Welcome

- In-Person Attendees
- Webinar Attendees

Continuing Education Credits (CECs)

Application has been made to the

SRP Professional Licensing Board to receive

2 Regulatory CECs and 1 Technical CEC

for this Training Class

Attendance Requirements:

- **In-Person Attendance**: Must sign-in / sign-out: May not miss more than 45 minutes of the training
- **Webinar participants**: must be logged-in for entire session and answer 3 out of 4 test questions (randomly inserted in the presentation)

Case Study Training - Rutgers

Schedule for DEP provided training

Next course - October 4, 2017

(2 times per year)

Early June, 2018

(1 time annually)

Case Study Training is a Prerequisite for the LSRP Exam

CECs: What's the Process?

- DEP compiles a list of "in-person" and "webinar" participants eligible for CECs
- DEP will email participants that requested a "Training Certificate"
- Email will contain a "Link" to a LSRPA webpage, which will have instructions on how to access certificates
- Certificates are issued by the LSRPA - *$25 processing fee*

Test Your Knowledge

Sky diving without a parachute may be hazardous to your health.

A. True

B. False

EXAMPLE WEBINAR QUIZ SLIDE

Important reminders

- Please mute cell phones
- Phone calls / conversations
  - Please take outside of the meeting room
- Question/Answers
  - At times specified during the presentation
  - Please wait for the microphone
  - Webinar participants, wait for question period to “open up” and can then type in question

Commingled Plume Technical Guidance Committee

- DEP compiles a list of “in-person” and “webinar” participants eligible for CECs
- DEP will email participants that requested a “Training Certificate”
- Email will contain a “Link” to a LSRPA webpage, which will have instructions on how to access certificates
- Certificates are issued by the LSRPA - *$25 processing fee*

Remember!

Remember to sign in <u>and</u> out for credit

NJDEP Commingled Plume Technical Training

May 16, 2017

NJ Licensed Site Remediation Professionals Association

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EDR

LSRP Continuing Education Requirements

36 Continuing Education Credits (CECs) over 3 year LSRP license renewal period

Minimum CECs must be satisfied in these categories:

- 3 CECs Ethics*
- 10 CECs Regulatory
- 14 CECs Technical
- 9 CECs Discretionary

Ethics Continuing Education Requirements

- The LSRPA offers, and will continue to offer, a 3 credit Ethics course ***six (6) times*** during each 3 year license period
- Twice a year - usually in March and September of each year
- Held throughout the state: 2x in Northern NJ, Central and Southern NJ

Ethics Continuing Education Requirements

- Next Ethics Courses will be September 18, 2017 in Somerset and on January 23, 2018 in New Brunswick

- Registration opening soon on LSRPA website: www.lsrpa.org/

Ethics Continuing Education Requirements

- One more Ethics Course in the current licensing cycle, in September, 2018 - Go to LSRPA website for info, especially if you are not a member (members receive eblasts!)
- The courses are also listed on the Licensing Board's list of approved courses
- LSRPA will begin a new set of ***six (6)*** Ethics courses in March 2019 through September 2021

Continuing Ed
Programs vs. Activities

LSRP Licensing Board Rules - Continuing Ed. - NJAC 7:26I Subchapter 4

- **Continuing Education "PROGRAMS":**
- **1 CEC for 1 hour of instruction at universities, colleges, DEP, LSRPA and other organizations**
- **Includes "Alternative Verifiable Learning Formats" (AVLF)**

  Webinars **- Exam required**

  No more than 18 CECs allowed for AVLFs / 3-year cycle

- **Continuing Education "ACTIVITIES": Application required for each activity**

  Teaching a course

  Preparing and giving presentations

  Presenting a paper

"Activities" limited to 18 CECs / 3 year renewal cycle

Public Service Announcement from the LSRP Licensing Board

- Carefully track CECs for each renewal cycle
- Most common issue is timing
- Renewal app is due 90 days prior to license expiration date
- CECs must be completed at time of application submission
- There are several on-line CEC options if time is tight - except for Ethics!!
- Pay renewal fees on time

Upcoming LSRPA Courses & Events

- **June 20th** – LSRPA Member Breakfast (Presumptive & Alternative Remedies), Ponzio's, Cherry Hill **(1.5 Reg. CECs). Registration is open on the LSRPA website now!**
- **June 28th** – **Hot Topic**: Attainment of Remediation Standards, Parsippany **(3 Reg. CECs).** Includes a networking reception after the course. **Registration is open on the LSRPA website now!**
- **July 25th – Super Hot Topic:** ***Extensive*** Commingled Plume training, Florham Park **(6 Tech. CECs).** Includes a networking session after the course. Registration to open soon: watch the LSRPA website. Members, you will receive eblasts, too.
- **September 19th –** Ethics, Somerset, **(3 Ethics CECs). Registration to open soon**: watch the LSRPA website. Members, you will receive eblasts, too.
- **October 10th –** Save the Date! LSRPA 2nd Annual Golf Networking Event, Location TBD
- **October 25th** – Due Diligence in New Jersey, Princeton **(3 Reg. CECs). Registration is open on the LSRPA website now!**
- **January 23, 2018--** Ethics, New Brunswick, **(3 Ethics CECs). Registration to open soon**: watch the LSRPA website. Members, you will receive eblasts, too.

Visit LSRPA.org for details and registration

Recent LSRPA Initiatives

- Jan 23 & 24, 2018: BIG Conference, Ethics Course, and Annual Meeting, New Brunswick, NJ - More Exciting Info Coming Soon!

- Historic Fill Whitepaper for LSRPs – Now on the LSRPA website

- LSRPA CE Course Listing – List of upcoming LSRPA hosted/co-hosted events; LSRPA website > CE Tab; Online Course Calendar being developed

Visit *LSRPA.org - Member Services* for details

Recent LSRPA Initiatives

- **CE Tracking Spreadsheet Tool – Go to the CEC button on the LSRPA website - Plug in your classes as you go and it keeps track for you**

- **Dispute resolution - LSRPA listing of members willing to serve as a technical arbitrator/mediator in disputes between LSRPs / adversarial parties**

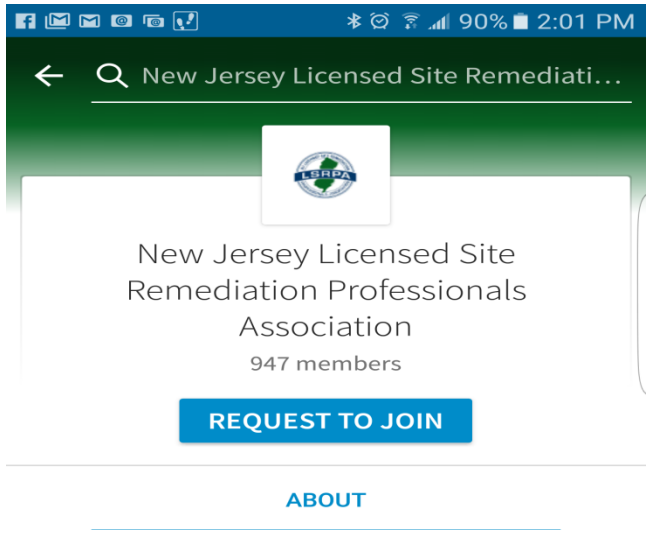
- **Sounding Board - Provides a forum for complex questions / concerns related to regulation or guidance; Responses based on collaborative input from the Sounding Board Subcommittee and are verbal / non-binding; Legal disclaimer agreement required and confidentiality is maintained**

