

SSUES & Trends

Vapor Intrusion in Wisconsin 2023 Updates

Issues & Trends - 2023 Jennifer Borski and Jim Walden

Zoom Logistics

- All attendees muted
- To comment or ask questions, use chat or raise hand
- Send questions to Jennifer Borski
- Q&A session open at end of presentation



Today's recording will be available at dnr.wi.gov, search "RR Training Library"

RR Program Announcements

Congrats, Matt Thompson!

Accepted a new position as the Team Supervisor in the West Central Region (WCR) stationed in the Eau Claire office.



Public Input Opportunities

Coming Soon

- Guidance: Tips and Reminders for a Complete Closure Submittal (RR-979)
- Addressing Vapor Intrusion at Remediation and Redevelopment Sites in Wisconsin (RR-800)

Remediation and Redevelopment Program		March 2023		
Addressing Vapor Intrusion at Remediat	tion and Rede	velopment		
Wis. Stat. ch. 292, Wis. Admin. Code chs. NR 700-7	799			
Purpose programments in far persons who perform investigation and transities commissions under Waccasis Administrative Code (We, Admin States (Wis, Sault, A. 202, Specifically, Mis guidance is insteaded for environmental consultants, and atomacys who involved with the inve apport contamination. This guidance applies to sites with volktilless of unburdless commission who the potential to imparts to occupies Unbidings of twildings on the programment of the commission distributions for whistings may This guidance identifies conditions that indicate an assessment of the regulation lenge-term streamforthy, and clarifies when sites with a comp mure achieve course.	tion of sites with environ Code) chs. NR 700-799 2 r responsible parties, pro stigation, remediation, o ats (i.e., vapors) that have become occupied. e vapor intrusion pathway ki, identifies appropriat lete or potential vapor m	mental md Wisconsin perty owners, r mitigation of e migrated to or / is necessary at e responses, igration pathway		
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Public Input Opportunities

Coming Soon

- Guidance: Mechanical and Chemical/Biological Spill Response Methods (RR-710)
- DNR Staff Provide Spill Response and Support (RR-559)
- Immediate Reporting Required for Hazardous Substance Spills (RR-560)





Public Input Opportunities

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WISCONSIN DEPARTMENT OF NATURAL RESOURCES

HUNTING FISHING PARKS CLIMATE ENVIRONMENT FORESTRY LICENSES NEWS ABOUT CONTACT

> TOPIC > BROWNFIELDS: REDEVELOPMENT OPPORTUNITIES

REMEDIATION & REDEVELOPMENT PROGRAM PUBLIC NOTICES

Remediation & Redevelopment (RR) Program public notices and public comment opportunities are listed below.

External advisory group meeting information can be found on each group's webpage and on the DNR Hearings and Meetings Calendar.

Find trainings and presentations offered by the RR Program on the RR Program presentations & trainings webpage.

Program Guidance Public Notices

PROGRAM GUIDANCE

The RR Program welcomes input on all program guidance. Current guidance can be found using the search tools listed on the RR Program <u>Publications and Forms page</u>. To offer feedback on current RR Program guidance, you can email the staff contact listed in the specific guidance document or <u>DNRRRGuidance@wisconsin.gov</u>.

The following table lists guidance in development or under active review by the program. Email the staff contact listed in the table below to share feedback. Staff will review and consider comments received to improve the quality of the guidance.

There are no program guidance postings for public comment at this time.

Brownfields: Redevelopment Opportunities Q

RR Report Newsfeed

Find Contaminated Land Activities

Request Green Team Assistance

Submit Files Related to ch. NR 700, Wis. Adm. Code

Report a Spill

Environmental Contamination & Cleanup

Related Links

For Environmental Professionals



dnr.wisconsin.gov/topic/brownfields/ publicnotices.html

Remediation and Redevelopment External Advisory Group

- □ Subgroup Series Dec. 5, 2023
- □ **RR EAG** January 25, 2024
- Subgroup Series Feb. 28
- □ **RR EAG** April 11, 2024
- Subgroup Series May 29
- RR EAG July 25, 2024 (tentative)

i Sign up for Updates dnr.wisconsin.gov/topic/brownfields/rreag

Brownfields Funding Resources



Gena Larson Gena.Larson@wisconsin.gov

WAM Contractor Services (DNR-managed)

