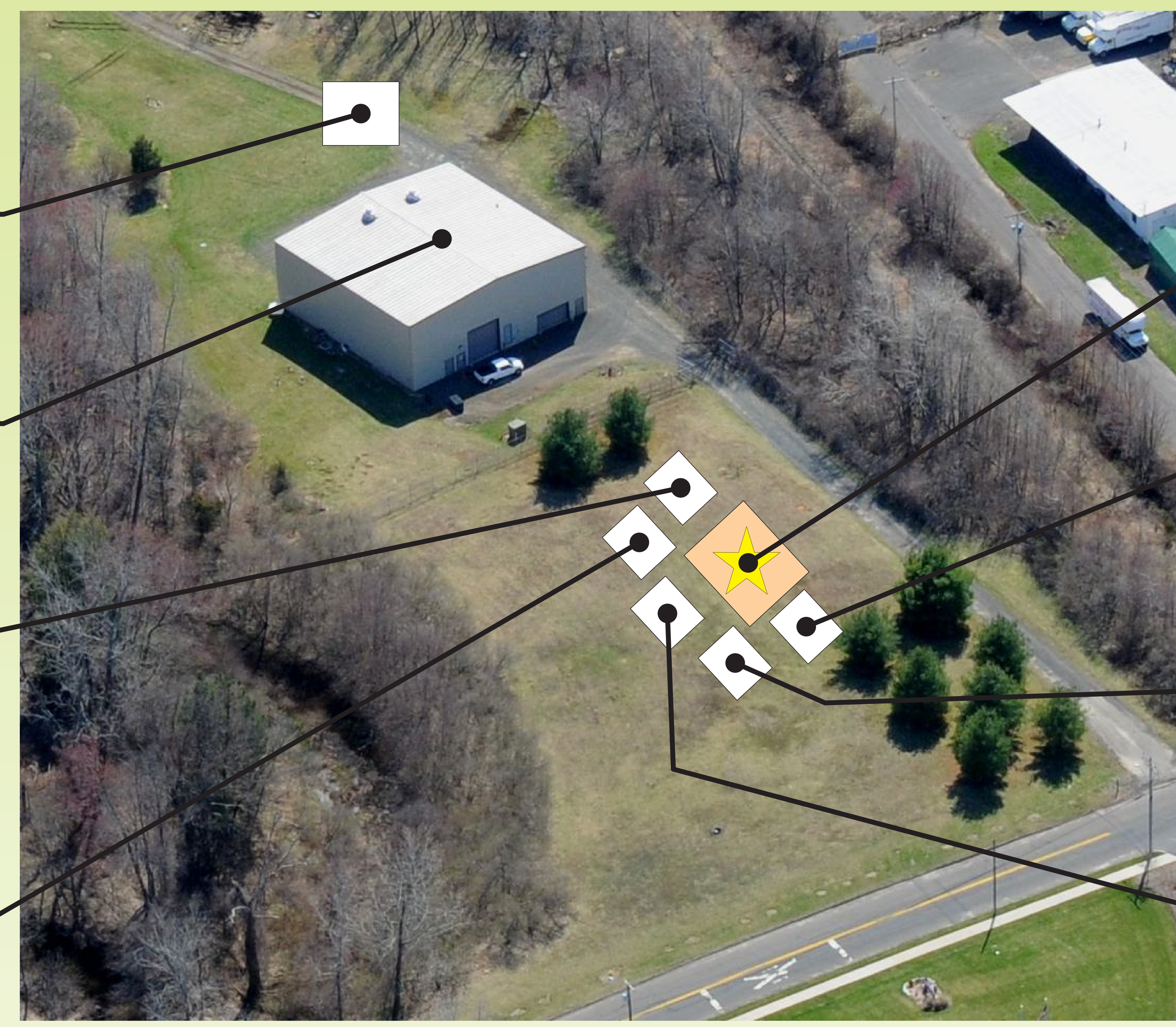
Solvents Recovery Service of New England, Inc. Superfund Site
Open House – September 2013

Welcome! A new phase of cleanup work is about to begin at the SRSNE Superfund Site. Visit the different topic-specific tents and the treatment system building to meet with project representatives and learn about each element of the cleanup plan. Visit www.epa.gov/region1/superfund/sites/srs, www.srsnesite.com, or the Southington Public Library for additional information.



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Solvents Recovery Service of New England, Inc. Superfund Site
Site Operations History, Key Investigations & Actions

Site Operations Timeline

- **1955 - 1991:** Spent solvents received from customers were distilled to remove impurities, then returned or sold for reuse. More than 41 million gallons of waste solvents, fuels, paints, and other materials were processed at the facility. The distillation process was an early recycling approach, but SRSNE's operation of the Southington facility resulted in numerous leaks and spills to the bare ground from a variety of activities.
- **1957 - 1967:** Waste materials generated during processing were disposed onsite. After 1967, wastes were either transported to a disposal facility or burned – the State of Connecticut issued an order to stop burning waste in the 1970s.
- **Late 1970s:** USEPA conducted the first groundwater investigation.
- **1979:** USEPA filed suit against SRSNE under the Resource Conservation and Recovery Act (referred to as RCRA).
- **1983:** SRSNE Site added to the Superfund Program's National Priorities List.
- **1990:** USEPA started the Remedial Investigation process to characterize the nature and extent of impacts from historical operations.

Testing for contamination in groundwater

- **1991:** Site operations cease.
- **1994:** After SRSNE's failure to comply with earlier legal actions initiated by USEPA and the State of Connecticut, USEPA approached 1,700 companies who sent solvents to the Site for processing to have them collectively take responsibility for Site cleanup. **This marked the formation of the SRSNE Site Group.**

Key Investigations & Actions

Since 1990, more than 15 investigations have been completed across a 50-acre study area, and 275 groundwater monitoring wells have been installed. Highlights:

- **1990 - 1994:** USEPA's Remedial Investigation **–** carried out in three phases.
- **1992:** USEPA removes soils from the railroad drainage ditch and chemicals stored at the Site.
- **1995:** SRSNE Site Group builds a pump and treat system for groundwater.
- **1996:** SRSNE Site Group begins new Remedial Investigation & Feasibility Study work.
- **1999:** SRSNE Site Group adds pumping wells to enhance the groundwater containment system.
- **1995/1999 - Present:** SRSNE Site Group operates the groundwater containment and treatment systems.

Drilling a groundwater monitoring well

- **2005:** USEPA issues the Record of Decision for the Site – this ROD describes the final cleanup plan.
- **2008:** USEPA and the SRSNE Site Group sign the Consent Decree to perform the final cleanup work.
- **2009:** Agreement for the design and implementation of the final cleanup plan is finalized, engineering work begins.

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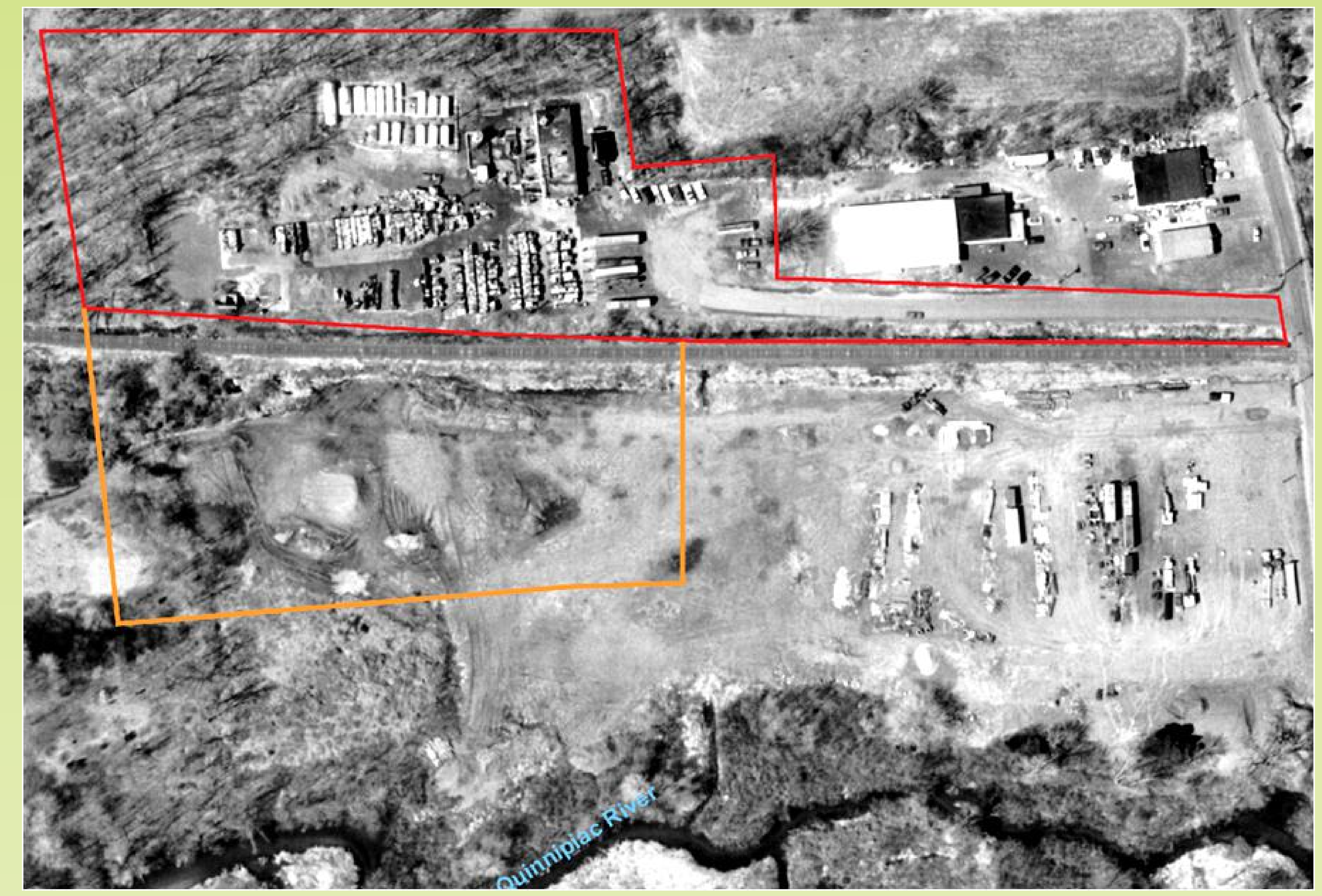
Solvents Recovery Service of New England, Inc. Superfund Site
Historical Operations & Prior Cleanup Efforts

SRSNE Site 1965

SRSNE Site 1975



SRSNE Site 1980

Phytoremediation Study Area

A portion of the Operations Area, prior to demolition of old structures

View of the wetland constructed in the Quinnipiac River floodplain

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Solvents Recovery Service of New England, Inc. Superfund Site
Cleanup Program Components & Timing

Cleanup Plan

The key elements of the cleanup effort – which is designed to control and treat sources of pollution in soil, sediment, and groundwater – are as follows:

- **Site Preparation:** Preparing the Site to effectively carry out the cleanup plan.
- **Thermal Treatment:** Heating soils in the former SRSNE Operations Area to remove, capture, and treat waste oils and solvents in the ground. This process is called *in situ* (or in place) thermal treatment.
- **Excavation, Consolidation, and Capping:** Digging up targeted areas of soil from across the Site, consolidating the soils in the former Operations Area, and covering the materials with a permanent, waterproof cap.
- **Treat & Monitor Groundwater:** Continuing to pump and treat groundwater in select areas of the Site where relevant federal and state drinking water standards are currently not being met, and monitoring groundwater in other areas.
- **Limit Future Use & Monitor:** Placing restrictions on future use of the property and groundwater and carrying out long-term monitoring to make sure the cleanup plan is successful.
- **Restore:** Planting native vegetation in areas affected by the cleanup work and supporting recreational enhancements by expanding the rails-to-trails corridor.