Visit *LSRPA.org - Member Services* for details

SOCIAL MEDIA IS NOT JUST FOR KIDS…

It is an important way to connect our membership with the community

LinkedIn



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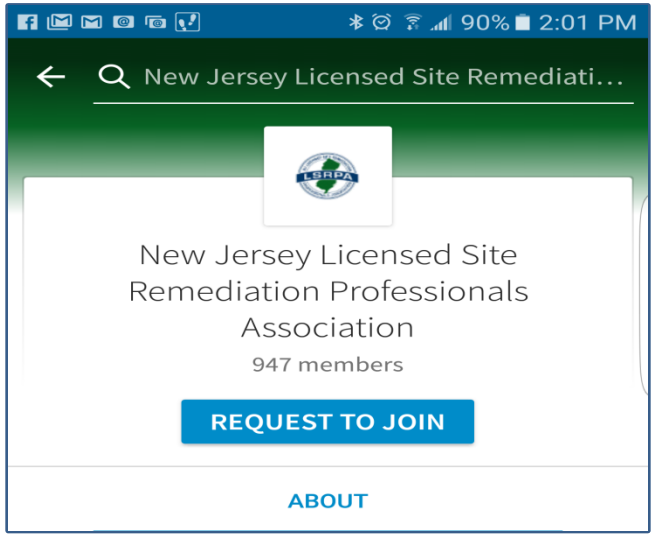
JOIN THE CONVERSATION

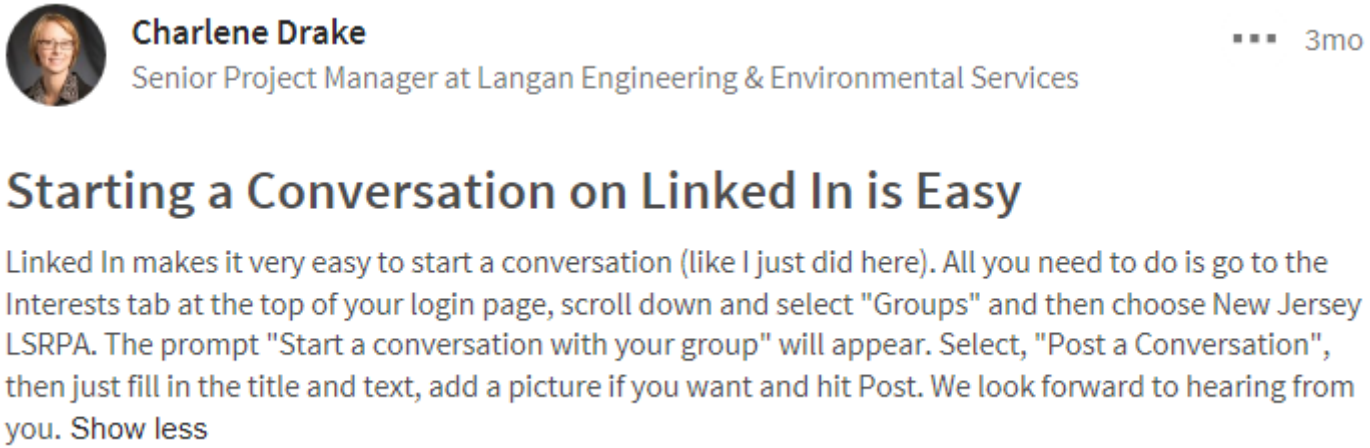
Be part of the LSRPA's LinkedIn Group

It's easy:

- Get out your phone (some of you never put it away)
- Go to www.LinkedIn.com or use the app
- Sign in with your user name and password
- Search: New Jersey Licensed Site Remediation Professionals Association
- When you arrive at our page, select REQUEST TO JOIN



You can like, share, comment or start a conversation



Charlene Drake ··· 3mo

Senior Project Manager at Langan Engineering & Environmental Services

Starting a Conversation on Linked In is Easy

Linked In makes it very easy to start a conversation (like I just did here). All you need to do is go to the Interests tab at the top of your login page, scroll down and select "Groups" and then choose New Jersey LSRPA. The prompt "Start a conversation with your group" will appear. Select, "Post a Conversation", then just fill in the title and text, add a picture if you want and hit Post. We look forward to hearing from you. Show less

WANTED - VOLUNTEERS

GET INVOLVED !

- **LSRPA Committees**

Governance (incl. Bylaws)
Continuing Education
Membership/Next Generation
Risk Management/Loss Prevention
Mentoring
Regulatory Outreach
Sponsorship
Sounding Board (NEW!)
Communications
College Outreach
Finance
Legal/Legislative
Nominating
SRRA 2.0


NJ LICENSED SITE REMEDIATION
LSRPA
PROFESSIONALS ASSOCIATION

Thank You!

Document Overview and Introduction

Mary Anne Kuserk, NJDEP
Bureau of Ground Water Pollution Abatement

Commingled Plume Technical Guidance Committee

NJDEP

- Mary Anne Kuserk, Chair
- Michael Infanger
- Henry Kindervatter
- Christina Page
- George Nicholas (retired)
- George Blyskun (retired)

External Stakeholders

- John Engdahl, Speedway, LLC
- Mark Fisher, The ELM Group, Inc.
- Rayna Laiosa, PSEG
- B.V. Rao, EG&R Environmental Services
- Andrew B. Robins, Sills Cummis & Gross P.C.
- Michael van der Heijden, Woodard & Curran
- Lisa K. Voyce, HDR Engineering, Inc.

Technical Guidance: Overview

- This guidance:
  - Defines a commingled plume condition
  - Discusses common commingled plume scenarios
  - Describes the process of investigating plumes and developing technical lines of evidence to help reach remedial decisions
  - Identifies technical tools and techniques to establish MLEs
  - Describes possible resolution mechanisms
  - Outlines administrative procedures (issuing RAO and RAP compliance)
  - Presents case studies for commingled plume scenarios

Definitions

Commingled Plume Condition:

A commingled plume condition exists when ground water plumes, originating from two or more temporally or spatially discrete contaminant discharges, have mixed or encroached upon one another to the extent that the remediation performed on one plume will affect the remediation of the other contaminant plume(s).

Definitions (cont.)

Lines of Evidence:

Information that helps support a conclusion, focusing on the development of multiple lines of evidence (MLE) that, when assessed cumulatively, can reduce uncertainty and provide sufficient support for remedial decisions.

Overprinting:

Condition that results when temporally discrete discharges are spatially co-located.

Commingled Plume Scenarios

- Four commingled plume scenarios described
  - Off-site Sources
    - Different Constituents
    - Similar Constituents
  - On-Site Sources
    - Different Constituents
    - Similar Constituents (Overprinting Scenario)

Note: For off-site sources, if not commingled, use *Off-Site Source GW Investigation Technical Guidance.*

Characterizing Commingled Plumes

- Presence of contamination different than those under investigation
- Changes in the ratios of contaminants detected
- Changes in geochemical conditions
- Unexplained sustained increases in contaminant concentrations
- Plume length or configuration is different than predicted with models

Summary

General rule: justifying commingled plumes with different contaminant signatures is usually less complicated. Same contaminants will likely result in having to develop multiple lines of evidence.

Accordingly, the Department does not expect the investigator to explain or document why any or all of these **technical tools and resolutions mechanisms** do not apply to their specific commingled plume situation, provided that the PRCR continues to satisfy its regulatory obligations.

Using Multiple Lines of Evidence to Investigate and Address Commingled Plumes

Mark D. Fisher, CHMM, LSRP
Managing Partner, The ELM Group, Inc.

Techniques for Developing MLEs

What are "Lines of Evidence?"

