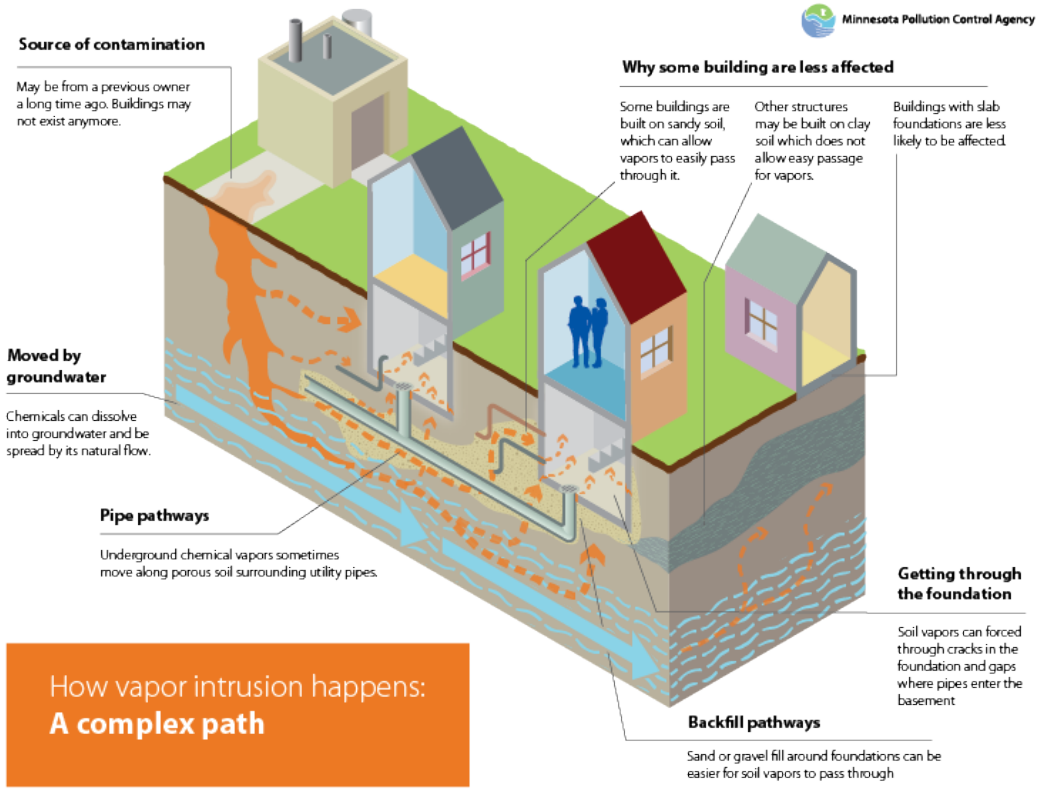
- Development of an approach to evaluate and mitigate the risk of Vapor Intrusion (VI) to human health associated with legacy sites across the State of Minnesota
- Legacy Sites = MERLA Sites investigated and ‘Closed’ under one or more state regulatory program prior to MPCA adoption of updated (2015) Best Management Practices for VI

Overview

1. Vapor Intrusion Background
   - What is VI?
   - VI in Minnesota
   - Challenge of Legacy Sites
2. Systematic Approach
   - Overview of the five-step process
   - Site evaluation
   - Site investigation/delineation
   - Decision making/mitigation
3. Program Summary
4. Questions

What is vapor intrusion?

- Migration of vapor-forming chemicals from any subsurface contaminant source into overlying structures
- Recognized in the 1980s with concerns over radon intrusion
- Increased awareness that anthropogenic chemicals could pose threats to human health via the vapor intrusion pathway
- Chemical vapors can degrade indoor air and pose risks to human health



