Vapor Intrusion Pathway: Immediate Environmental Concern

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Vapor Intrusion (VI) Pathway

Migration of subsurface vapors to indoor air

Courtesy: ITRC
When is the VI Pathway Complete?

1) There is an identified source related to a discharge;
2) There is a migration pathway; and,
3) A receptor (current or future) is adversely impacted by a subsurface vapor contaminant migrating into a structure.
Vapor Intrusion IEC Scenarios

Site-related Contaminants of Concern (COC)

- Tetrachloroethene (PCE)
  - GWSL – 1 µg/L
  - SGSL – 34 µg/m³
  - IASL – 3 µg/m³
  - RAL – 30 µg/m³

- Trichloroethene (TCE)
  - GWSL – 1 µg/L
  - SGSL – 27 µg/m³
  - IASL – 3 µg/m³
  - RAL – 20 µg/m³

Non-COC

- Benzene
  - GWSL – 15 µg/L
  - SGSL – 16 µg/m³
  - IASL – 2 µg/m³
  - RAL – 14 µg/m³

“•” – exceeds VI Screening Level
Is this a Vapor Intrusion IEC?

ISSUES:

- IA COC > RAL
- IA non-COC > RAL
- SG & GW not sampled
- Status of VI Pathway unknown
- Additional VI investigation warranted to assess IEC

ANSWER: NO

Scenario #1

Benzene – 18 µg/m³ •
PCE – 36 µg/m³ •

Basement not sampled

SSSG not sampled

GW not sampled
Is this a Vapor Intrusion IEC?

**ISSUES:**
- IA COC > RAL
- IA non-COC > RAL
- GW COC > GWSL
- Status of VI Pathway still unknown
- Additional VI investigation warranted to assess IEC

**ANSWER:** NO
Is this a Vapor Intrusion IEC?

**ISSUES:**
- IA COC > RAL
- IA non-COC > RAL
- GW COC > GWSL
- High GWT
- Status of VI Pathway unknown
- Use Multiple Lines of Evidence (MLE)
- Additional VI investigation may be warranted

**Scenario #3**

- Benzene – 18 μg/m³ •
- PCE – 36 μg/m³ •
- Basement not sampled
- SSSG not sampled
- PCE – 36 ppb •

**ANSWER:**
MAYBE
Is this a Vapor Intrusion IEC?

 ISSUES:

- IA COC > RAL
- IA non-COC > RAL
- 1st Floor IA results ND
- SSSG COC > SGSL
- GW COC > GWSL
- VI Pathway complete

 ANSWER: YES

Scenario #4
**Is this a Vapor Intrusion IEC?**

**ISSUES:**
- IA COC < RAL
- IA non-COC > RAL
- SSSG (both) > SGSL
- GW (both) > GWSL
- COCs well documented
- VI Pathway complete

**1st Floor not sampled**

**1st Floor samples:**
- PCE – 1 μg/m³
- Benzene – 17 μg/m³

**PCE – 38 μg/m³**
- Benzene – 600 μg/m³

**PCE – 4 μg/L**
- Benzene – 45 μg/L

**ANSWER:**

**YES,** but...
Is this a Vapor Intrusion IEC?

**ISSUES:**
- 1st Floor IA COC > RAL
- SSSG COC > SGSL
- GW COC > GWSL
- VI Pathway complete??
- Background sources
- Multiple lines of evidence
- Additional VI investigation may be warranted

**ANSWER:** NO
Is this a Vapor Intrusion IEC?

ISSUES:
- IA COC > RAL
- IA non-COC > RAL
- SSSG & GW COC > SLs
- SSSG & GW Non-COC > SLs
- VI Pathway complete

ANSWER: YES
Is this a Vapor Intrusion IEC?

ISSUES:
- IA COC > RAL
- SSSG & GW COC > SLs
- Building vacant
- VI Pathway complete
- How to monitor future use?
- Off-site vs. onsite
- Mitigation warranted in the future if occupied

ANSWER:
YES
ISSUES:
- IA COC > IASL
- SSSG & GW COC > SLs
- Child Day Care Facility
- VI Pathway complete
- VC condition, not IEC
- Mitigation warranted using different timeline

ANSWER: NO
**ISSUES:**
- IA COC > RAL
- Commercial Building
- Status of VI Pathway unknown
- Utilize COC in current operations
- Future use?
- Additional VI investigation warranted if use or chemicals change

**ANSWER:**
**NO**
Scenario #11

Is this a Vapor Intrusion IEC?