- Information that helps support a conclusion
- A single line of evidence may not be sufficient; typically more are better, hence "multiple lines of evidence" (MLE)
- MLEs assessed cumulatively can reduce uncertainty and provide sufficient support for remedial decisions

Techniques for Developing MLEs

Using Multiple Lines of Evidence

Can be used to sufficiently identify, understand, and develop remedial strategies to address a commingled plume (remediate or get to acceptable resolution).

The Department acknowledges that these are not the only available MLEs to address commingled plumes, nor are you required to evaluate each of the examples to determine if they are applicable.

It's all about professional judgement.

Examples of Lines of Evidence: Site Background and Existing Data

- Department Databases – HazSite Data
  - Electronic Data Deliverables (EDDs) for most cases managed by SRWMP since July of 1997, along with other data collected by the Department
  - How to access – Appendix E of the guidance document; may include “raw data” and/or GIS-Ready
- USGS Ground Water Watch
  - Database with info from state and federal studies over the past 100 years; typically flow-related data

Examples of Lines of Evidence
Site Background and Existing Data (cont.)

- NJ-Geo Web
  - Includes SRP Sites, Regulated Facilities, CEAs, ambient GW quality data, and much more
- NJDEP DataMiner
  - Detailed info on Sites in SRP and other DEP programs
- Other Commercial Sources
  - Sanborn maps, historic aerials, topo maps, local municipal info

Examples of Lines of Evidence

- Additional Ground Water Sampling
  - On/Off-site locations; chemical and water level data
  - Supplement your “normal” dataset

- Potential Preferential Pathways
  - Evaluate geologic conditions
    - Variable permeabilities, buried stream channels, fracture and bedding planes
  - Evaluated man-made conditions
    - Utilities, foundations/piles

Examples of Lines of Evidence

Fate and Transport Modeling

- Many options and levels of complexity to evaluate many different types of issues/questions
- Back-calculate potential sources / Reverse particle tracking
- Model the site plume conditions with and without commingled conditions to evaluate potential resolution options
- Use existing and future data to validate model conclusions
- Models currently in the public domain in Appendix F

Examples of Lines of Evidence: Statistical Analysis

- Statistical/stochastic techniques
  - Address uncertainty, establish/predict trends, differentiate sources
- Geostatistical methods
  - Evaluate spatial distribution or patterns in the dataset that may not be readily apparent
- Stochastic analysis
  - Estimate probability of possible outcomes and evaluate uncertainty, especially when there is lack of knowledge about certain factors or parameters

Examples of Lines of Evidence: Statistical Analysis (cont.)

- Refer to Appendix B for examples of statistical analysis

- Refer to NJDEP's MNA Technical Guidance and Ground Water SI/RI/RA Technical Guidance documents for additional statistical options

Examples of Lines of Evidence: Environmental Forensics

- Evaluation of historic chemical and physical information to determine source and/or age of a discharge

- Evolving science with various levels of reliability

Examples of Lines of Evidence: Environmental Forensics (cont.)

- Appendix C provides common techniques
  - Petroleum Hydrocarbon Pattern Recognition – Fingerprinting
  - Petroleum Hydrocarbon Pattern Recognition – PIANO
  - Degradation Compounds – Petroleum and Chlorinated Compounds
  - Trace Compound Additives – Petroleum and Chlorinated Compounds
  - Compound-Specific Stable Isotope Analysis (CSIA)- Petroleum and Chlorinated Compounds
  - Biomarkers / Weathering Analysis - Petroleum

Examples of Lines of Evidence

Use of Conceptual Site Models (CSM)

- CSM is a written or illustrative depiction of the physical, chemical and biological processes that control the transport, migration and potential impacts of contamination to receptors.
- Dynamic and iterative process that can support and further explain remedial decisions
- See the CSM Technical Guidance Document

Examples of Lines of Evidence

- High Resolution Site Characterization (HRSC)
  - Investigative approach utilizing focused data collection to refine understanding of subsurface lithology and contaminant distribution in three dimensions
  - Examples:
    - Direct push tools (membrane interface probes)
    - Borehole flow and chemical/geochemical testing
    - Soil-gas sampling and other field screening analyses
  - Can involve real-time data evaluation and field adjustments in data collection

Multiple Lines of Evidence

Potential Lines of Evidence Checklist

- Table 1 of guidance document
- Not “required” but designed to assist investigator in tracking MLEs

Potential Lines of Evidence Checklist

TABLE 1

Potential Lines of Evidence Checklist

Check off the boxes that support a commingled plume condition.		
Site Name:	**Prepared By:**	
Site Address:	**NJDEP PI#**	
Incident #:	**Block:**	**Lot:**

	Source 1		**Source 2**		**Source 3**	
	Current Operations	Historical Operations	Current Operations	Historical Operations	Current Operations	Historical Operations
Source Location						
On-Site						
Off-Site						
Unknown						
Discharge Information						
Known Discharge						
Unknown Discharge						
Contaminant Type						
Similar Contaminants						
Different Contaminants						
Receptor Information						
Have Receptors Been Identified? (Yes/No)						
Does an IEC Condition Exist? (Yes/No) *						
Are there engineering controls associated with vapor intrusion or ground water contamination? (Yes/No)						
Are Receptors Protected? (Yes/No)						

Summary

- Many options for developing MLEs when dealing with commingled plumes.
- MLEs are useful in investigating and evaluating/justifying remediation strategies and resolution mechanism(s).
- MLEs included in the guidance are just examples
  - Use some or none of these
    - Not required to explain why these options were not used
- The use of the LSRP's professional judgement is highly recommended, along with providing the necessary documentation to support decision making.

Questions

Resolution Mechanisms

Mary Anne Kuserk, NJDEP
Bureau of Ground Water Pollution Abatement

Resolution Mechanisms

So you have a Commingled Plume Condition?

What's next?

Objectives

- Allow remedial activities to move forward ensuring timeframes are not missed
- Protecting receptors
- Avoid potential litigation
- Reduce remediation time and/or costs if working together
- Input on planning remedial actions to address releases

Resolution Mechanisms

Independent of seeking resolution to manage the commingled plume, certain things must still be addressed:

- Identification of all potential receptors
- Mitigation of any impacted or imminently threatened receptors (i.e., VI or potable well impacts)
- Control of on-going sources and implementation of IRMs including free product if present

Resolution Mechanisms

3 ways to approach the remediation:

1. Work cooperatively with other PRCRs

2. Proceed with completing the remediation independently

3. Seek alternate resolution with other PRCRs

Working Cooperatively

- Considered the optimal path forward
- Breaking down projects into smaller tasks, if scope of entire project cannot be allocated
- Benefits
- Challenges

Working Independently

- Depending on the scope of the commingled situation, this may be the easiest path forward (i.e., larger plume overtaking a smaller release)
- Benefits
- Challenges

Working with Uncooperative PRCR

- Mechanisms:
  - Neutral Party Technical Mediation
  - Neutral Party Technical Arbitration
  - Other Mediation or Arbitration
    - Not involving the LSRP
  - Seek treble damages
  - Litigation

Working with Uncooperative PRCR (cont.)

- NJDEP Office of Dispute Resolution
  - Potential disputes with the DEP and the PRCR
  - Will not address disagreements between LSRPs

- NJDEP Technical Consultations
  - LSRPs and PRCR to discuss technical concerns
  - Will not address disagreements between LSRPs

Break

Administrative Requirements

Mike Infanger, NJDEP
Bureau of Remedial Action Permitting

Objectives

- Pre Remedial Action Permits (RAPs)
  - Scenarios
  - Classification Exception Areas (CEA)
- Post RAPs
  - Scenarios
- Response Action Outcome (RAO) notices

HOTLINE CALLS

Each Section has a Hotline Paragraph that looks like this, but they are not all the same!