Vapor intrusion in Minnesota

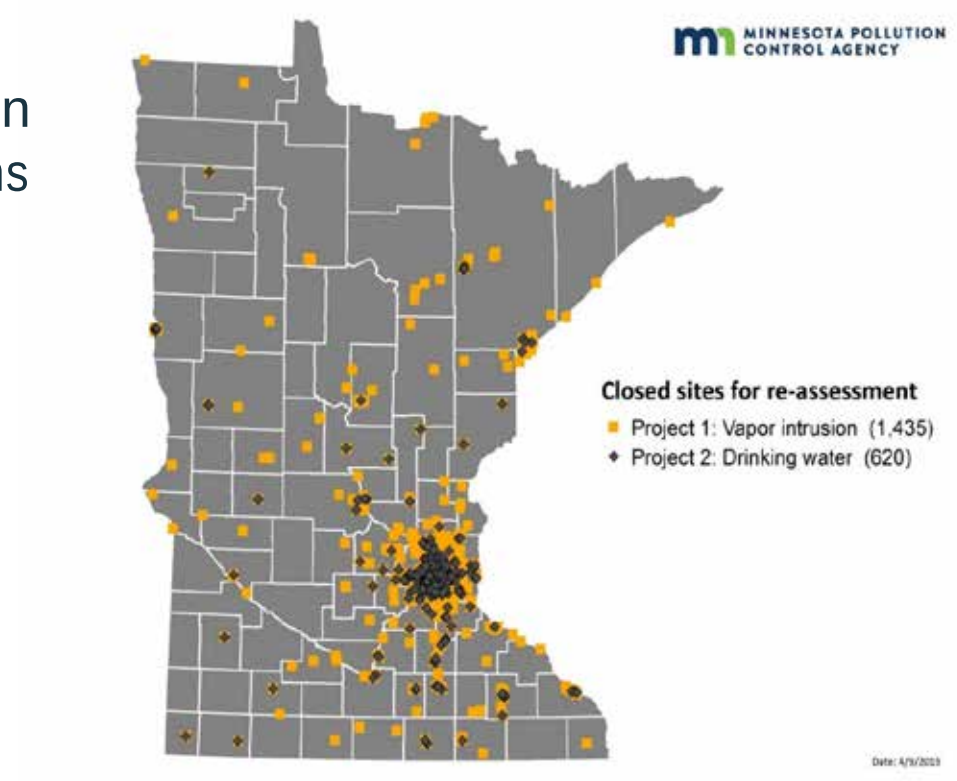
- VI Pathway Investigation is routinely carried out as part of active site investigation
  - 881 active sites across MPCA Remediation and Redevelopment Program
  - VI potential identified at 631 sites
  - Investigation activities conducted at 450 sites
  - VI risk confirmed at 34% of sites and action was taken to address
- VI investigation conducted in accordance with Best Management Practices for Vapor Investigation developed in 2016

The challenge of legacy sites

- Past investigation of contaminated sites focused on groundwater impacts
- Sites achieved regulatory closure with no consideration of VI pathway
- Minnesota understood the need to evaluate potential VI risk at legacy sites

Challenge of legacy sites continued.....