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Solvents Recovery Service of New England, Inc. Superfund Site
Public Outreach Activities & Project Contacts

USEPA's May 2013 Fact Sheet

The SRSNE Site Group Website

Public Outreach

USEPA, CTDEEP, and the SRSNE Site Group are working together during the cleanup process to carry out **community involvement and outreach activities**.

Tools the team is using to provide updates on the status of work include:

- Project fact sheets
- Open house sessions
- Project websites
- Document archive at the Southington Public Library

Detailed work plans, engineering design documents, and project reports submitted to USEPA and CTDEEP are available on the SRSNE Site Group's website. Contact any of the project representatives to learn more about the SRSNE Site, or take home one of the project briefing books.

Scan the codes below to link to the project sites:

USEPA	**SRSNE Site Group**
www.epa.gov/region1/superfund/sites/srs	www.srsnesite.com

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Solvents Recovery Service of New England, Inc. Superfund Site
Vision of Final Conditions & Future Plans

Future View of Capping/Trail Area – Looking South

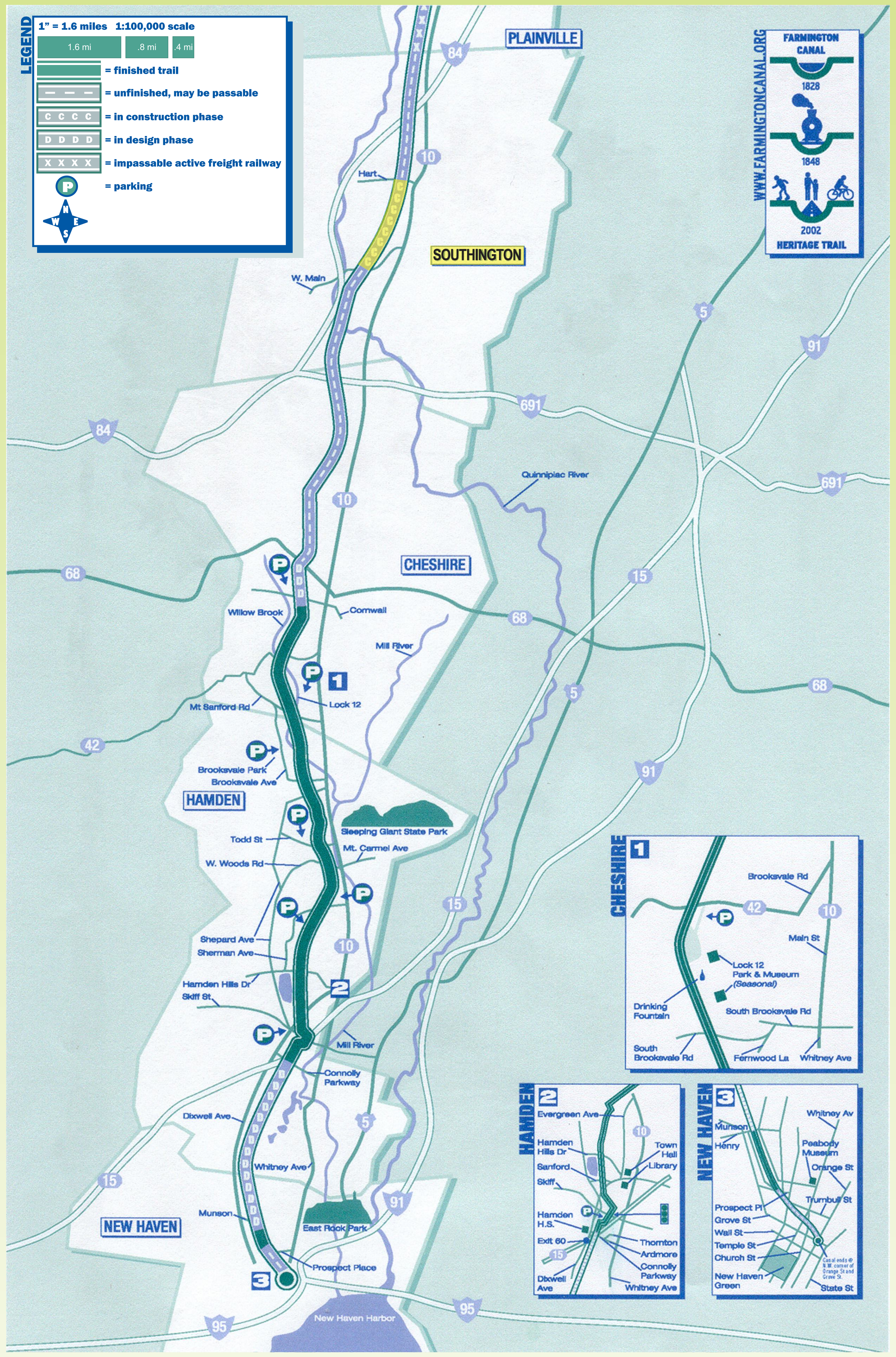
After thermal treatment of the soils in the former Operations Area is complete, the team will install a **multiple-layer waterproof cap.** The cap will be designed to **isolate treated soils and materials excavated from other areas of the Site**, prevent further contamination of groundwater, and protect human health.

Once the cap is in place, the SRSNE Site Group will build a new segment of the **Farmington Canal Heritage Trail**, paving the former railroad right-of-way between **Curtiss Street and Lazy Lane**. This will link up the existing rails-to-trails corridor in Southington, and provide additional recreational opportunities for local residents and visitors. Plans for the trail also include construction of a **public parking lot** just off Lazy Lane.

Conceptual views of how the capped area and trail corridor will look after cleanup work is done are shown to the left.