- Up to \sim \$54,000 in services per property
- DNR hires contractor & oversees work

WAM Community-managed

- Up to \$100,000 grant to local government
- Local government selects contractor & oversees work

Ready for Reuse

- 0% interest loan, 22% match requirement
- Up to 30% loan forgiveness



Today's recording will be available at dnr.wi.gov, search "RR Training Library"



Subscribe to **RR Report Newsfeed** for Email Notifications

dnr.wisconsin.gov/topic/Brownfields/News.html



Jennifer Borski

Dry Cleaning and Vapor Intrusion Team Leader





- Vapor Mitigation Systems: Active Alarms, Telemetry & Backup Power
- New Vapor Intrusion Resources
- RR External Advisory Group Vapor Intrusion Subgroup
- Technical Updates on Passive Sampling, Sewers, Cracks and other Pathways – Jim Walden





Vapor Mitigation Systems Active Alarms, Telemetry & Backup Power

Active Alarms, Telemetry & Backup Power

Active Notification Options

- Audible notification that is clear and distinct
- Visual light notification that is vividly observable
- Notification by telemetric means such as by email or other electronic communication

Note—ANSI/AARST RMS-MF and RMS-LB consolidated into a single publication
ANSI/AARST SGM-MFLB 2023
An American National Standard

Soil Gas Mitigation Standards for existing Multifamily, School, Commercial and Mixed-Use Buildings



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ANSI/AARST An American National Standard



Soil Gas Mitigation Standards for Existing Homes





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ANSI/AARST Soil Gas Mitigation Standards for Existing Homes (SGM-SF-2023, Section 8.2.2) and Soil Gas Mitigation Standards for Existing Multifamily, School, Commercial and Mixed-Use Buildings (SGM-MFLB-2023, Section 8.2.2)

Vapor Mitigation Systems Active Alarms, Telemetry & Backup Power **Do Not Alter Or Disconnect Radon System** Alarm Test Low Button Battery **Test Monthly** Test battery by momentarily pressing button. 口目 If alarm sounds weak or not as loud as desired, replace battery. - PVC Sub-Slab Retest for radon at least every 2 years. DUCTWORK **Early Warning Device** Depressurization Alarm On: **Fan Not Operating Or Flow Is Restricted** System **Remove Battery To Silence** INLINE And Refer to Owners Manual CENTRIFUGAL Manufactured by RadonSystemAlarms.co Vacuum Port BLOWER LOW PRESSURE ALARM SEALED FLOOR & WALL SOIL GAS CRACKS COLLECTION SUMP - - 0 **CRUSHED STONE** 00 0 https://vim-1.itrcweb.org/ **©CLEAN VAPOR**

Vapor Mitigation Systems Active Alarms, Telemetry & Backup Power





https://www.vaporsentinel.com/

Active Alarms, Telemetry & Backup Power

DNR may determine the frequency with which a VMS must be monitored, which could be "frequent" or "continuous monitoring" of system components to assure protectiveness. (Wis. Admin. Code § NR 724.13(1)(d))



Active Alarms, Telemetry & Backup Power

DNR recommendations to meet this requirement where there is a **risk to public health** using current technology:

- a. Active notification (audible, visual <u>or</u> telemetry) for all active VMSs; and
- b. Telemetry and backup power where <u>both</u> are present:
 - i. Multi-family residential building (or site-specific conditions warrant); and
 - ii. Acute risk levels detected prior to mitigation in indoor air or sub-slab vapor

DNR will monitor technology and health risk with Department of Health Services (DHS) and provide modified recommendations when appropriate.



Active Alarms, Telemetry & Backup Power

Acute Risk

- □ Trichloroethene (TCE) above vapor action level (VAL) in indoor air
- □ TCE above the vapor risk screening level (VRSL) in sub-slab vapor
- □ Non-carcinogen above three times the VAL or VRSL
- □ Carcinogen above ten times the VAL or VRSL

Use Guidance: Wisconsin Vapor Quick Look-Up Table

Indoor Air Vapor Action Levels and Vapor Risk Screening Levels (RR-0136) to determine non-carcinogen vs. carcinogen for inhalation pathway

Go to dnr.wi.gov, search "RR-0136"