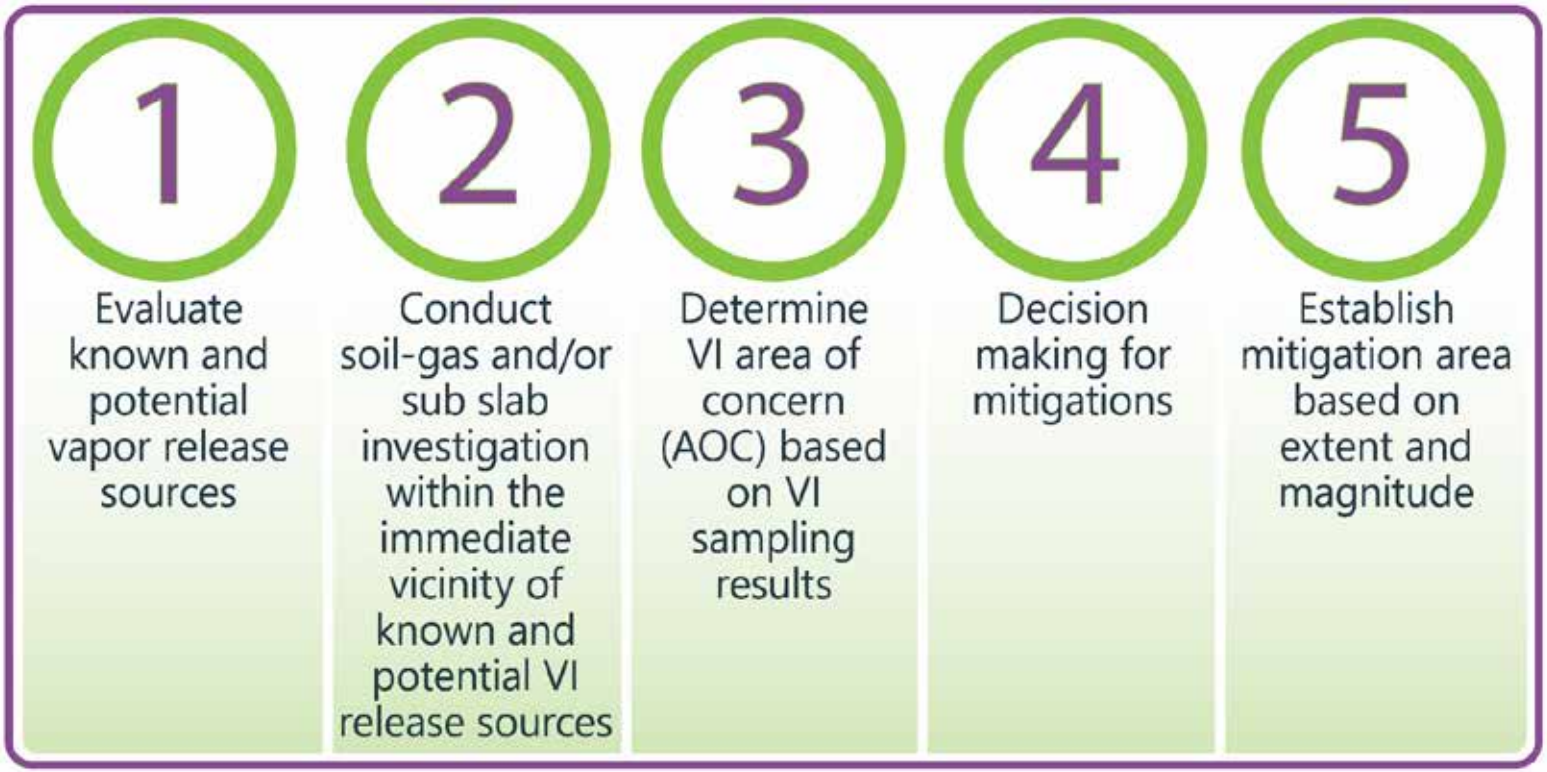
- ~ 4,300 legacy sites identified in VIC, RCRA, Superfund programs
- ~ 1,400 sites identified with chlorinated volatile organic compounds as the primary contaminant of concern



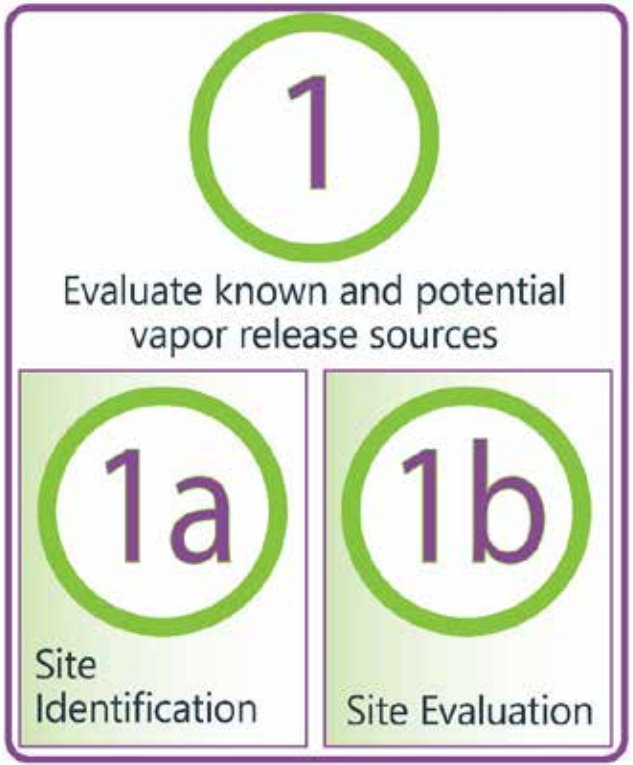
Systematic approach

Primary objective: Development of an approach to evaluate the risk of VI to human health associated with legacy sites across the State of Minnesota