Call the NJDEP Hotline (1-877-WARNDEP) and report to the operator, using the specific terms ***italicized*** below. Provide the following information to the NJDEP Hotline operator even if you are not prompted to do so.

1. Identify that the contamination was observed **on** the subject site.
2. Identify the address of the on-site property and whether the on-site property (where the new source of contamination was detected) is residential or non-residential.
3. Identify the contaminants, the concentrations, and the media that are impacted (soils, ground water, surface water, sediments, etc.) associated with the commingled plume contamination.
4. Identify that the detected unknown ***"contamination has been detected at the subject site and available information supports the conclusion that the contamination is unrelated to the discharge(s) currently being remediated."***
5. Identify the Site Remediation Program - Program Interest (SRP PI) Number of the site that was conducting the investigation that resulted in the detection of the contamination.
6. Identify any available information regarding proximal receptors identified in the Receptor Evaluation (N.J.A.C. 7:26E-1.13) that may be impacted (schools, child care centers, residences, etc.).

Four Commingled Plume Scenarios

1. Overprinting - Separate discharge detected on-site; source of the new discharge also located onsite
2. Separate discharge detected on-site; contaminants migrating onto site from off-site location
3. Different contaminants found downgradient
4. Similar contaminants found downgradient

Scenario 1

Overprinting

- Hotline call
- Submit Confirmed Discharge Notification (CDN) within 14 days of Hotline call
- See Section 5.1

Scenario 2

Separate discharge detected on-site; contaminants migrating onto site from off-site location

- Hotline call
- Submit CDN within 14 days of Hotline call
- See Section 5.2

Scenario 3

Different contaminants found downgradient

- Hotline call
- Complete investigation
- No CDN
- No RAO Notice
- See Section 5.3.1

Scenario 4

Similar contaminants found downgradient

- Complete investigation
- Hotline call
- No CDN
- No RAO Notice
- See Section 5.3.2

Classification Exception Area

Considerations for developing a Classification Exception Area (CEA) in Commingled Plume Situation:

- Wherever possible, model the individual contributions to the plume (use modeling, forensics, or other lines of evidence).
- When commingled plumes cannot be differentiated, include entire plume.

Table 2: Post Remedial Action Permits Decision Tree

	Discharge Scenario	Action	Terminate RAP when
A (Section 5.5.1)	Newly identified discharge detected	Continue on typical RAP-GW path	Applicable standards are met
B (Section 5.5.2)	Newly identified discharge detected	Make modifications to RAP-GW	Applicable standards are met
C (Section 5.5.3)	Impact from new discharge is severe	Request RAP-GW abeyance - extrapolate initial plume	When the initial plume is extrapolated to meet applicable standards
D (Section 5.5.4)	Impact from new discharge is severe and covers footprint of initial discharge	Request RAP-GW abeyance/wait and see	When possible, demonstrate that 1st discharge is remediated

Post RAP Scenarios

Scenario A - New Discharge (Section 5.5.1)

- Minimal Impact on Existing Remediation; No Remedial Action Permit Modification Necessary
- Action: Continue on typical RAP-GW path

Post RAP Scenarios (cont.)

Scenario B - New discharge (Section 5.5.2)

- Significant Impact on Existing Remediation; RAP-GW Modifications Needed
- Action: Make modifications to RAP-GW

Remedial Action Permit Abeyance

What happens when an existing RAP monitoring plan is no longer appropriate?

- Request a RAP abeyance from DEP with the next Biennial Certification
- Provide a justification based on professional judgement
- Propose an appropriate course of action
- Subject to Department written approval

What is an abeyance?

An abeyance puts the permit monitoring plan on hold.

(Scenarios C and D)

Post RAP Scenarios (cont.)

Scenario C (Section 5.5.3)

- New Discharge; Significantly Impacts Existing Remediation
  - Sampling will not allow differentiation of the impact from new discharge
  - MLE Available to extrapolate when remediation would be Complete

Post RAP Scenarios (cont.)

Scenario C Actions

- Request RAP-GW abeyance
- Continue to pay permit fees and submit Biennial Certification
- Develop lines of evidence to extrapolate when initial plume would have met applicable standards

Post RAP Scenarios (cont.)

Scenario D (Section 5.5.4)

- New Discharge; Significantly Impacts Existing Remediation
  - Sampling will not allow differentiation of the plumes
  - Inadequate MLE available to extrapolate when remediation would be complete

Post RAP Scenarios (cont.)

Scenario D Actions

- Request RAP-GW abeyance
- Continue to pay permit fees and submit Biennial Certification
- Wait until remediation of 2nd discharge is completed

Response Action Outcome (RAO) Notices

Existing RAO Notices:

- Contamination Remains On-site Due to Off-site Contamination

New Commingled Plume Notices

- Similar constituents - On-site and Off-site Sources
- Different constituents - multiple on-site discharges
- Similar constituents – multiple on-site discharges

Questions

Case Study Scenario

Underground Storage Tank
On-site Source Contamination Scenario Similar Constituents (Overprinting)

Michael van der Heijden, LSRP
Woodard & Curran

Case Type: Overview

- Former large corporate owner (ABC Retail Station) completed remediation
  - Monitored Natural Attenuation (MNA) remedy
  - Remedial Action Permit – Ground Water (RAP-GW)

- Sold to XYZ Retail (independent operator) in 2010

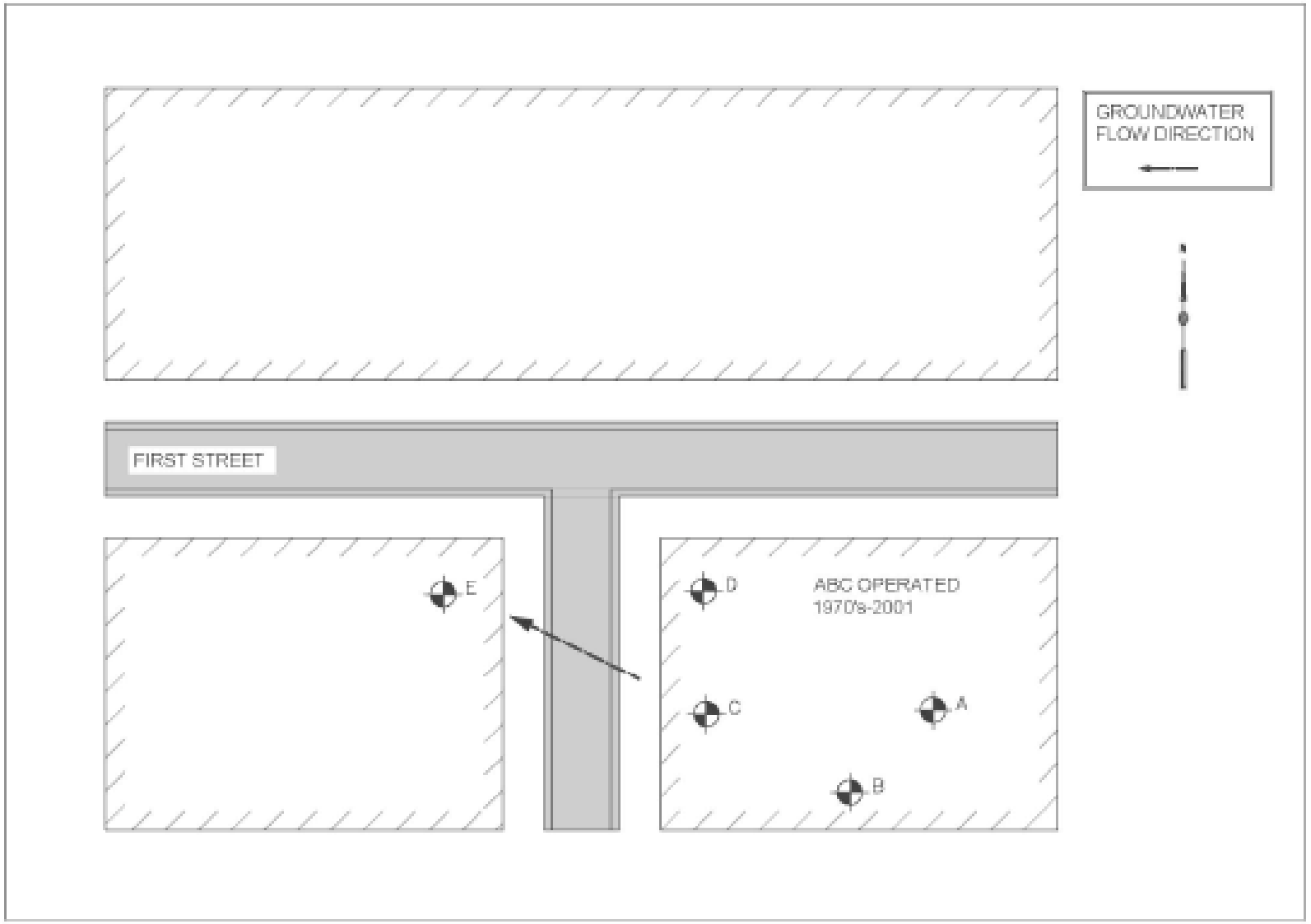
Case Type: Overview (cont.)