Guidance: Wisconsin Vapor Quick Look-Up Table ^{1, 2, 3} Indoor Air Vapor Action Levels and Vapor Risk Screening Levels

(Based on May 2023 U.S. Environmental Protection Agency (U.S. EPA) Regional Screening Levels)

Remediation and Redevelopment Program

August	202
August	202

	RESIDENTIAL AF = 0.03			SMALL COMMERICAL AF = 0.03				LARGE COMMERCIAL/INDUSTRIAL AF = 0.01				MOLECULAR	U.S.EPA RSL	
CHEMICAL		INDOOR AIR VAL		SUB-SLAB VAPOR VRSL		INDOOR AIR VAL		SUB-SLAB VAPOR VRSL		INDOOR AIR VAL		SUB-SLAB VAPOR VRSL		BASIS
	µg/m ³	ppbV	µg/m³	ppbV	µg/m³	ppbV	µg/m³	ppbV	µg/m³	ppbV	μg/m ³	ppbV	g/mole	
Benzene	3.6	1.1	120	37	16	4.9	520	160	16	4.9	1,600	490	78.11	с
Carbon Tetrachloride	4.7	0.73	160	25	20	3.1	680	110	20	3.1	2,000	310	153.82	с
Chloroform	1.2	0.24	41	8.3	5.3	1.1	180	36	5.3	1.1	530	110	119.38	с
Chloromethane	94	45	3,100	1,500	390	190	13,000	6,200	390	190	39,000	19,000	50.49	n
Dichlorodifluoromethane	100	20	3,500	700	440	88	15,000	3,000	440	88	44,000	8,800	120.91	n
1,1-Dichloroethane (1,1-DCA)	18	4.4	590	140	77	19	2,600	630	77	19	7,700	1,900	98.96	с
1,2-Dichloroethane (1,2-DCA)	1.1	0.27	36	8.7	4.7	1.1	160	39	4.7	1.1	470	110	98.96	С
1,1-Dichloroethylene (1,1-DCE)	210	52	7,000	1,700	880	220	29,000	7,200	880	220	88,000	22,000	96.94	n
Dichloroethylene, cis-1,2-	42	10	1,400	350	180	45	5,800	1,400	180	45	18,000	4,500	96.94	n
Dichloroethylene, trans-1,2-	42	10	1,400	350	180	45	5,800	1,400	180	45	18,000	4,500	96.94	n
Ethylbenzene	11	2.5	370	84	49	11	1,600	360	49	11	4,900	1,100	106.17	с
Methylene Chloride	630	180	21,000	5,900	2,600	740	88,000	25,000	2,600	740	260,000	74,000	84.93	n
Naphthalene	0.83	0.16	28	5.3	3.6	0.68	120	23	3.6	0.68	360	68	128.18	с
Tetrachloroethylene (PCE)	42	6.1	1,400	200	180	26	5,800	840	180	26	18,000	2,600	165.83	n
1,1,1-Trichloroethane (1,1,1-TCA)	5,200	940	170,000	31,000	22,000	4,000	730,000	130,000	22,000	4,000	2,200,000	400,000	133.41	n
Trichloroethylene (TCE)	2.1	0.38	70	13	8.8	1.6	290	53	8.8	1.6	880	160	131.39	n
Trichlorofluromethane				-		-				-			137.37	
Vinyl Chloride	1.7	0.65	56	22	28	11	930	360	28	11	2,800	1,100	62.50	с
Xylene (mix)	100	23	3,500	790	440	100	15,000	3,400	440	100	44,000	10,000	106.17	n

Notes

All values in µg/m³ obtained from U.S. EPA Vapor Intrusion Screening Level (VISL) calculator (three significant figures) & rounded to two significant figures.

VISL linked to U.S. EPA RSL database of toxicity and chemical parameters.

All values in ppbV calculated from VALs & VRSLs reported above in µg/m3.

Bolded values are updated from previous version of WI Vapor Quick Look-Up Table.