Five step-process



Site evaluation



1a - Begin with an all-encompassing list of legacy sites to review for the potential for VI and utilize methods of prioritization to define a starting point

1b – Develop an approach to evaluating each site for potential VI risk

Site identification/prioritization

- **Challenge of addressing over 1,400 legacy sites**
- MPCA prioritized sites based on following criteria:
  - Sites with VOC impacts within 500 feet of a sensitive receptor (schools, daycares): 190 sites
  - Sites with TCE identified as contaminant of concern (COC) within environmental justice areas: ~100 sites
  - Sites with other VOCs as COC located within defined environmental justice areas: ~600 sites
  - Other: ~ 560 sites

1b Site evaluation

Primary objective:
Determine the need for action, or decide to rule out the potential for VI at a legacy site.

Site evaluation

Site evaluation utilized the following criteria:

1. Site Background and History
   a) Site ownership
   b) Operational history and property use transfer
   c) Current site use
2. Site Conceptual Model
   a) Site layout and presence of utilities (if known)
   b) Regional/site-specific geology
   c) Regional/site-specific hydrology

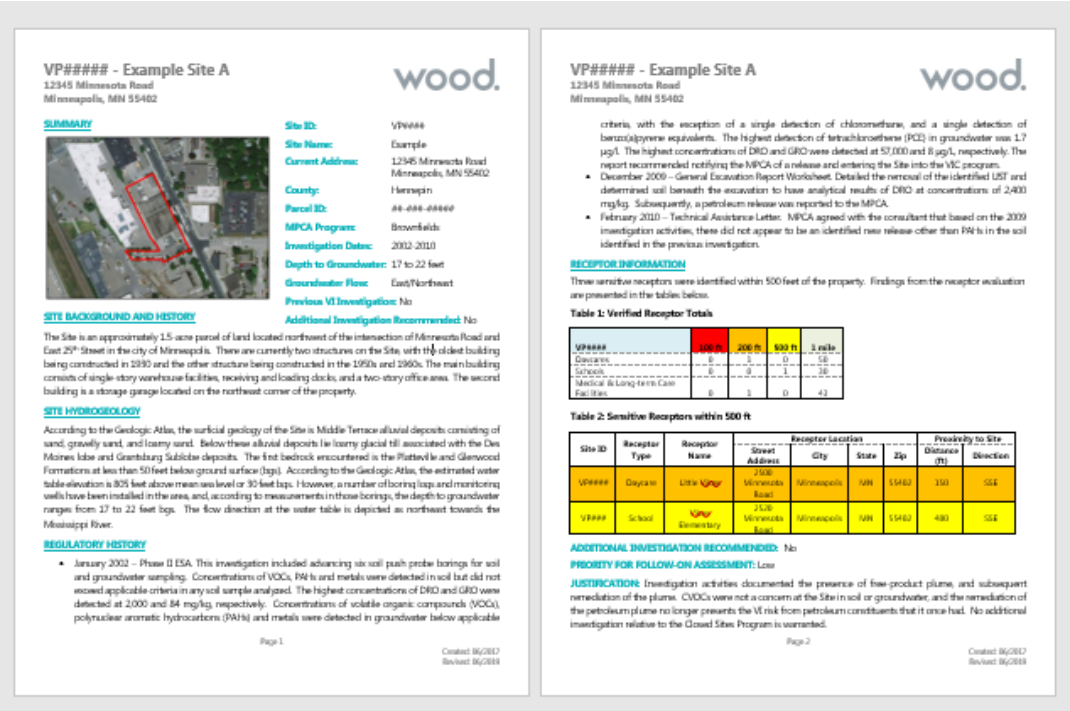
Site evaluation

3. Regulatory History
   a) Review of past environmental investigations
   b) Past regulatory involvement
   c) Identification/review of COC
   d) Analytical profile (min.-max. concentrations of primary COC)
4. Receptor Evaluation
   a) Identification of receptors within specified search distances
   b) Evaluation of sensitive receptors
      1. daycares
      2. schools
      3. medical/long-term care facilities

1b Site evaluation

Results

- Site profiles are developed summarizing findings for each evaluation
- Profiles used to support site management decision
- Results also entered into a matrix for tracking activity at each legacy site



VP##### - Example Site A
12345 Minnesota Road
Minneapolis, MN 55402

wood.