- During routine monitoring, significant increase in Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) observed
  - Spatially similar, but temporally different (“overprinting”)
- Case Study covers:
  - Background
  - Tools Used
  - Resolution Strategy
  - Administrative Resolution

Background (ABC Retail)

- Discharge from UST piping in 1996 – reported discharge; commenced with SI/RI
- Soil excavation and LNAPL recovery
- Based on SI/RI, no off-site soil investigation and no other receptors
- Monitoring well network included:
  - Two source wells (MW-A & MW-B)
  - Two on-site plume wells (MW-C & MW-D)
  - One off-site sentinel well (MW-E)

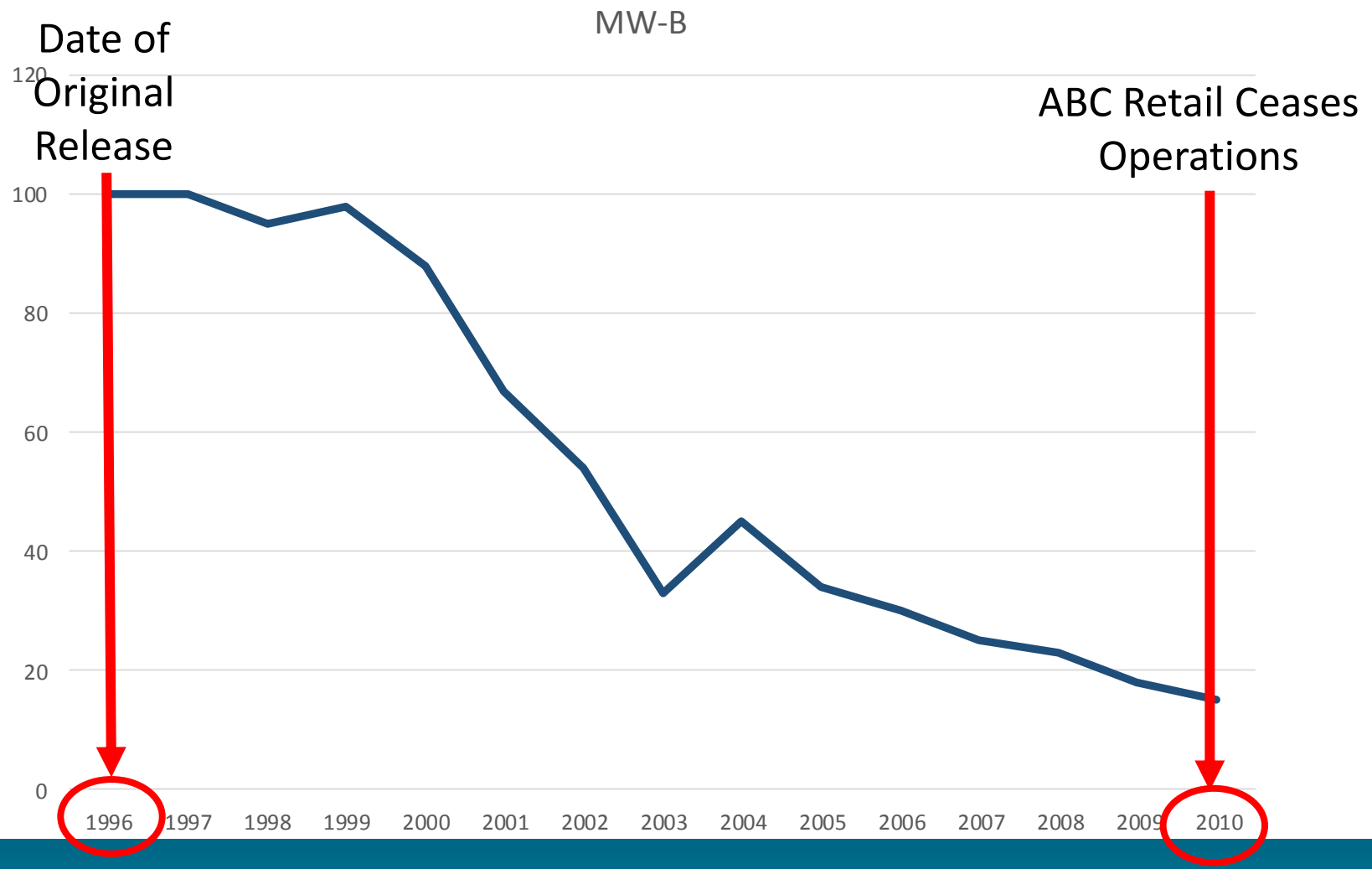
Background:
Monitoring Well Network



Background: 1996 - 2010

- BTEX in source area decreased to below Ground Water Quality Standards (GWQS)
  - Plume monitoring wells range Non-Detect to 20,000 ppb
  - Concentrations exhibited decreasing trend
- LNAPL recovery ceased in 2008
- Quarterly ground water monitoring initiated
- Sentinel well BTEX concentrations below GWQS
- ABC Retail ceased operations in 2010