- = Inhalation toxicity values not available from U.S. EPA

AF = Attenuation Factor VAL = Vapor Action Level VRSL = Vapor Risk Screening Level U.S. EPA RSL = Regional Screening Level n= noncancer; c = carcinogenic

Immediate Action Criteria: carcinogens (c) = 10 x VAL or VRSL; non-carcinogens (n) = 3 x VAL or VRSL; TCE in indoor air at certain concentrations

Active Alarms, Telemetry & Backup Power



Active Alarms, Telemetry & Backup Power

Next Steps

- Revisions to Addressing Vapor Intrusion at Remediation & Redevelopment Sites in Wisconsin (RR-800)
- Developing a fact sheet on alarms and telemetry
- □ Consultants' Day Coming to a region near you in 2024!





New Vapor Intrusion Resources



Chemicals used in commercial activities - such as dry cleaning chemicals, chemical degreasers and petroleum products like gasoline - are known as volatile organic compounds (VOCs). Spilled or disposed VOCs can leak into soil and groundwater and stay for decades. VOCs can become a gas or vapor and enter buildings. This process is known as vapor intrusion which has been linked to some short- and long-terr health effects



DEPARTMENT OF

HUNTING FISHING PARKS CLIMATE ENVIRONMENT FOREST

> TOPIC > BROWNFIELDS: REDEVELOPMENT OPPORTUNITIES

VAPOR INTRUSION RESOURCES FOR PROPERTY OWNERS. **OCCUPANTS, AND THE PUBLIC**

such as dry cleaning chemicals, chemical degreasers and petroleum products like gasoline - are known as volatile organic compounds (VOCs). Spilled VOCs and those disposed of down sewers sometimes can leak into soil and groundwater and if they become a gas or vapor, can potentially enter buildings. This process is known as vapor intrusion which has been linked to some short- and long-term health effects.

This webpage contains general information about vapor intrusion for property owners, tenants and the general public.

- Municipal leaders looking to protect their citizens from vapor intrusion can find more information on the Vapor Intrusion Prevention & Partnership Toolkit webpage.
- Technical information about vapor intrusion is available on the Vapor Intrusion Resources for Environmental Professionals webpage
- Additional information can be found by visiting the Environmental Protection Agency's What is Vapor Intrusion? [exit DNR].

dnr.wisconsin.gov/topic/Vapor/

* TOPIC
 * BROWNFIELDS: REDEVELOPMENT OPPORTUNITIES

VAPOR INTRUSION RESOURCES FOR ENVIRONMENTAL **PROFESSIONALS**

Screening for the vapor intrusion (VI) pathway must be conducted at every contaminated site in Wisconsin. The need to investigate VI is elevated when screening indicates the potential for VI is present, especially when trichloroethylene (TCE) is present due to its potential for acute (short-term) health risks. Mitigation is the process of interrupting the VI exposure pathway such that the vapors no longer affect occupants. Mitigation is not a form of remediation.

HUNTING FISHING PARKS CLIMATE ENVIRONMENT FOR

This webpage provides resources to help environmental consultants screen the vapor pathway, assess vapor risk and investigate and mitigate vapor intrusion at specific buildings.

- · General information about vapor intrusion for property owners, tenants and the general public is available on the Vapor Intrusion webpage.
- · Municipal leaders looking to protect their citizens from vapor intrusion can find more information on the Vapor Intrusion Prevention & Partnership Toolkit webpage.

January 2021 - The Interstate Technology & Regulatory Council (ITRC) published a comprehensive web-based series of technical resources for VI mitigation. An overview of mitigation options and key considerations, from the conceptual site model to an exit strategy, are included. See "ITRC guidance" under the "Guidance and Forms" tab below

HUNTING FISHING PARKS CLIMATE ENVIRONMENT FORESTRY LICENSES NEWS AROUT CONTAC

• TOPIC • VAPOR INTRUSION

VAPOR INTRUSION RESOURCES FOR LOCAL GOVERNMENTS

ertain chemicals that get spilled or discharged into the ground can emit gases, or vapors, that move through the soil. Additional Resources Contaminated vapors may enter a house or building through cracks, holes, drains and other small openings in a basement floor, wall or foundation slab - even with new construction. This is called vapor intrusion. It is similar to how VI Resources for Environmental radon, a naturally occurring gas, enters a house or building. Professionals

Contaminated vapors, which may be odorless and colorless, can accumulate and become a potential health risk. When vapor intrusion occurs, the local government and health department may be a valuable resource to the affected individuals and community.