SUMMARY

Site ID:	VP#####
Site Name:	Example
Current Address:	12345 Minnesota Road Minneapolis, MN 55402
County:	Hennepin
Parcel ID:	##-###-#####
MPCA Program:	Brownfields
Investigation Dates:	2002-2010
Depth to Groundwater:	17 to 22 feet
Groundwater Flow:	East/Northeast
Previous VI Investigation:	No
Additional Investigation Recommended:	No

SITE BACKGROUND AND HISTORY

The Site is an approximately 1.5-acre parcel of land located northwest of the intersection of Minnesota Road and East 25th Street in the city of Minneapolis. There are currently two structures on the Site, with the oldest building being constructed in 1910 and the other structure being constructed in the 1950s and 1960s. The main building consists of single-story warehouse facilities, receiving and loading docks, and a two-story office area. The second building is a storage garage located on the northeast corner of the property.

SITE HYDROGEOLOGY

According to the Geologic Atlas, the surficial geology of the Site is Middle Terrace alluvial deposits consisting of sand, gravelly sand, and loamy sand. Below these alluvial deposits lie loamy glacial till associated with the Des Moines lobe and Grantsburg Sublobe deposits. The first bedrock encountered is the Platteville and Glenwood Formations at less than 50 feet below ground surface (bgs). According to the Geologic Atlas, the estimated water table elevation is 805 feet above mean sea level or 30 feet bgs. However, a number of boring logs and monitoring wells have been installed in the area, and, according to measurements in those borings, the depth to groundwater ranges from 17 to 22 feet bgs. The flow direction of the water table is depicted as northeast towards the Mississippi River.

REGULATORY HISTORY

- January 2002 – Phase II ESA. This investigation included advancing six soil push probe borings for soil and groundwater sampling. Concentrations of VOCs, PAHs and metals were detected in soil but did not exceed applicable criteria in any soil sample analyzed. The highest concentrations of DRO and GRO were detected at 2,000 and 84 mg/kg, respectively. Concentrations of volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs) and metals were detected in groundwater below applicable

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Created: 8/5/2017
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criteria, with the exception of a single detection of chloromethane, and a single detection of benzo(a)pyrene equivalents. The highest detection of tetrachloroethene (PCE) in groundwater was 1.7 µg/l. The highest concentrations of DRO and GRO were detected at 57,000 and 8 µg/L, respectively. The report recommended notifying the MPCA of a release and entering the Site into the VIC program.

- December 2009 – General Excavation Report Worksheet. Detailed the removal of the identified UST and determined soil beneath the excavation to have analytical results of DRO at concentrations of 2,400 mg/kg. Subsequently, a petroleum release was reported to the MPCA.
- February 2010 – Technical Assistance Letter. MPCA agreed with the consultant that based on the 2009 investigation activities, there did not appear to be an identified new release other than PAHs in the soil identified in the previous investigation.

RECEPTOR INFORMATION

Three sensitive receptors were identified within 500 feet of the property. Findings from the receptor evaluation are presented in the tables below.

Table 1: Verified Receptor Totals

VP#####	100 ft	200 ft	500 ft	1 mile
Daycare	0	1	0	10
Schools	0	0	1	28
Medical & Long-term Care Facilities	0	1	0	42

Table 2: Sensitive Receptors within 500 ft

Site ID	Receptor Type	Receptor Name	Receptor Location				Proximity to Site	
			Street Address	City	State	Zip	Distance (ft)	Direction
VP#####	Daycare	Little [redacted]	2508 Minnesota Road	Minneapolis	MN	55402	150	SSE
VP#####	School	[redacted] Elementary	2520 Minnesota Road	Minneapolis	MN	55402	480	SSE

ADDITIONAL INVESTIGATION RECOMMENDED: No

PRIORITY FOR FOLLOW-ON ASSESSMENT: Low

JUSTIFICATION: Investigation activities documented the presence of free-product plume, and subsequent remediation of the plume. CVOCs were not a concern at the Site in soil or groundwater, and the remediation of the petroleum plume no longer presents the VI risk from petroleum constituents that it once had. No additional investigation relative to the Closed Sites Program is warranted.