Future View of Capping/Trail Area – Looking West

Farmington Canal Heritage Trail
Plainville to New Haven



Visit www.farmingtoncanal.org

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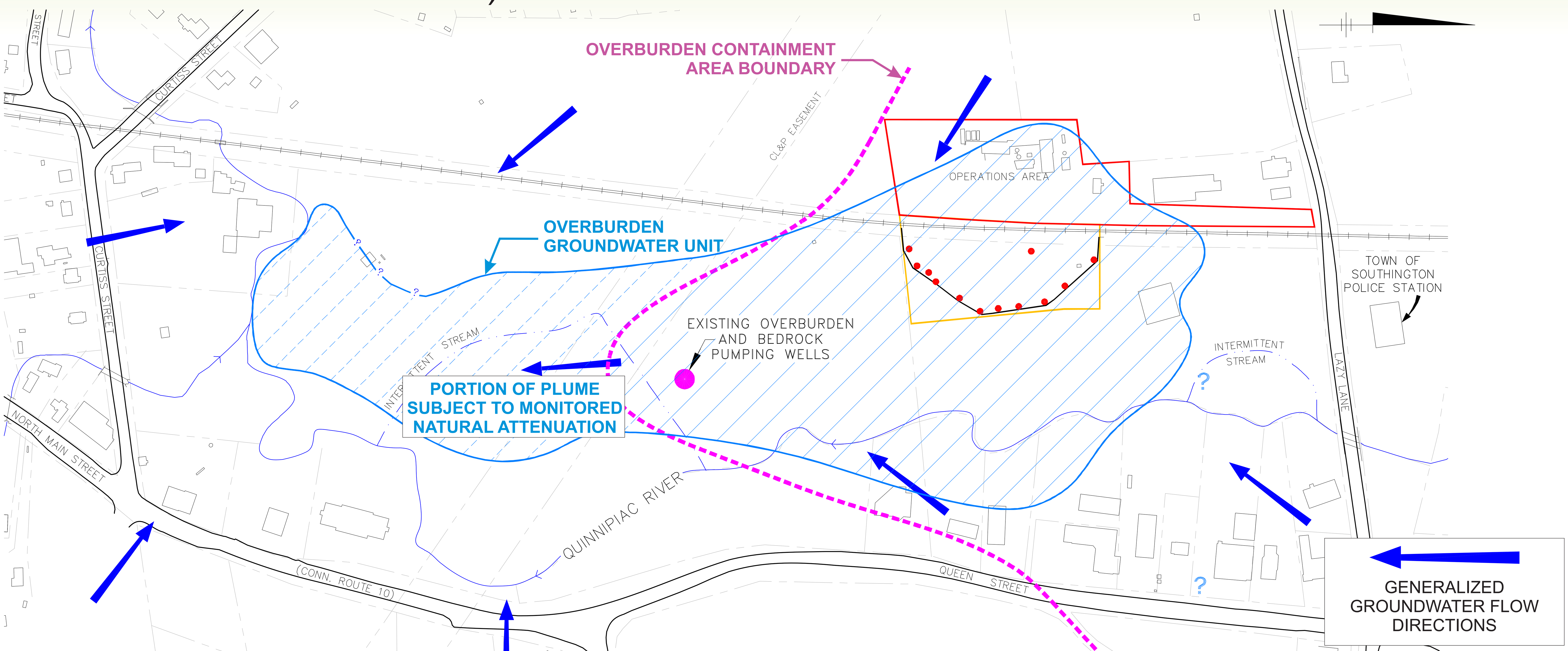
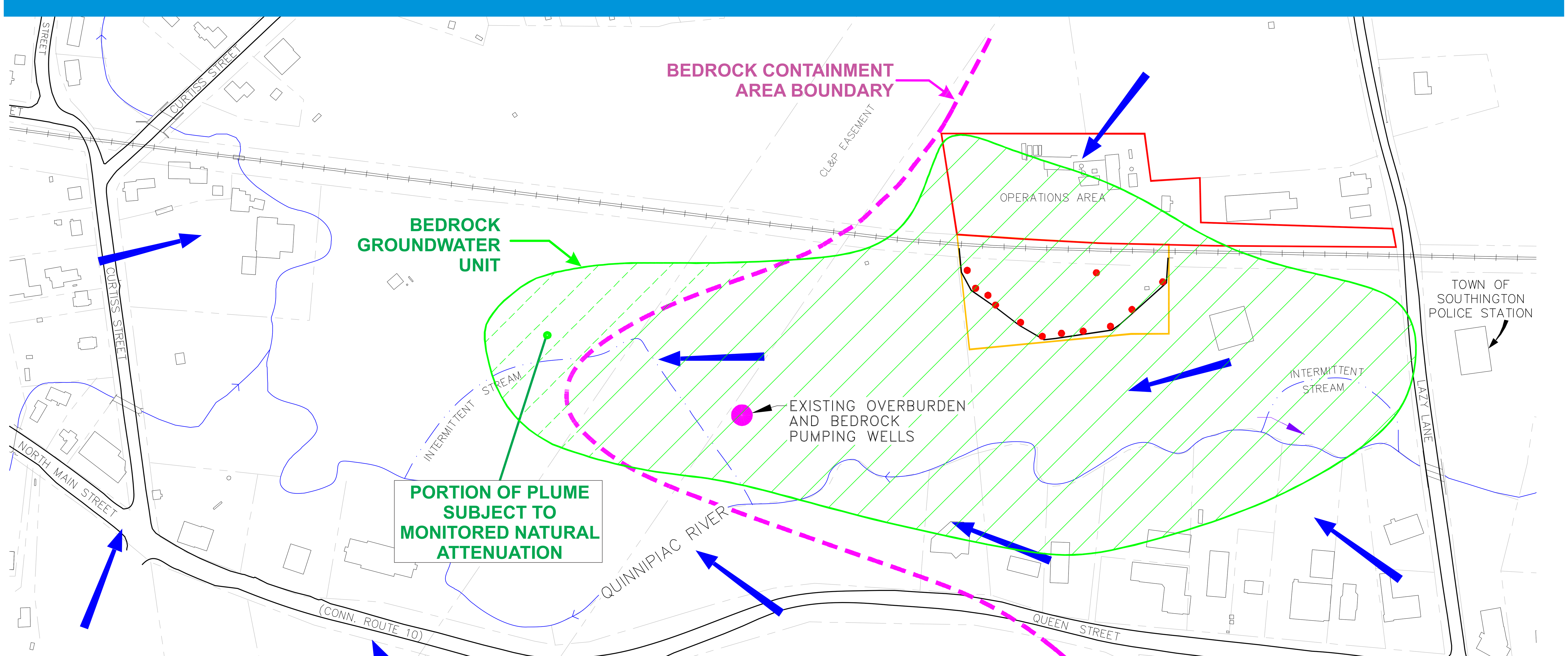
Solvents Recovery Service of New England, Inc. Superfund Site Groundwater Monitoring Zones

Groundwater at the Site is monitored both in the soils above bedrock (referred to as the overburden) and in the fractured bedrock. The depth to bedrock varies across the Site from approximately 12 to 175 feet. The maps below show the estimated location and extent of the groundwater plumes in the overburden and bedrock zones, and the portion of the plumes that will be addressed using Monitored Natural Attenuation (see the posters on Monitored Natural Attenuation for more information).



OVERBURDEN GROUNDWATER ZONE



BEDROCK GROUNDWATER ZONE

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Solvents Recovery Service of New England, Inc. Superfund Site
Groundwater Monitoring Program

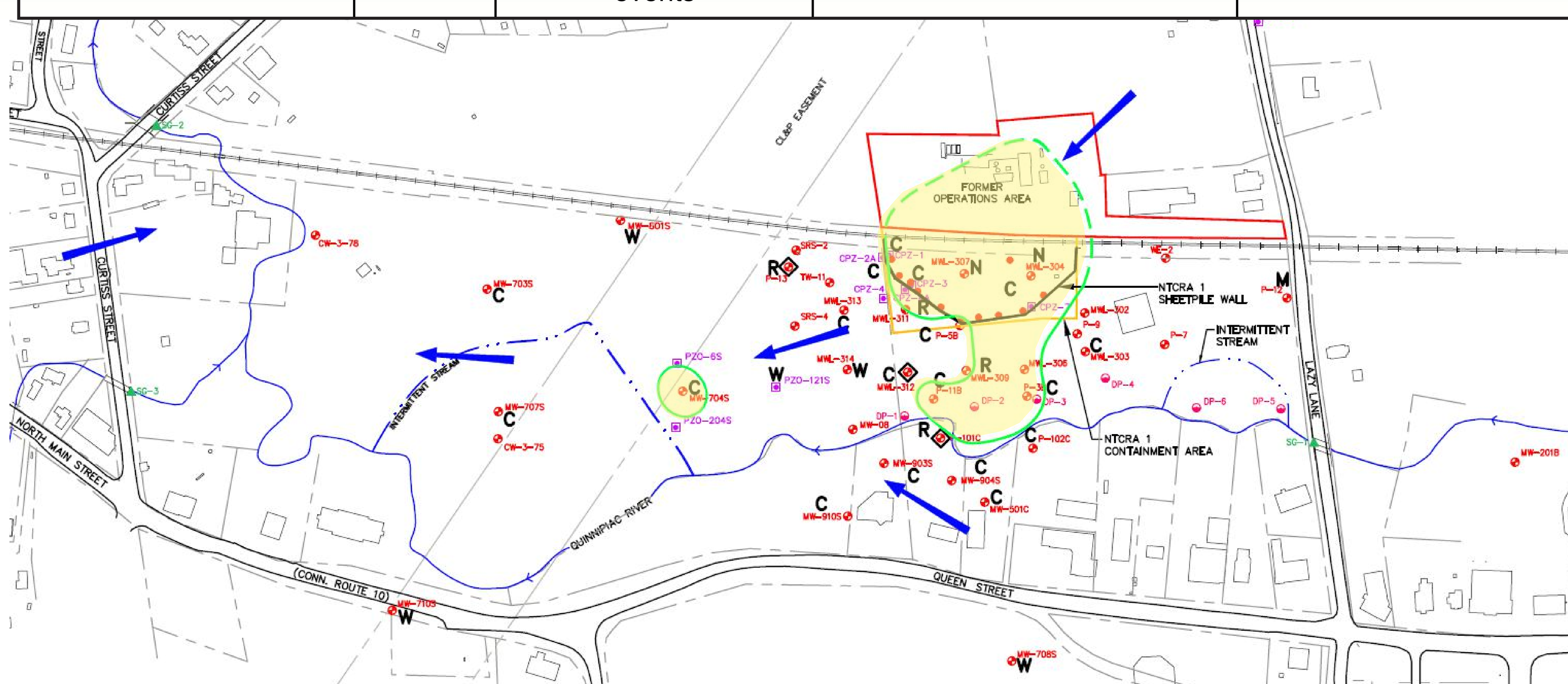
Well Group	# Wells	Sampling Period	Sampling Frequency	Analytical Parameters
"C" wells	83	first comprehensive event	1 event completed in May-June 2010	VOCs, alcohols, 1,4-dioxane, TAL metals, PAHs, PCBs
"R" wells	30			VOCs, alcohols, 1,4-dioxane, TAL metals, PAHs, PCBs, MNA parameters
"N" wells	10			VOCs, alcohols, 1,4-dioxane, TAL metals, PAHs, PCBs, MNA parameters
"M" wells	5			TAL metals, MNA parameters (background)
"B" wells	3			TAL metals (background)
"C" wells	83	subsequent comprehensive events	every 5 years beginning in 2014	VOCs, 1,4-dioxane, TAL metals
"R" wells	30			VOCs, 1,4-dioxane, TAL metals, MNA parameters
"N" wells	10			VOCs, 1,4-dioxane, TAL metals, MNA parameters
"M" wells	5			TAL metals, MNA parameters
"B" wells	3			TAL metals
"R" wells	30	after first comprehensive event	annual: since 2011	VOCs
			every two years: since 2012	MNA parameters
"M" wells	5	after first comprehensive event	annual: since 2011	TAL metals (background)
			every two years: since 2012	MNA parameters (background)
"B" wells	3	after first comprehensive event	annual: since 2011	TAL metals (background)
"W" wells	34	all comprehensive events	every 5 years beginning in 2010	Water levels only - during all comprehensive events

Well Group	# Wells	Sampling Period	Sampling Frequency	Analytical Parameters
"N" wells - overburden	8	before thermal treatment	every two years: since 2012	VOCs, MNA parameters
		during thermal treatment	annual	VOCs, MNA parameters
		after thermal, before equilibrium	3x / year	VOCs, MNA parameters
		after equilibrium	annual	VOCs
			biennial	MNA parameters
"N" wells - bedrock	2	before thermal treatment	annual: since 2011	VOCs, MNA parameters
		during thermal treatment	annual	VOCs, MNA parameters
		after thermal, before equilibrium	3x / year	VOCs, MNA parameters
		after equilibrium	annual	VOCs
			every two years	MNA parameters