Background: BTEX Concentrations



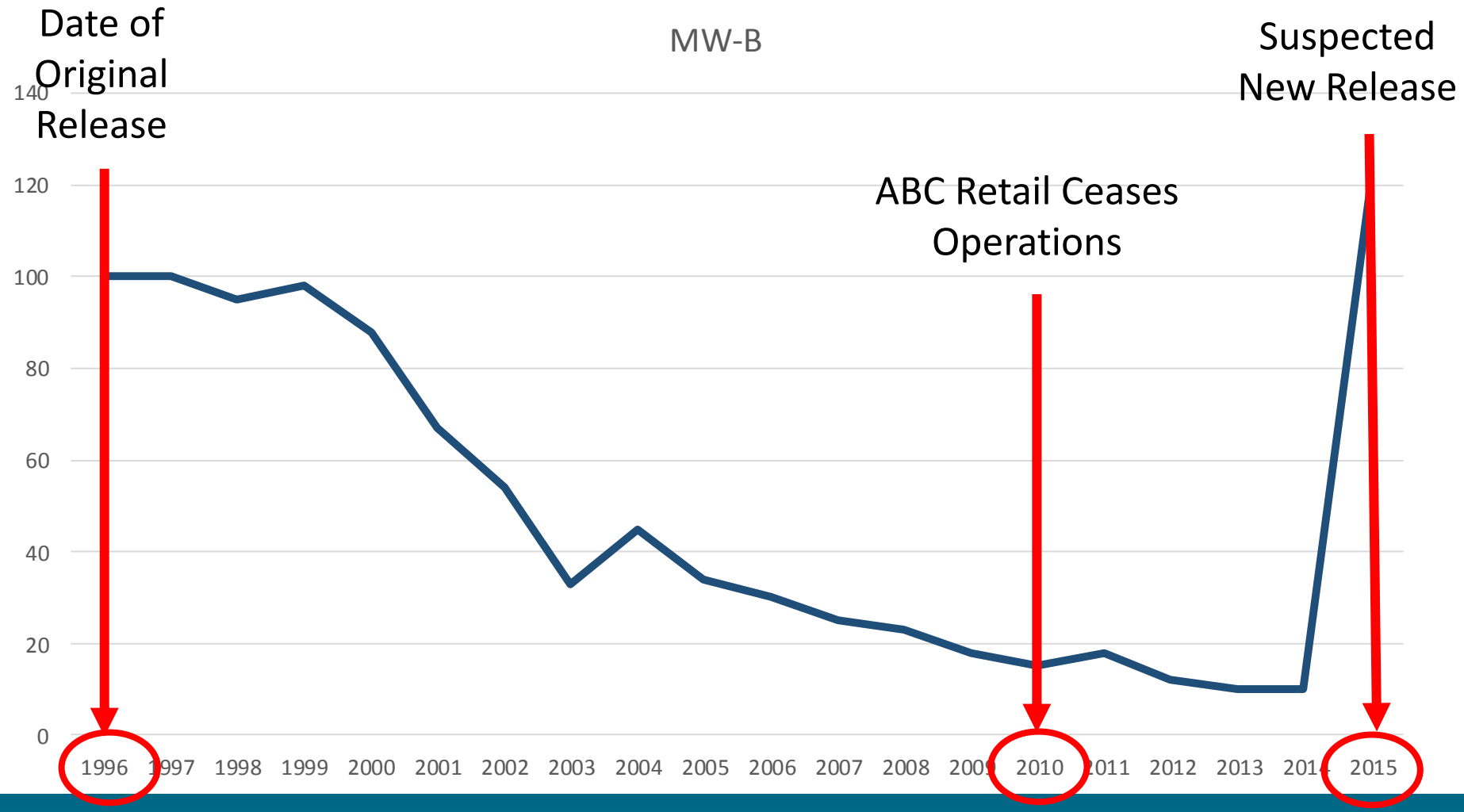
Background: 2010 - 2014

- Based on previous data – MNA remedy selected and received RAP-GW
- Issued Limited Restricted Use RAO for 1996 Case#
- XYZ Retail began operations late 2010
- Post-sale - continued decreasing trend for four years of RAP-GW monitoring

Background: 2015 – Present

- MW-B (source area well) - BTEX concentrations increased by order of magnitude
- MW-C and MW-D (plume area wells)- BTEX concentrations increased by order of magnitude
- MW-A (source area well) - BTEX concentrations remained the same
- MW-E (sentinel well)- BTEX concentrations stayed below GWQS
- **No new receptors identified related to new release**

Background: BTEX Concentrations



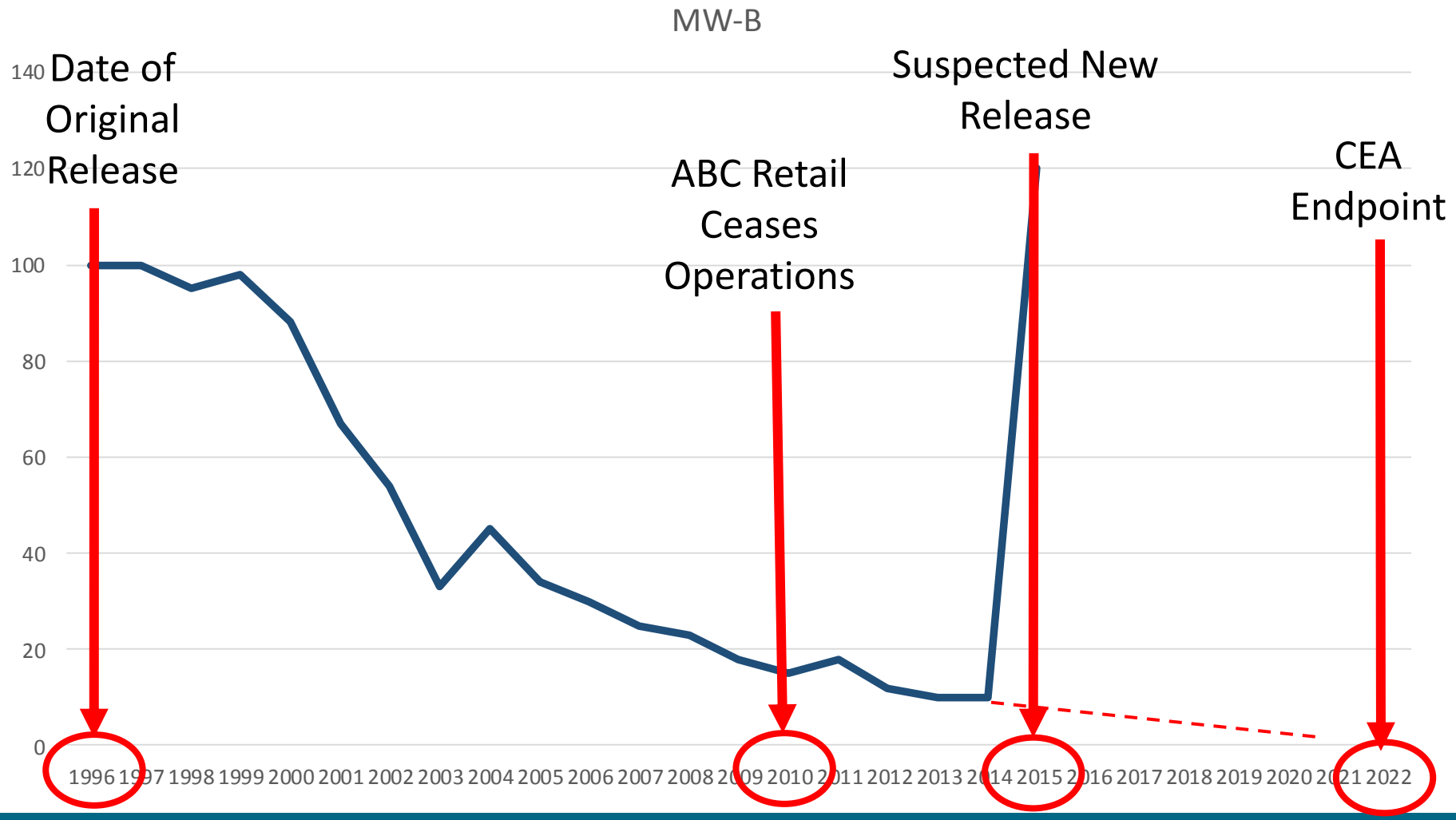
Tools Used: Development of MLE

- Conceptual Site Model
- Review operational history and timelines
- Statistics and Trend Analysis
  - Regression Analysis
  - Mann-Whitney U Test
  - Mann-Kendall Test
- Fate and Transport Modeling
  - BioScreen

Tools Used: Development of MLE (cont.)