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1b Site evaluation

Results continued…….

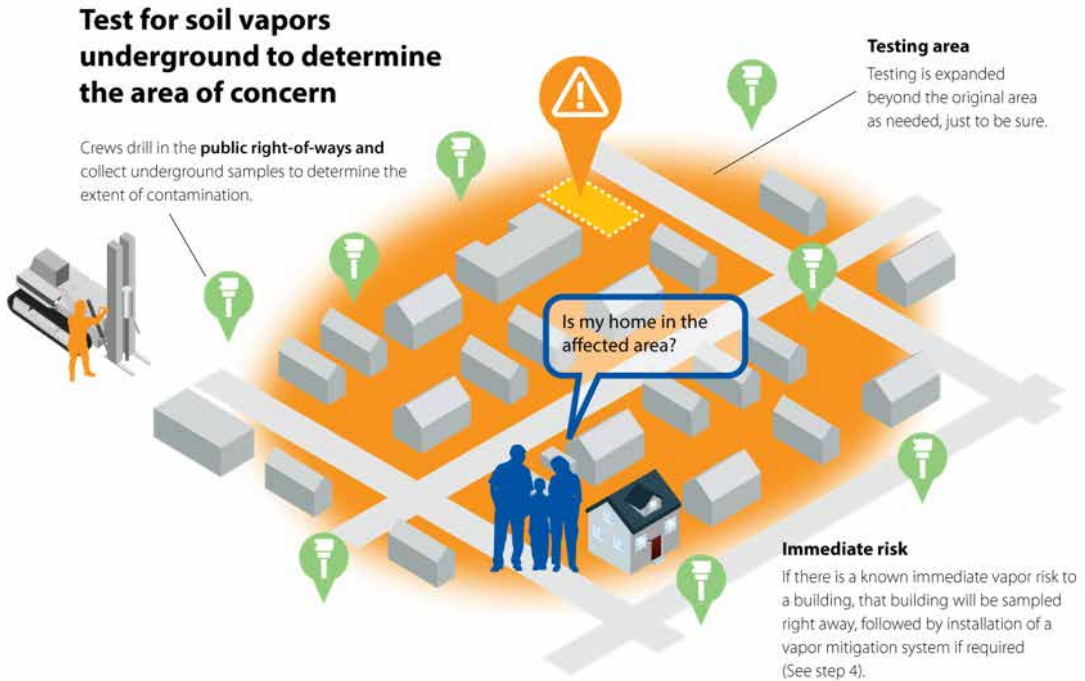
- Site profiles are accompanied by comprehensive receptor map that depicts potential receptors including sensitive receptors by distance
- Map provides visual representation of the site, receptors, preferential pathways, and source evaluation
- Profiles and accompanying map provide communication tool that illustrates a consistent, reproducible, and validated approach

Decision point

- **Justification for next steps**
  - Assessment complete – no investigation required
  - Identification of data gaps (i.e., co-located sites, adjoining sites, gaps in regulatory history)
  - Need for additional investigation (proceed to Step 2)

2 Site investigation

Primary objective:
Conduct soil gas and/or sub-slab vapor investigations within the immediate vicinity of closed site to determine VI risk