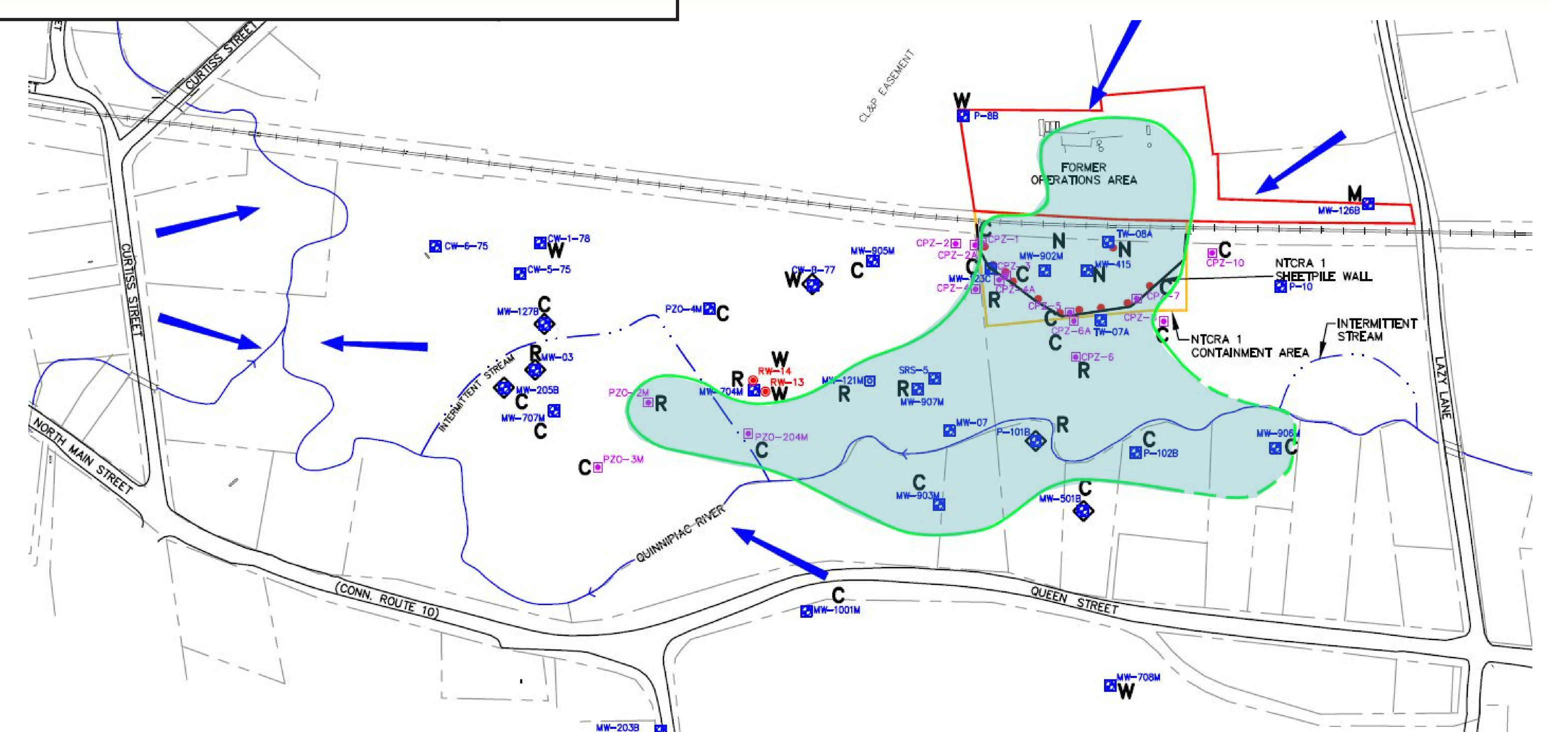
Monitoring Well Types

- **C** Monitoring Well for Comprehensive Sampling Rounds Only
- **R** Monitoring Well for Routine VOC and MNA Monitoring
- **N** NTCRA 1 Area Monitoring Well
- **M** Background Monitoring Well for Metals Sampling Only
- **B** Background Monitoring Well for Metals and MNA Sampling
- **W** Monitoring Well for Water Level Measurements Only

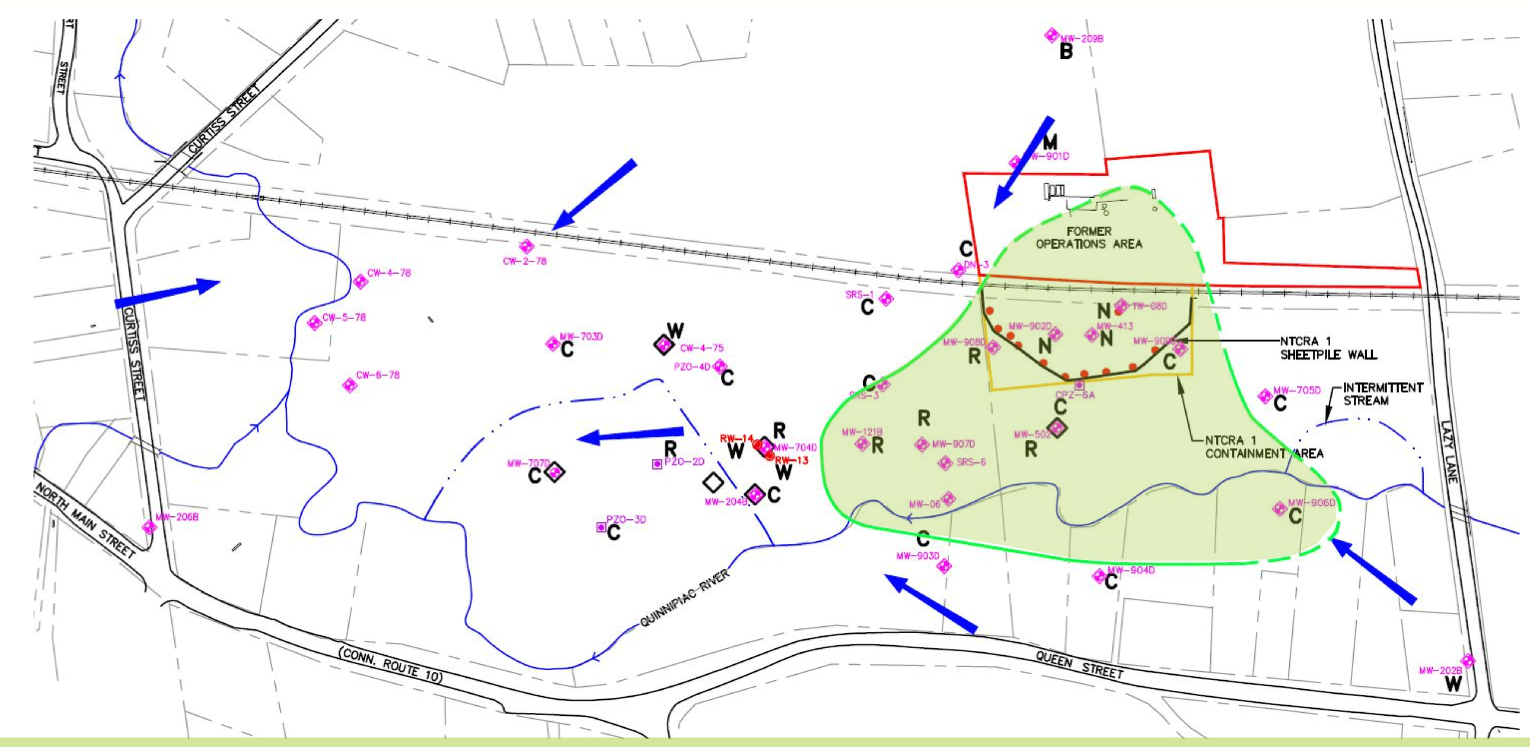
VOCs: Volatile Organic Compounds
TAL: Target Analyte List
PAHs: Polycyclic Aromatic Hydrocarbons
PCBs: Polychlorinated Biphenyls
MNA: Monitored Natural Attenuation