Understanding how vapor can migrate is important when local governments are starting to plan for utility work. building and occupancy permits, re-zoning, and development. The DNR recommends communicating with DNR staff early in the development planning process, so that DNR may provide relevant information regarding the NR 700 process and timeline, which may help keep developments on time and at cost.

The DNR does not have the authority to regulate building occupancy. Building occupancy is typically regulated by loca authorities in the city or county where the building is located. Local health departments may also assist in situations involving indoor air quality.



lennifer Borsk

apor Intrusion

For more information, contact

New Vapor Intrusion Resources

Resources for Local Governments

- □ VI overview
- Occupancy authority
- □ VI contacts
- Vapor Toolkit
- □ Vapor sources
- □ Investigation
- □ Mitigation

🗆 Health

https://dnr.wisconsin.gov/topic/Vapor/LocalGovtResources.html



RESOURCES FOR LOCAL Governments

Understand vapor intrusion, how it can affect the health of your community and impact the potential for redevelopment.

READ MORE

 \ominus



New Vapor Intrusion Resources



The Remediation & Redevelopment (RR) Program Document Search and Resource Portal provides access to publications, forms and templates. Each type of document is organized into a collection; if you are unsure of the document type, click on "All Documents" for a comprehensive collection.

RR Document Search and Resource Options





RR EAG – VI Subgroup

Next meeting

- □ Dec. 5, 2023, from 2:00 3:30 p.m.
- □ Attendance in person in Milwaukee or online

Tentative Agenda

- Review of draft work plan
- Prioritization of objectives
- Discussion on next steps for priorities





Jim Walden

Vapor Intrusion Technical Expert



Vapor Intrusion in Wisconsin Technical Updates: Passive Sampling, Sewers, Cracks and other Pathways

Jim Walden



Agenda

- Variability
- Passive Sorbent Sampling
- Conduit Vapor Intrusion (VI)
- Preferential Pathways (other than conduits)
- Real Time Tools
- New and Renovated Buildings in Contaminated Settings
- Rapid Response Mitigation (RRM)
- State Funded Vapor Investigations
- Q&A











Indoor Air Variability

TCE = Trichloroethene (aka trichloroethylene)

Sub-slab TCE Vapor Concentrations (µg/m³)

Residential Homes Investigated in Wisconsin



µg/m³ = micrograms per cubic meter

30-minute canister samples



Grab canister sample



Grab canister sample



Grab canister sample



Grab canister sample

TCE As An Acute Concern





DNR Conceptual Model of the VI Pathway near a Building

Passive Sorbent Sampling



Nov. 16, 2022 – Passive Air Sampling For Vapor Intrusion

- PDF of slides and webinar rect. Jing
- Go to **dnr.wi.gov**, search "RR Program Presentations & Training Library"

Subscribe to RR Report for notifications about future Issues & Trends

https://dnr.wisconsin.gov/topic/Brownfields/News.html

Passive Sorbent Samplers

- Primary advantage
 - Time integrated concentrations up to weeks
 - Some samplers achieve reporting limits < vapor action levels within hours
- Ancillary advantages over canister
 - Shelf life
 - Availability
 - Rapid deployment
 - Small size
 - Reduced shipping costs and carbon footprint
 - No vacuum

Passive Sorbent Samplers

Appropriate sampler and sorbent chosen based on:

- Contaminants of Concern (COC)
- Duration of sampling
- Setting parameters
 - Air velocity
 - Temperature
 - Humidity
 - Physical limitations
 - Diffusion limitations (e.g., soil)

Always work closely with the lab!



Passive Sub-slab Sampling



Passive Sub-slab (new sampler holders)





*Neodymium magnets of at least 30 lb capacity, use 2-3 per sample

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Passive Soil Gas Sampling

TCE sorbed onto passive samplers (mass in nanograms)





Wisconsin DNR – Environmental Contamination



June 2021

Remediation and Redevelopment Program

Guidance for Documenting the Investigation of Human-made Preferential Pathways Including Utility Corridors



Purpose

This guidance is for persons who perform and document investigation and remediation of sites with environmental contamination under Wisconsin Administrative Code (Wis. Admin. Code) chs. NR 700-799, including the Wisconsin Department of Natural Resources (DNR) staff who review such submittals. This guidance document presents ways that utility corridors and other human-made preferential pathways can influence contaminant migration, and methods to assess and options to sample these pathways to meet the requirements of Wis. Admin. Code § NR 716.11(5)(a).