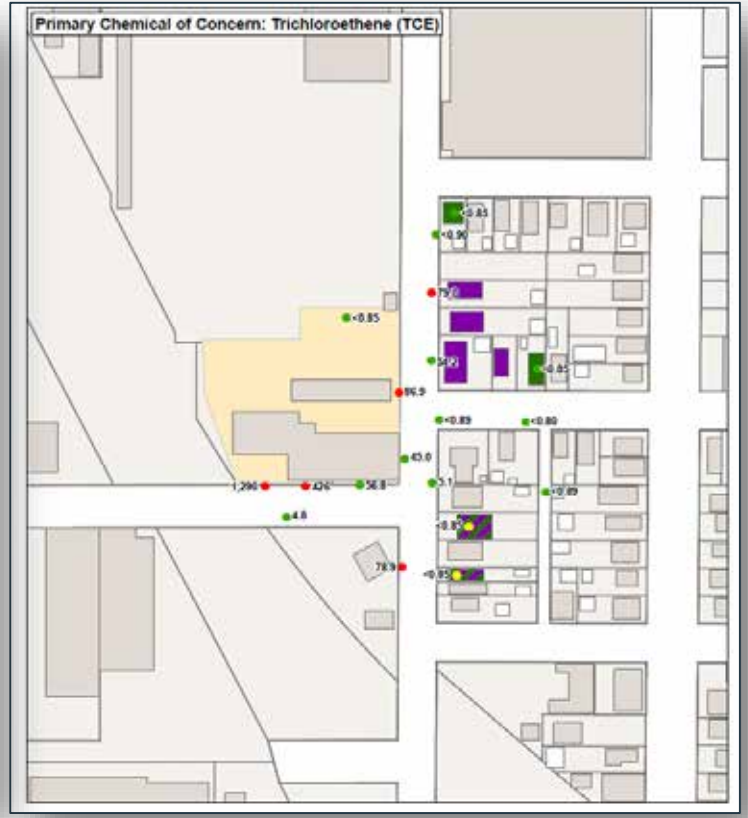


2 Site investigation

Sites are investigated in accordance with current BMPs

- Development of sampling plan to evaluate potential impacts to receptors
- Soil gas and/or sub-slab sampling at, or in the immediate vicinity of legacy sites
- Seasonal sampling (heating and non-heating seasons)
- Evaluation of results relative to Intrusion Screening Values

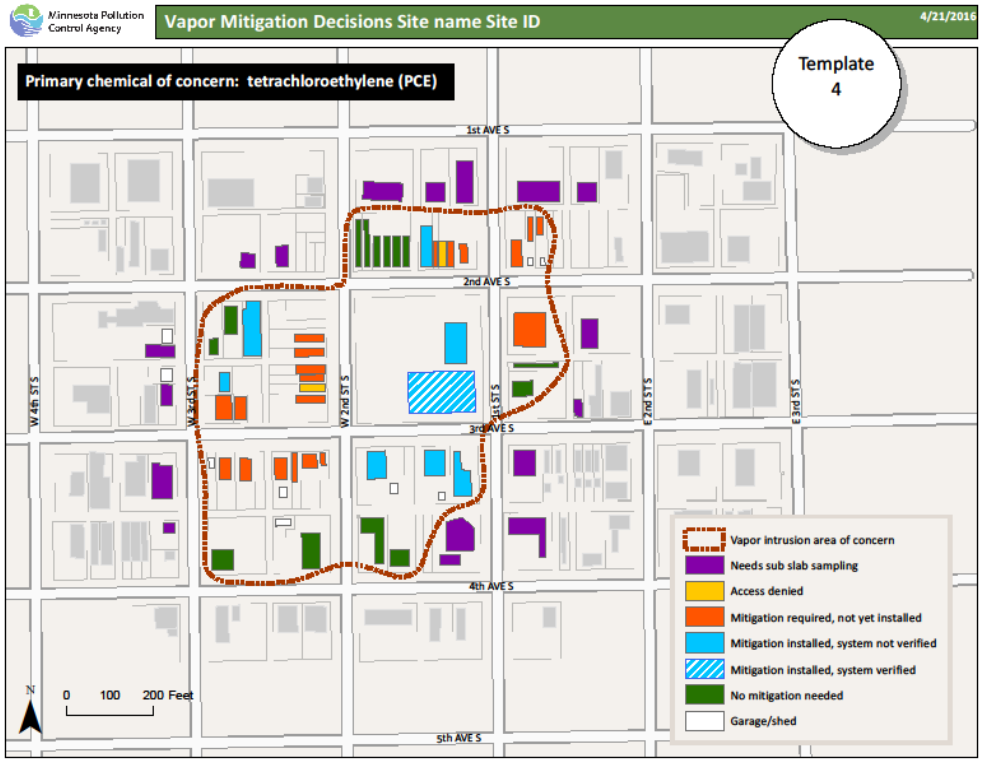
2 Site investigation



3 Delineate VI area of concern

Primary Objective

- Delineate the extent of VI impacts
- VI activities described in Step 2 continue until the full extent of VI risk (or area of concern) is delineated