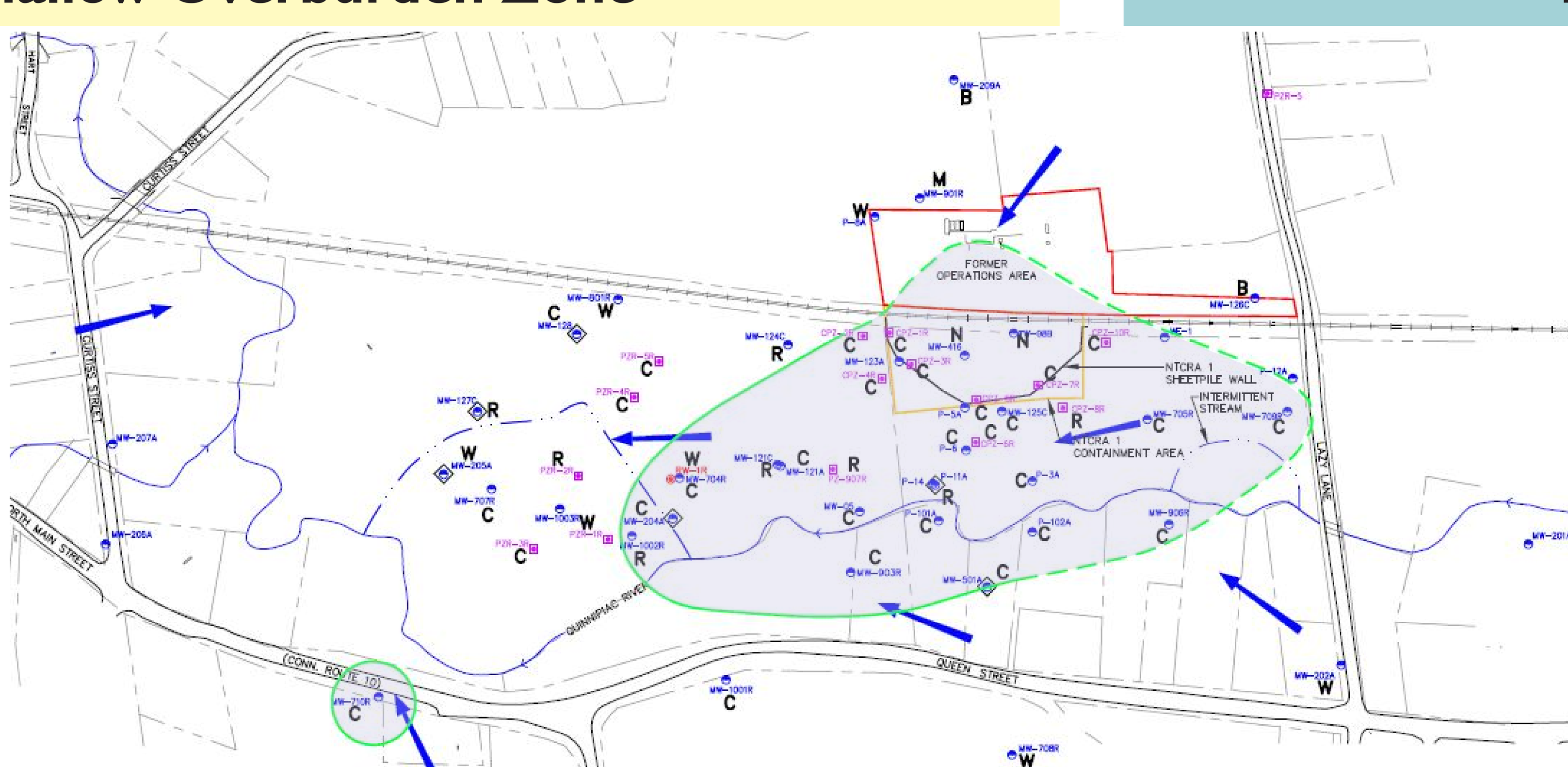
Shallow Overburden Zone



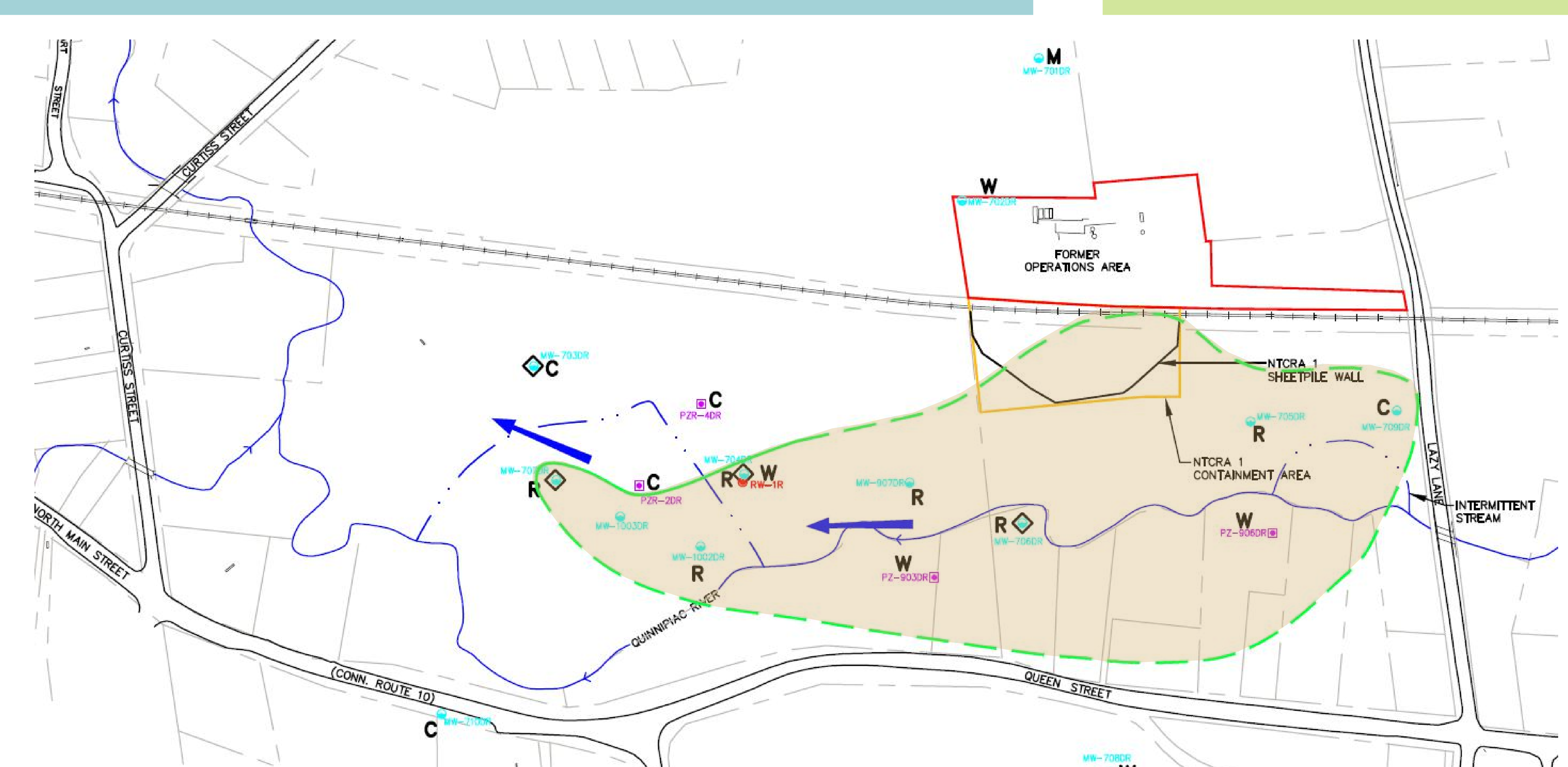
Middle Overburden Zone



Deep Overburden Zone



Shallow Bedrock Zone



Deep Bedrock Zone

SHALLOW OVERBURDEN MONITORING WELL
MIDDLE OVERBURDEN MONITORING WELL
DEEP OVERBURDEN MONITORING WELL
SHALLOW BEDROCK MONITORING WELL
DEEP BEDROCK MONITORING WELL
PIEZOMETER
ESTIMATED EXTENT OF GROUNDWATER VOC EXCEEDANCES OF DRINKING WATER STANDARDS
GENERALIZED GROUNDWATER FLOW DIRECTION

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Solvents Recovery Service of New England, Inc. Superfund Site Monitored Natural Attenuation in Groundwater

What is MNA?

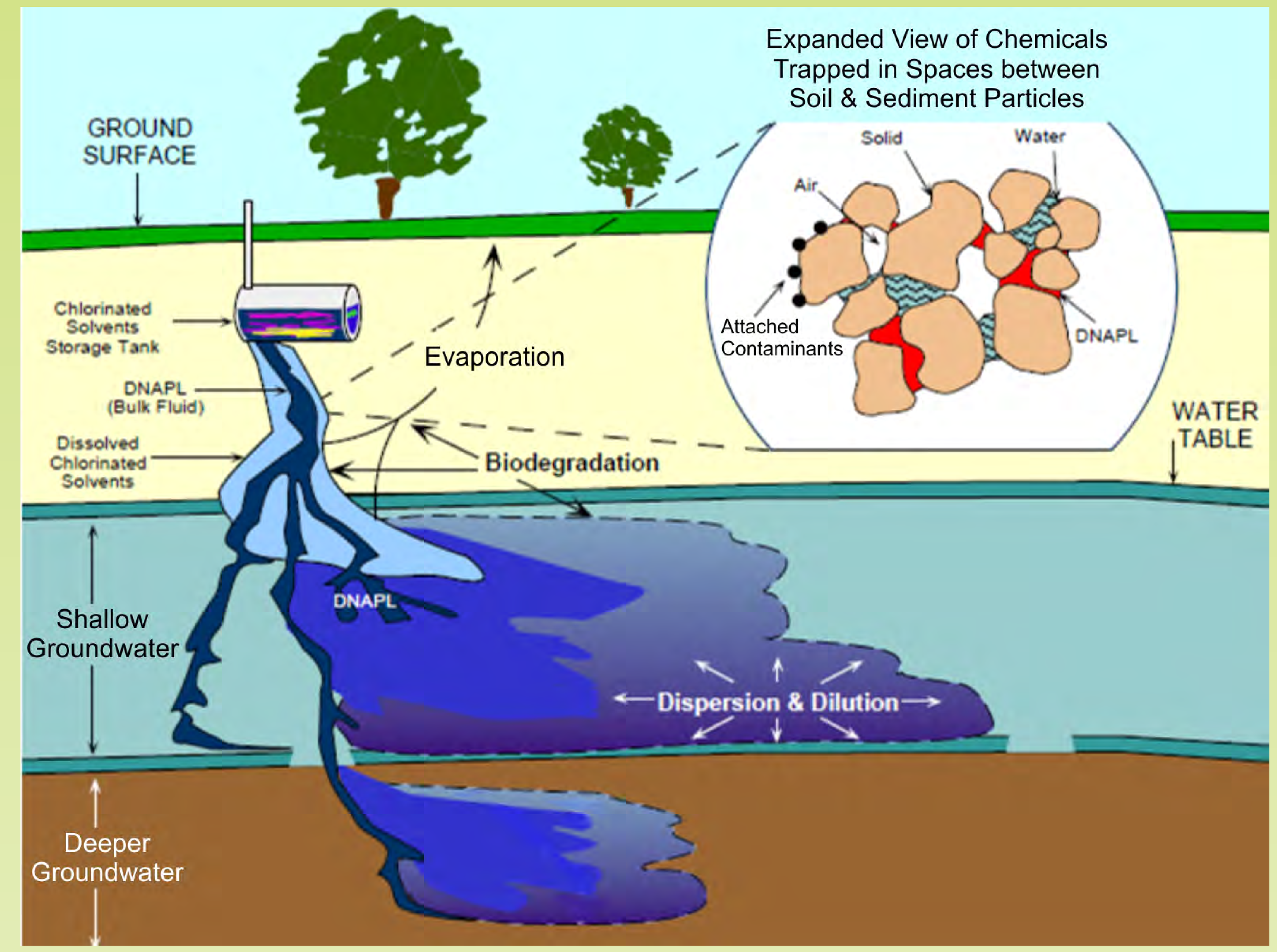
Monitored natural attenuation, or MNA, is the reliance on natural processes to achieve site-specific cleanup goals. The processes can reduce the mass, toxicity, mobility, volume, and concentration of the chemicals at a site. MNA is always used in combination with source control and as part of a carefully controlled and monitored cleanup program.

At the SRSNE Site, the key chemicals of concern are chlorinated solvents, such as TCE (formally called trichloroethylene), which is a common degreaser. These chemicals are in the soils and groundwater of the Site because of the leaks and spills that occurred when the facility was in operation.

MNA is an appropriate cleanup approach for the solvents in groundwater at the Site based on:

- **Historical groundwater data**, which show a declining trend in measured levels of chemicals over time at most monitoring locations.
- **Hydrogeological and geochemical data**, which demonstrate that conditions in soil and groundwater are right for MNA.
- The documented **presence of microorganisms** capable of breaking down the solvents in the soils of the Site.

What happens when chemicals are spilled on the ground?