- To establish new discharge, MLE used
  - Operational history
    - 16 years of ABC operations data
    - 4 years post-operations data
  - Effectiveness of previous remediation
  - Trend analysis
  - Significant increase in BTEX concentrations
- Based on MLE, ABC Retail concluded
  - New discharge had occurred
  - Would have met GWQS 7 years from XYZ Retail discharge

Tools Used: CEA Expected Endpoint



Resolution Strategy

- MLE established new overprinting discharge creating a commingled plume condition
- ABC Retail attempted to work cooperatively with XYZ Retail to seek resolution
- XYZ Retail doesn’t agree with ABC Retail conclusions – refuses to work cooperatively
- XYZ Retail goes defunct
- Now what?

Administrative Resolution: Old Paradigm

- ABC Retail likely to take burden of second release
- Live out the life of second release
- Site goes nowhere for ABC Retail

Administrative Resolution: New Paradigm

- NJDEP Hotline called using language in Section 5.1
- MLE confirmed new discharge and no receptors
- Property owner notified of new discharge
- Modified RAP-GW
- Assuming MW-A and MW-E (unaffected wells) attenuate as predicted, terminate RAP-GW in 7 years

Administrative Resolution: New Paradigm

- Unrestricted RAO can be issued with commingled plume notice (similar constituents, multiple on-site discharges)

- Table 2, Scenario B

Case Study Scenario

CVOC Case Studies 4 and 5

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Compound Specific Isotope Analysis (CSIA)

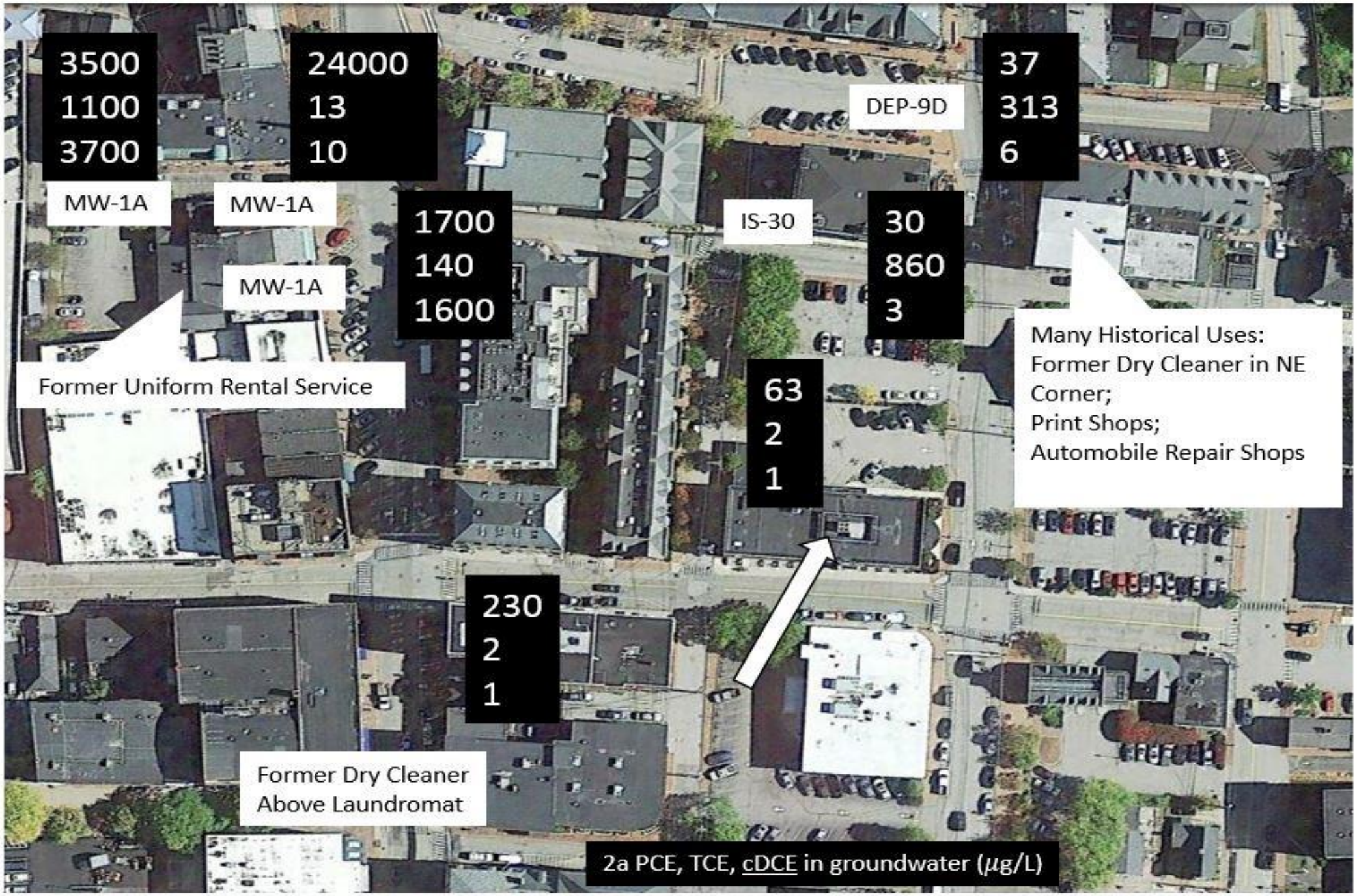
- Geochemistry-based technology
- Measures stable isotopes of carbon, hydrogen, chlorine in contaminants to determine chemical & biochemical reactions
- Analyzes relative abundance of stable isotopes and shifts in isotope ratios to help identify the contaminant source
- Not a DNA match of one source of TCE/PCE vs. another, but it’s close.
- Need multiple lines of evidence (MLE) to support defensible conclusions in:
  - Site characterization
  - Bioremediation
  - Monitoring remedy effectiveness.

CSIA (cont.)

- CSIA is accepted science for source identification and apportionment.
- See ITRC Environmental Molecular Diagnostics Fact sheets at: http://www.itrcweb.org/GuidanceDocuments/EMD1.pdf
- For more information on CSIA and other forensic methods

Background: Case Study #4

- Commercial area
- Many possible off-site sources - where are CVOCs coming from?
- 74 monitoring wells/100 screen points
- Shallow GW is clean, deep is dirty
- CSIA used as one tool (along with a good PA and local history) to find out


3500
1100
3700
MW-1A
24000
13
10
MW-1A
1700
140
1600
MW-1A
DEP-9D
37
313
6
IS-30
30
860
3
Former Uniform Rental Service
Many Historical Uses:
Former Dry Cleaner in NE Corner;
Print Shops;
Automobile Repair Shops
63
2
1
230
2
1
Former Dry Cleaner Above Laundromat
2a PCE, TCE, cDCE in groundwater (µg/L)

3D Isotope Ratios Signatures* and Chlorinated Hydrocarbon Concentrations

		Carbon			Chlorine		Hydrogen		Concentration		
Potential Source	Sample ID	cis-DCE ($\delta^{13}C$)	TCE ($\delta^{13}C$)	PCE ($\delta^{13}C$)	TCE ($\delta^{37}Cl$)	PCE ($\delta^{37}Cl$)	cis-DCE ($\delta^{2}H$)	TCE ($\delta^{2}H$)	cis-DCE (ppb)	TCE (ppb)	PCE (ppb)
Former Dry Cleaner	DEP-19D	-	-	-28.8	-	2.3	-	-	<1	2	230
	DEP-14D	-	-	-28.3	-	0.8	-	-	<1	2	63
Other	IS-50’	-	-35.8	-26.9	0.5	3.3	-	128	3	860	30
	DEP-9D	-	-34.8	-28.8	0.5	3.7	-	161	6	313	37
Former Uniform Rental Service	MW-1A	-29.9	-27.2	-29.2	2.5	0.5	292	429	3,700	1,100	3,500
	MW-1C	-	-	-28.9	-	0.2	-	-	10	13	24,000
	MW-1D	-29.7	-31.2	-28.8	0.2	0.4	192	-78	1,600	140	1,700