ISSUES:
- IA COC > RAL
- Commercial Building
- Don’t utilize COC in current operations
- VI Pathway complete

ANSWER: YES
Is this a Vapor Intrusion IEC?

ISSUES:
- IA COC > RAL
- Commercial & Office Buildings on site
- Utilize COC in current factory operations
- Don’t utilize COC in office
- VI Pathway complete?
- Future use?
- Additional VI investigation warranted if use changes

ANSWER:
YES & NO
IEC CASE STUDY

PRESENTED BY:
Mark D. Fisher, CHMM, LSRP
Principal – The ELM Group, Inc.
Site Background

- Operating dry cleaner in strip mall
- Confirmed release with soil and ground water impacts
- Site related contaminants of concern (COCS) – PCE and degradation compounds
- Remedial investigation initiated, but not completed
- Initial Receptor Evaluation completed
Initial Phase of VI Investigation

- Receptor Evaluation information
- Soil and ground water data
- Determination of structures to be included in VI sampling
- VI sampling – subslab (SS) with contingent indoor air (IA)
IEC Confirmed

- PCE above Rapid Action Levels (RALs) in several retail and at residence
- Operational considerations for active dry cleaner leasehold
- IEC regulatory/mandatory time frame (RTF/MTF) clock starts at confirmation of VI IEC
- Immediate notification to DEP Hotline and Case Manager (if any) – (IEC RTF)
Interim Response Actions – 14 Days

- Evaluate interim response actions – dry cleaner, retail leaseholds, residence

- Options – air purifier, seal cracks/obvious subsurface pathways, ventilation/HVAC mod.

- Implement interim response actions

- Submit IEC form, info & notifications within 14 days of VI IEC confirmation (IEC RTF)
Interim Response Actions – 14 Days

- Communicate with DEP IEC Case Manager
- Begin planning of engineered system response action (next IEC RTF)
- Begin planning of additional receptor/site characterization
- Protection of receptors is the primary concern
Subsequent Phase of VI Investigation – 60 Days

- Additional step out sampling based upon existing data (SS, IA, GW) within 60 days (IEC/Receptor Evaluation RTF)

- Continue with iterative process as needed based upon data & professional judgment

- Goal is to complete VI investigation & relevant components of remedial investigation ASAP
Subsequent Phase of VI Investigation – 60 Days

- Communicate with DEP IEC Case Manager to eliminate potential non-compliance situation

- Evaluate need for extension requests
Engineered System Response Action – 60 Days

- Engineered System Response Action needs to be initiated and form submitted within 60 days of VI IEC confirmation (IEC RTF)

- Multiple IECs and/or VCs will have separate clocks/time frames

- Typically requires prioritization of actions based upon sensitivity of receptors – work with DEP IEC Case Manager to establish extensions to time frames
Engineered System Response Action Report – 120 days

- Updated report, forms, tables and maps must be submitted within 120 days of VI IEC confirmation (IEC RTF)

- If multiple IECs/structures, include all available info/data with initial report, and then provide updates as needed
Engineered System Response Action Report – 120 days

- DEP does not want formal work plans for Engineered System Response Action Reports – keep it simple
  - Verbal and email communication
  - Presumption is subsurface depressurization for IEC structures
  - Other “engineered systems” will likely require more detailed DEP IEC Case Manager review/approval
Initiation of IEC Source Control – 1 Year

- Initiate control of the IEC contaminant source and submit report and form within 1 year of VI IEC confirmation (IEC RTF with associated mandatory time frame).

- “Source control” not specifically defined
  - Focus/DEP expectation is removal or initiate remediation of gross mass/source material
  - Dissolved phase GW contamination is not part of “source control”
  - Communicate DEP IEC Case Manager to reduce potential for non-compliance

- Establish monitoring and maintenance plan for systems and affected structures
QUESTIONS?
IEC Program Status

Andrew Sites, NJDEP
IEC Program Status

- 72 LSRP IECs & VCs
- 70 Publicly Funded IECs
- 85% of LSRP cases are VI
Problems & Misconceptions

- IECs become VCs when levels decrease
- Reporting IEC or VC with no pathway
- Sampling when COC is used in building
- IEC complete after receptor control
- No information submitted with IEC form
- No Receptor Delineation for IECs
Future Changes

• New Technical Rules for May 2012

• IEC Guidance will be revised for May 2012

• Revised VIG: Expanded Operation, Maintenance & Monitoring
Questions?