After a spill or leak, chemicals like chlorinated solvents sink down below the ground surface. The chemicals can follow different paths, and any of the **five key natural attenuation processes** may start to work:

- *Biodegradation:* when microorganisms "eat" or otherwise transform the chemicals into compounds that are less toxic (or not toxic at all) – these organisms are almost everywhere in nature.
- *Sorption:* where chemicals dissolved in groundwater "stick" to solids like silt, sand or clay or get trapped in the spaces in the soil or sediment – this slows or stops the movement of the chemicals.
- *Evaporation:* when chemicals move from the solid or liquid phase into the atmosphere or the spaces in soil.
- *Dilution:* when concentrations of chemicals in groundwater are reduced by the addition of clean water from lakes and rivers or precipitation.
- *Chemical degradation:* a spontaneous change in chemicals without microorganism activity – chemicals break down into simpler compounds.

At the SRSNE Site, some of the chlorinated solvents are heavier than water – these are called dense non-aqueous phase liquid, or DNAPL – and may sink below the water table. The portion that dissolves can move with the natural flow of the groundwater, and over time, the measured amounts of the dissolved solvents is lowered by dilution.

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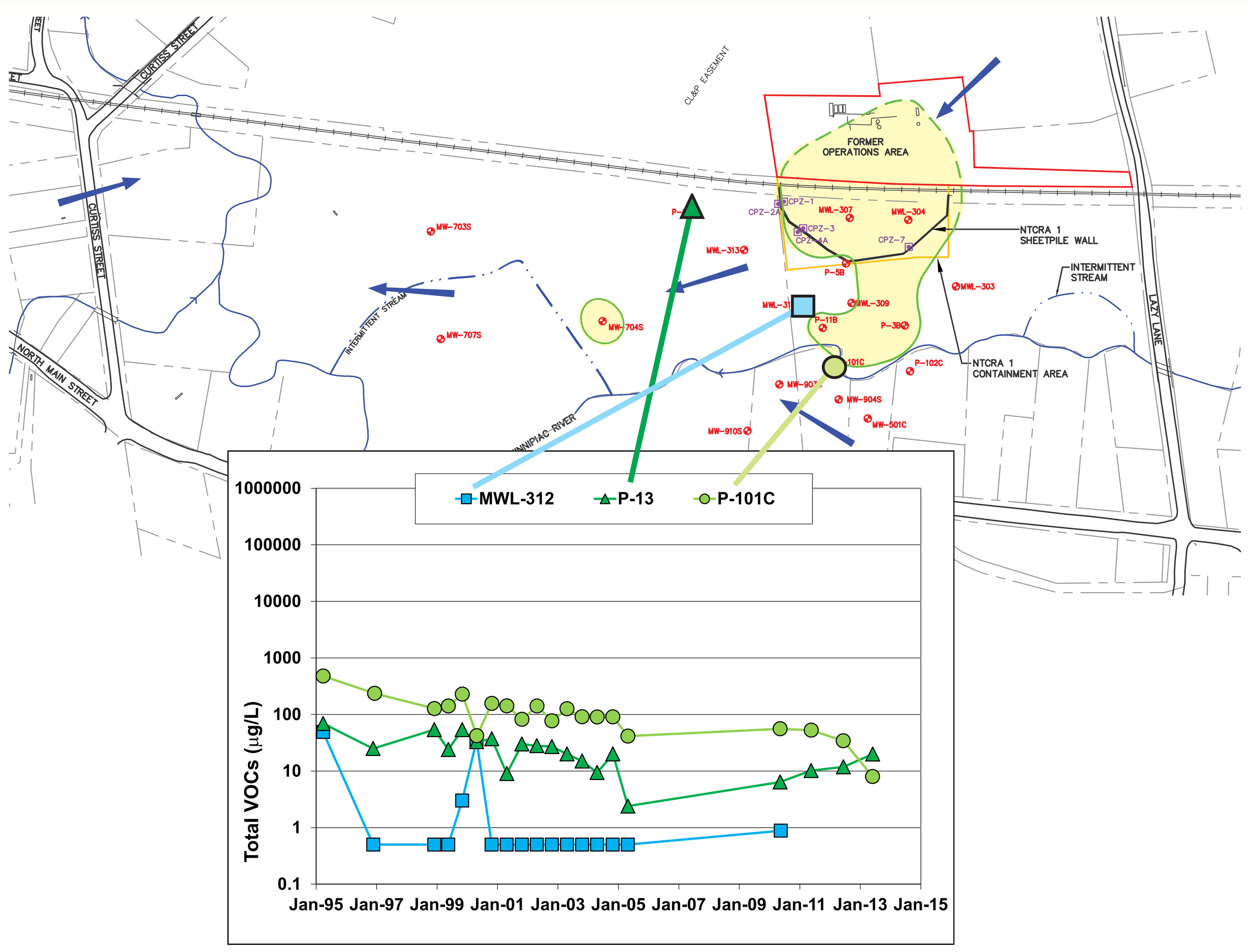
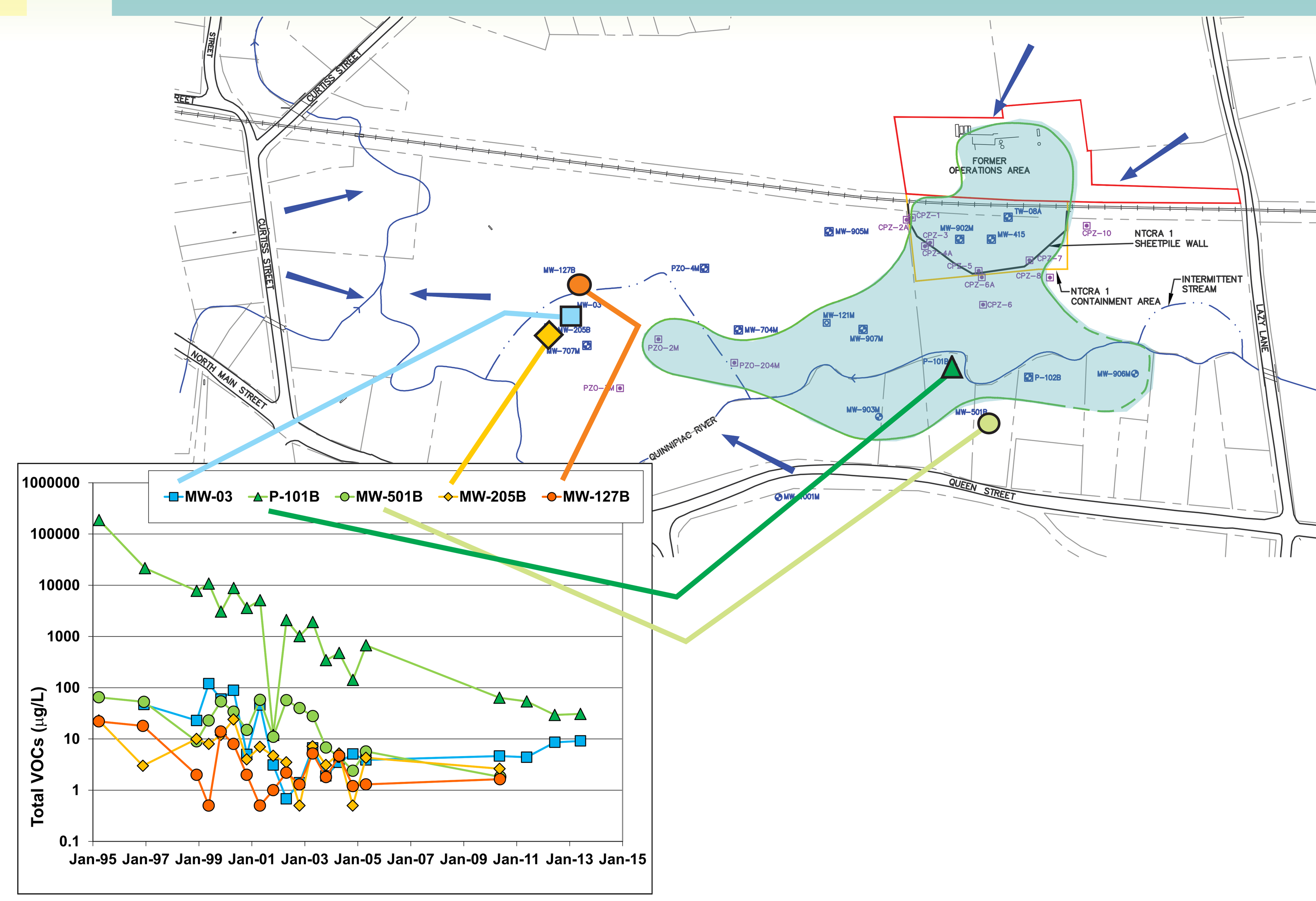
Solvents Recovery Service of New England, Inc. Superfund Site Monitored Natural Attenuation in Groundwater

Changes in Concentrations of Volatile Organic Compounds in Groundwater Over Time at the SRSNE Site