Background- Case Study #4

- Multiple CVOC discharges
- Primary contributors to PCE contamination are from a former uniform rental service and dry cleaner
- Other unidentified TCE sources - further study to identify them
- TCE CSIA results showed PCE biodegradation.
    - Evidence that in-situ bioremediation is remedial option

Resolution Strategy

Resolution strategies include:

- Establishing CEA for identified sources
- CEA plume commingled with contamination from unknown sources - reported to NJDEP Hotline
- RAO-A issued for the off-site source(s)
- Lack of shallow contamination did not allow TCE to be tracked to a specific source at the surface using CSIA alone
  - Further evidence needed

Administrative Considerations

- Case study involves a discharge on-site with contaminants migrating on-site from off-site
- Investigate to show contamination is from off-site source and subject site is not a contributor
- Requires PA, maybe SI to determine if a source of contamination exists on-site.
    - See Off-site Source Ground Water Investigation Technical Guidance.

Administrative Considerations (cont.)

- If the investigation does not show that contamination is from unknown off-site source, and is from on-site source, PRCR required to remediate.

- If the investigation does demonstrate that contamination is from off-site source and the subject site is not contributing, PRCR/designee:
  - Call Hotline
    - Report a discharge not related subject site- contamination verified to be from an unknown off-site source.
    - Provide the information in Section 5.4 to Hotline operator, even if not prompted to do so.

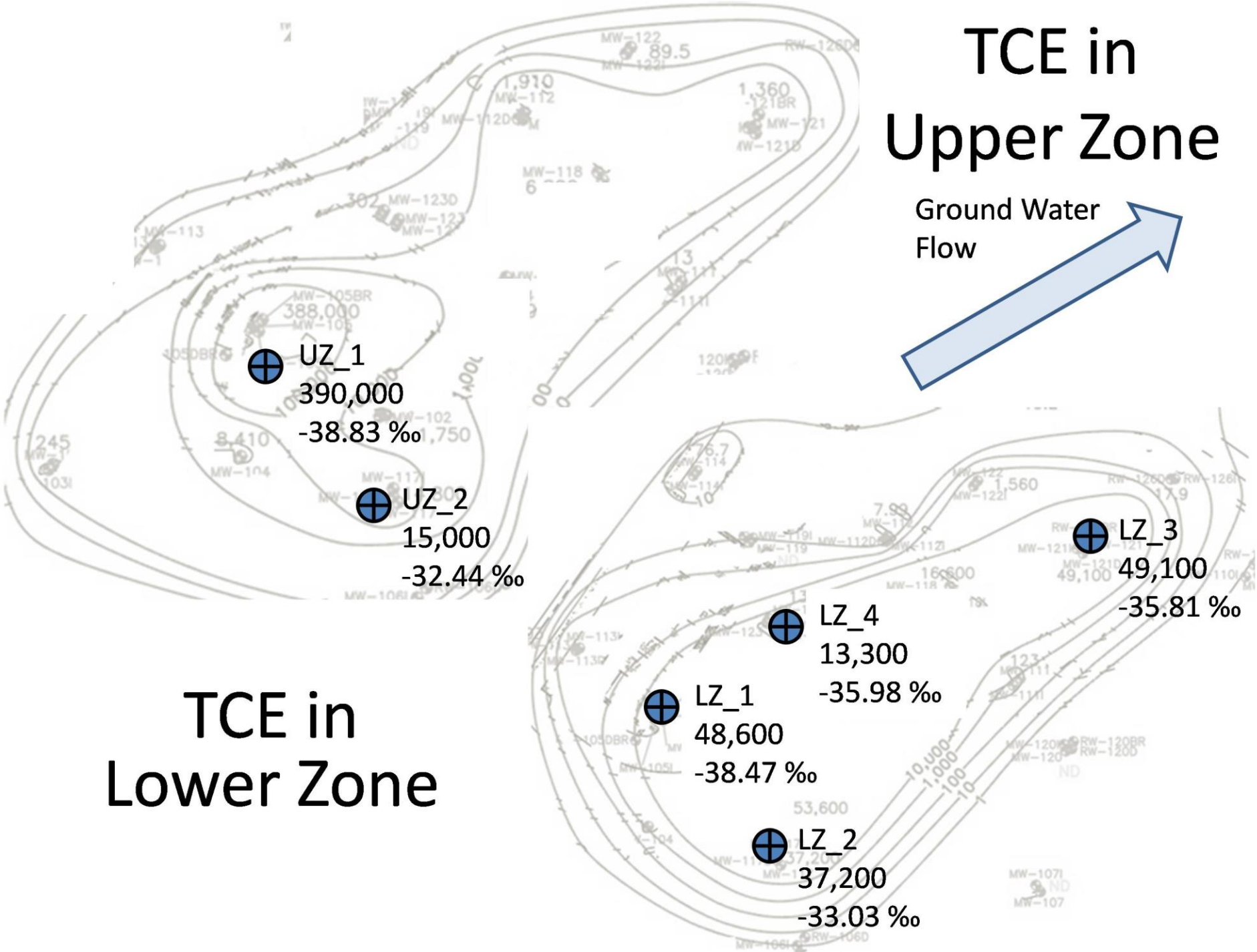
Administrative Considerations (cont.)

- LSRP can issue RAO-A for the contamination from an unknown off-site source

- Include RAO notice “Contamination Remains On-Site due to Off-site Contamination”

Background: Case Study #5

- Brownfields redevelopment – airport to mall
- Several aquifer zones contaminated
- Assumed different source areas
- CSIA, PA, other tools used to identify CVOC sources/PRCRs on-site and off-site
- CSIA showed significant difference in TCE signature at two DNAPL hot spots
- All MLE agreed - two distinct sources


TCE in
Upper Zone
Ground Water
Flow
UZ_1
390,000
-38.83 ‰
UZ_2
15,000
-32.44 ‰
TCE in
Lower Zone
LZ_3
49,100
-35.81 ‰
LZ_4
13,300
-35.98 ‰
LZ_1
48,600
-38.47 ‰
LZ_2
37,200
-33.03 ‰

Resolution Strategy

- CSIA used to help estimate CEA duration
- Proceed with remediation as funded by insurer
- Complete remediation and establish CEA for identified sources
- Report to Hotline as unknown, off-site source
  - NJDEP may investigate off-site sources

Administrative Considerations

- On-site discharge reported and remediated
- PRCR must submit CDN within 14 days of call to Hotline
- PRCR must retain LSRP to complete investigation of on-site discharge

Administrative Considerations (cont.)

- MLE indicate potential off-site source for contamination detected on-site
- Complete investigation per Off-Site Ground Water Technical Guidance
  - Determine if it is an on-site source or migration on-site from off-site – with the subject site not contributing.

Administrative Considerations (cont.)

- If investigation does not show contamination is from an off-site source, and is from on-site source, PRCR required to remediate.

- If the investigation does show contamination is from off-site source – with no contribution from subject site, PRCR/designee:
  - Call Hotline
    - Report a discharge not related subject site- contamination verified to be from an unknown off-site source.
    - Provide the information in Section 5.2 to Hotline operator, even if not prompted to do so.

Administrative Considerations (cont.)

- LSRP can issue RAO-A for the contamination from an unknown off-site source

- Include RAO notice “Contamination Remains On-Site due to Off-site Contamination”

Questions?

Before you run out the door?
Thanks for coming!