Vapor migration through human-made preferential pathways and utility conduits is of particular importance. These preferential pathways may allow contaminant vapors to move from source areas into buildings, and to migrate beyond plume boundaries and historically recommended screening distances. This document focuses on vapor migration in utility conduits, but also relates to the preferential migration of contaminated groundwater, soil or surface water in human-made features.

Publication: RR-649 dnr.wi.gov Search: vapor This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in stantic or administrature rule are referenced. Any regulatory decisions mode by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts. Guidance for Documenting the Investigation of Human-made Preferential Pathways Including Utility Orridors (RR-649)

Go to dnr.wi.gov, search "DNR RR-649"

Preferential Pathways (other than) conduits)



Pathways Dependent on Indoor Pressure



Identifying and Evaluating Vapor Intrusion through Preferential Migration Routes and Points of Entry into Buildings

B. Schumacher, et. al. USEPA Nov 2021 EPA/600/R-21/272

Pathways with Independent Driving Forces



Identifying and Evaluating Vapor Intrusion through Preferential Migration Routes and Points of Entry into Buildings

B. Schumacher, et. al. USEPA Nov 2021 EPA/600/R-21/272

Real Time Assessment



Real Time Assessment















Real Time Assessment

- Accurate for intended purpose
 - Confirmed in use/not just marketing claim
 - Achieve Vapor Action Levels (VALs)/Vapor Risk Screening Level (VRSLs), as appropriate
- Calibrated/re-calibrated per manufrcturer's recommendations
- Do research before the device is needed
- Communicate relevant information to DNR Project Manager

New and Renovated Buildings at Contaminated Settings

Redeveloped or Reoccupied Building

- Involve DNR early
- Incorporate VI in construction schedule
- Use passive soil gas sampling to characterize source
- Assess off-gassing building mater (s)
- Pre-redevelopment remediation



Redeveloped or Reoccupied Building

- Preferential VI routes
- Robust mitigation
- Good construction quality control best practices
- Incremental redevelopment samping
- Comprehensive indoor air sampling before occupancy



New Building at Contaminated Sites

- Involve DNR early
- Incorporate VI in construction schedule
- Use passive soil gas sampling to characterize source
- Pre-redevelopment remediation



New Building at Contaminated Sites

- Preferential VI routes
- Robust mitigation
- Good construction quality control
- Sub-slab vapor and comprehensive indoor air sampling before occupancy
- Allow for DNR review time in project planning



Rapid Response Mitigation (RRM)



RRM - Timeframes

- Letter from Department of Health Services (DHS) to DNR defining a "single exposure" referenced in DHS March 25, 2021 letter
- Letter from DHS to DNR with recommended time frames and response actions at vapor intrusion sites
- DHS response to Request for Opinian on risk guidelines in DNR's Vapor Intrusion Guidance RR-800; comments to immediate action criteria and Trichloroethylene (TCE) acute risk

Go to dnr.wi.gov, search "Vapor Intrusion Resources for Environmental Professionals"







RRM

- Notification
- Source and Pathway Identification
- Pathway Sealing
- Ad Hoc Ventilation
- Indoor Air Treatment
- HVAC Modification
- Long-term Mitigation
- Confirm Indoor Air Quality



State Funded Vapor Investigations



DNR Vapor Intrusion Zone Contract (VIZC) or Vapor Intrusion Assessment Contract (VIAC) Investigations

»)

Priority Factors

- Presence and concentration of TCE and Perchloroethylene (aka PCE or Perc)
- # properties
- Sewer impact
- Population
- Social vulnerability
- Investigation status



VIZC / VIAC

- 9 Investigations completed or started
- 8 Buildings sampled
- **3** Buildings mitigated
- 2 Mitigation system evaluated or upgrided6 Sanitary sewer systems sampled



Takeaways

- Consider variability and all pathways in VI Conceptual Site Model
- Use the appropriate investigation tool
- New or renovated buildings be proactive with sampling, remediation, mitigation, and communication
- Have a RRM plan before sampling a building
- Reach out to the DNR Project Manager with questions
- Numerous unreported discharges still pose a VI risk



Questions?

THANK YOU!

CONNECT WITH US

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