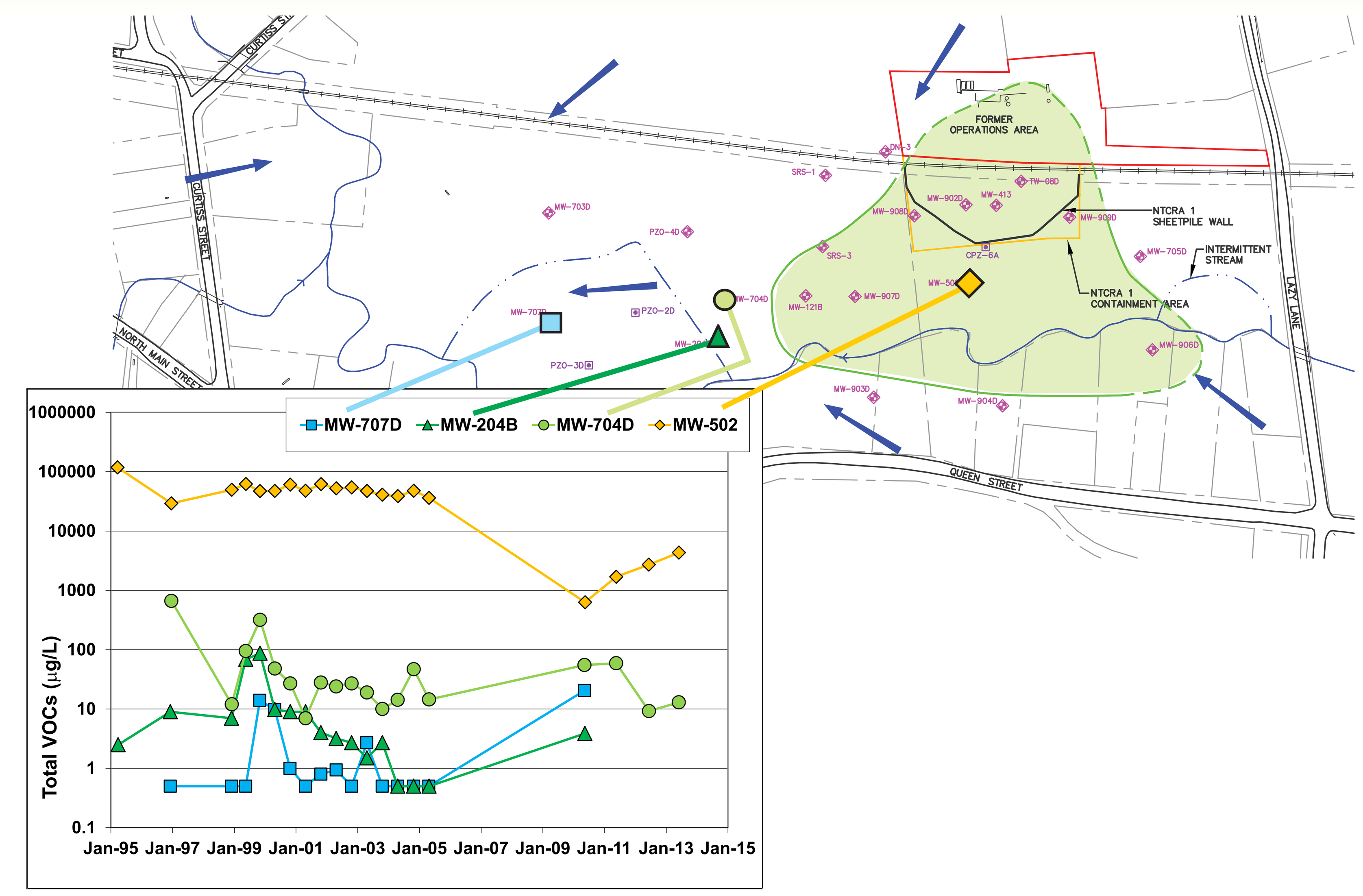
Shallow Overburden Plume



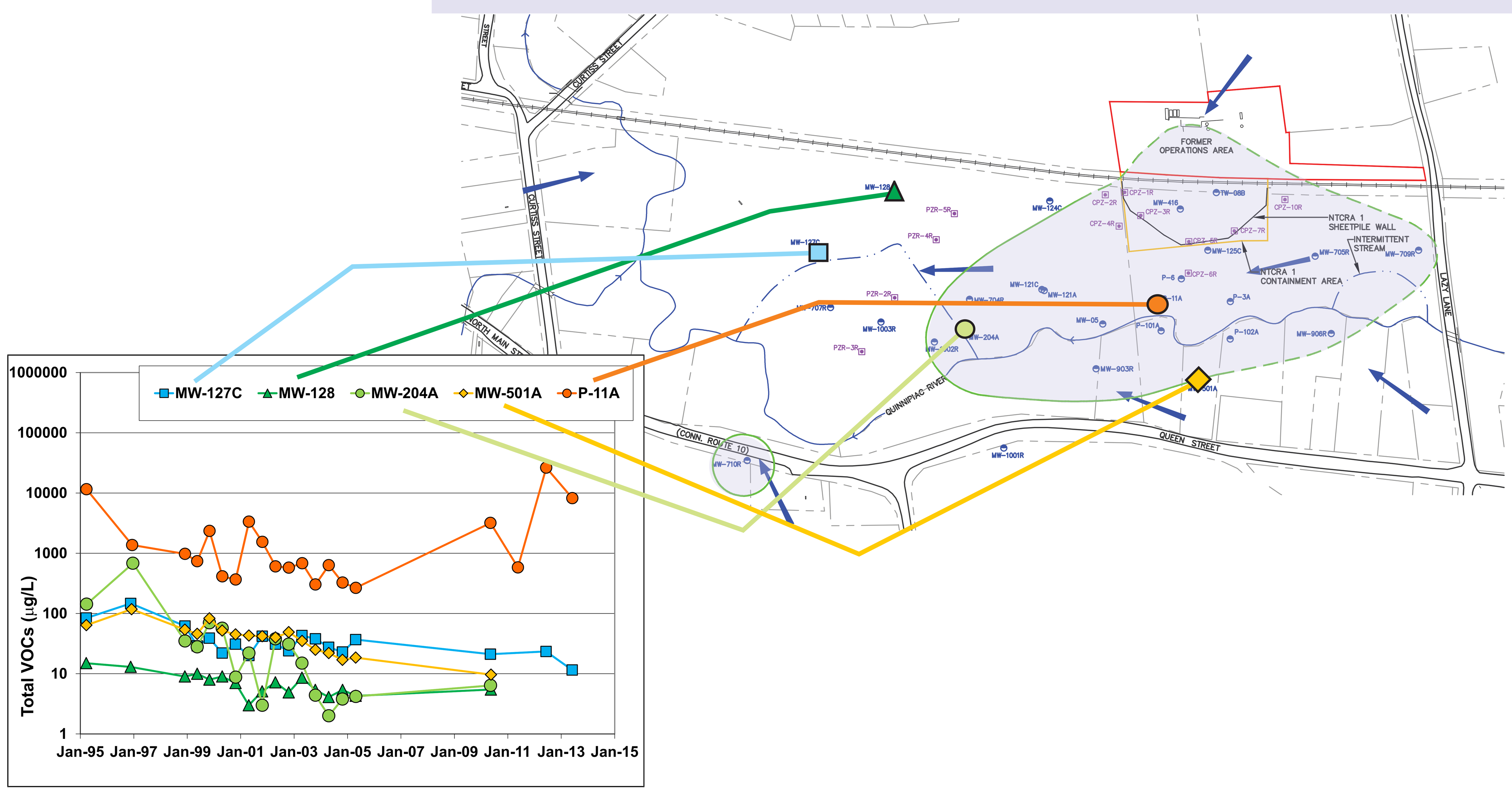
Middle Overburden Plume



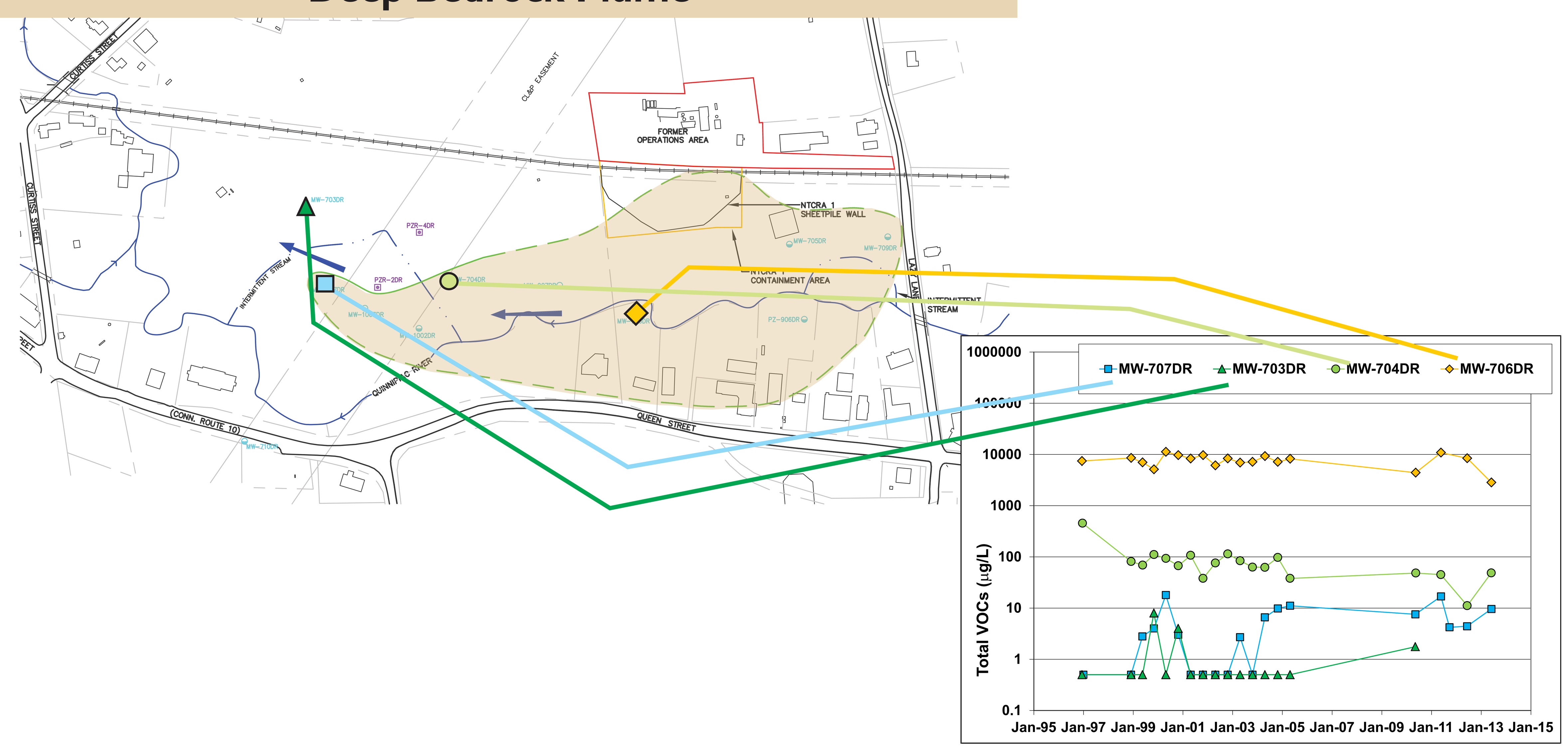
Deep Overburden Plume



Shallow Bedrock Plume



Deep Bedrock Plume



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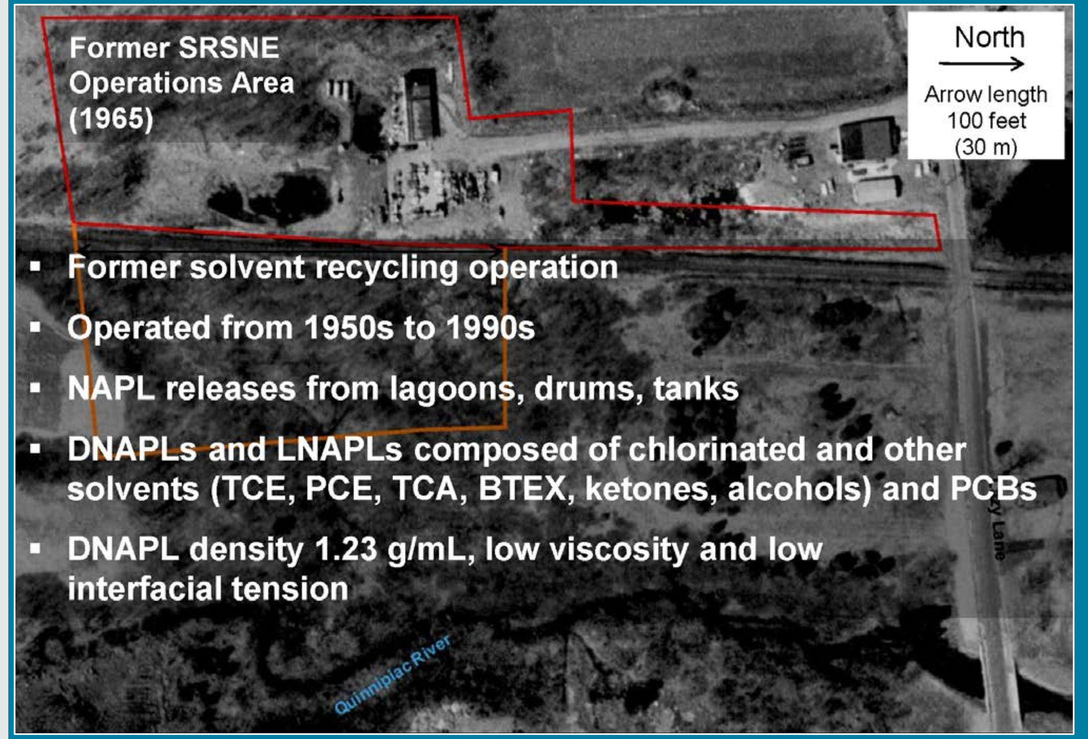
DNAPL and Dissolved Plume Assessment in Fractured Bedrock – Modeling and Verification

Michael J. Gefell, PG, CPG (ARCADIS); Bernard H. Kueper, PhD, PE, (Queen's University) and Bruce R. Thompson (*de maximis, inc.*)

Background

At a USEPA Region 1 Superfund Site, solvents were stored and processed from the 1950s to the 1990s; resulting releases produced a multi-component, dense non-aqueous phase liquid (DNAPL) source zone in the overburden and fractured sandstone bedrock, along with associated aqueous phase plumes. Further down-dip delineation of DNAPL in bedrock fractures through direct observation would require drilling to over 450 feet (140 meters [m]), and could still be inconclusive. Therefore, the shape of the bedrock DNAPL zone and dissolved plume were evaluated using a combination of: a) 3-D MVS modeling conducted on locations of visible DNAPL in bedrock wells, and bedrock fracture statistics; b) MODFLOW/MODPATH modeling of groundwater flow paths; c) dual-domain solute-transport (CRAFLUSH) modeling of the dissolved plume length; and d) verification by targeted