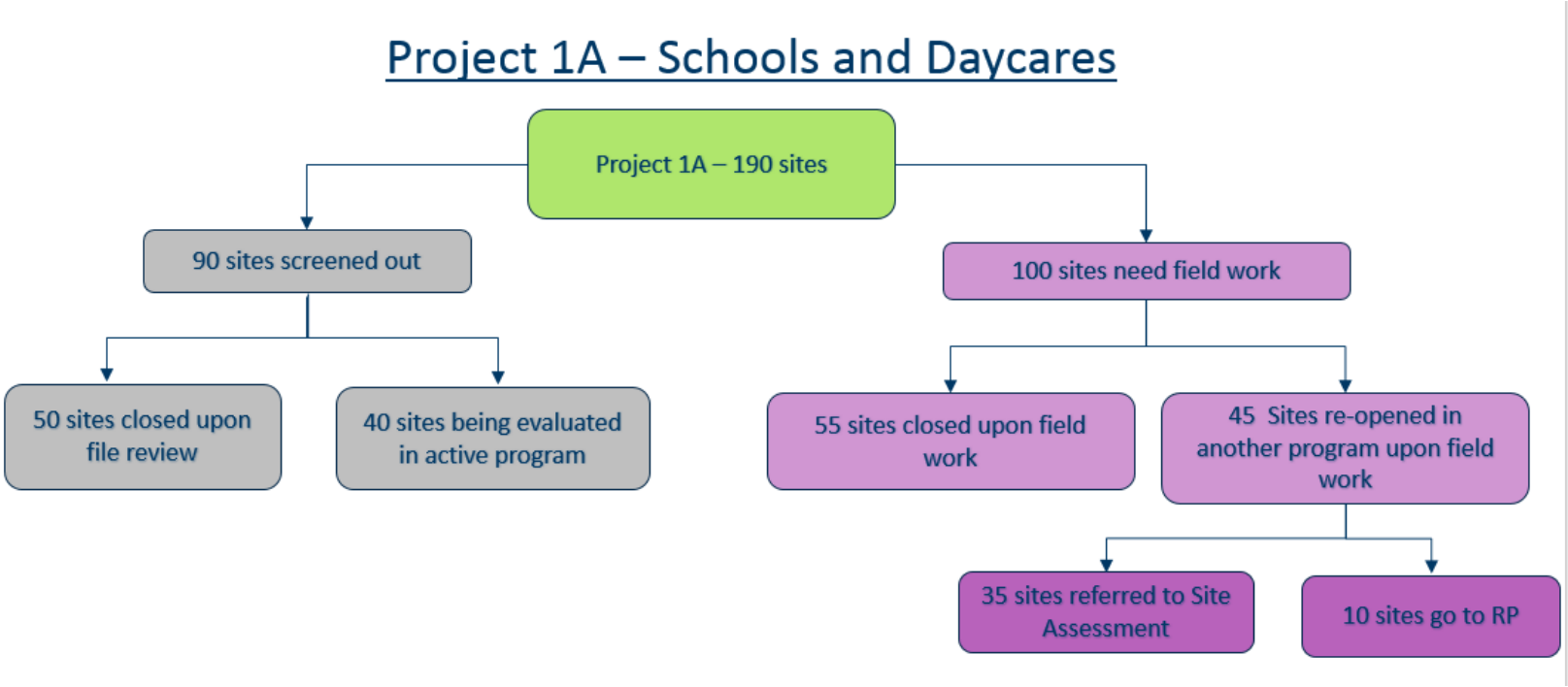


Decision making & mitigation

- MPCA Site Management decision is based on results of VI investigations and need to mitigate VI risk

Program summary

Project 1A – Sensitive Receptors



Questions?

Thank you!
For more information:

Cory Vowles
Project Manager
cory.vowles@woodplc.com
612-252-3789

Andri Dahlmeier
Superfund Project Manager
Minnesota Pollution Control Agency
andri.dahlmeier@state.mn.us