drilling of new down-gradient monitoring wells. Measured hydraulic apertures of bedrock fractures decrease with depth. Therefore, predicted groundwater velocity and TCE plume length decrease dramatically with depth; e.g., the bedrock DNAPL zone deeper than 400 feet (120 m), if any, produces a simulated steady-state TCE plume length of <30 feet (<10 m). This study demonstrates that targeted drilling informed by empirical data and modeling techniques leads to efficient and cost-effective delineation of VOCs in bedrock.



Solvents Recovery Service of New England, Inc. (SRSNE) U.S. EPA Region 1 Superfund Site

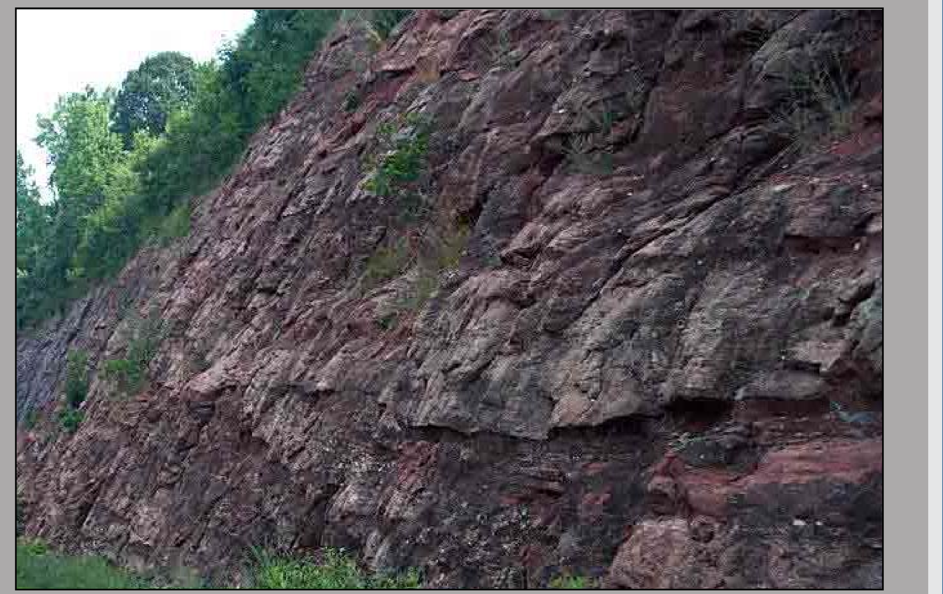
Objectives

- Reassess DNAPL zone in bedrock
- Model TCE plume extent
- Verify modeling results
- Qualitatively evaluate risk

Sampling site-specific DNAPL

New Haven Arkose Bedrock Mean Site-Specific Parameters Based on Measurement

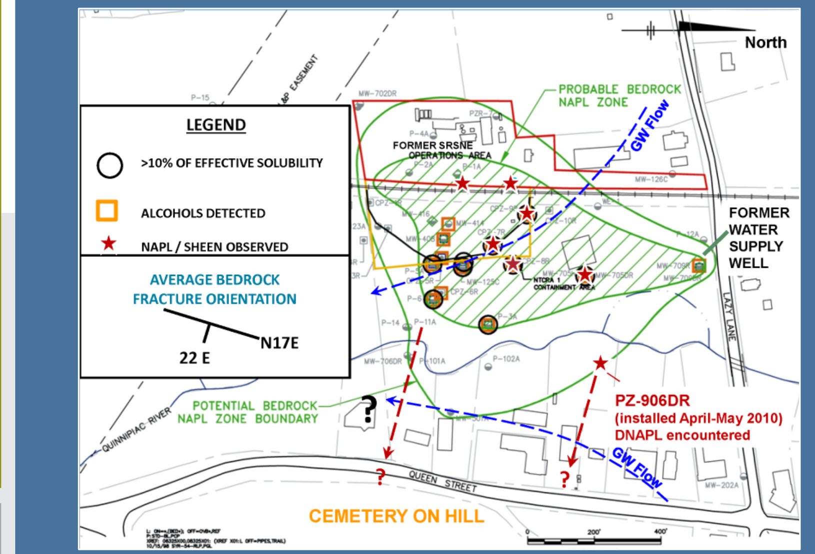
- Triassic "Redbeds" – Arkosic Sandstone
- Hydraulic conductivity = 10^{-4} cm/s
- Fracture aperture = 97 microns
- Matrix fraction organic carbon = 0.5%
- Matrix porosity = 8%
- Fracture porosity = 0.006%



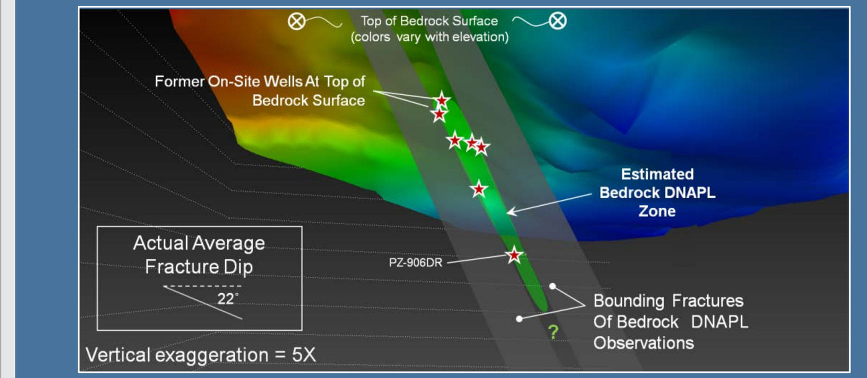
New Haven Arkose in road cut

New Haven Arkose rock cores at SRSNE Site

DNAPL In Bedrock Fractures

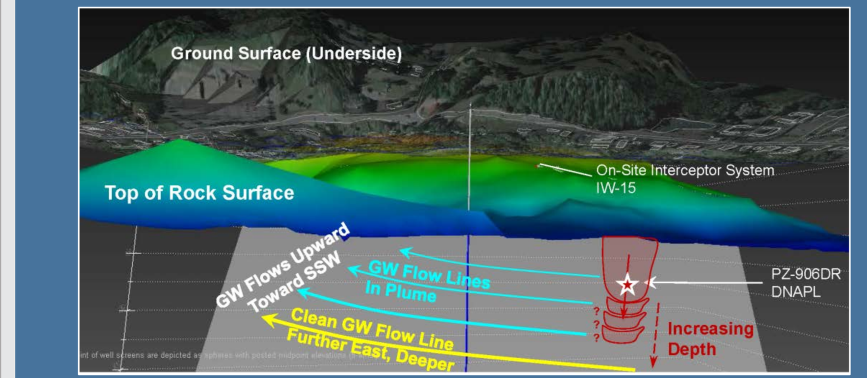


Bedrock NAPL Zone (1998 Remedial Investigation)



DNAPL Observations in Bedrock and Average Fracture Dip

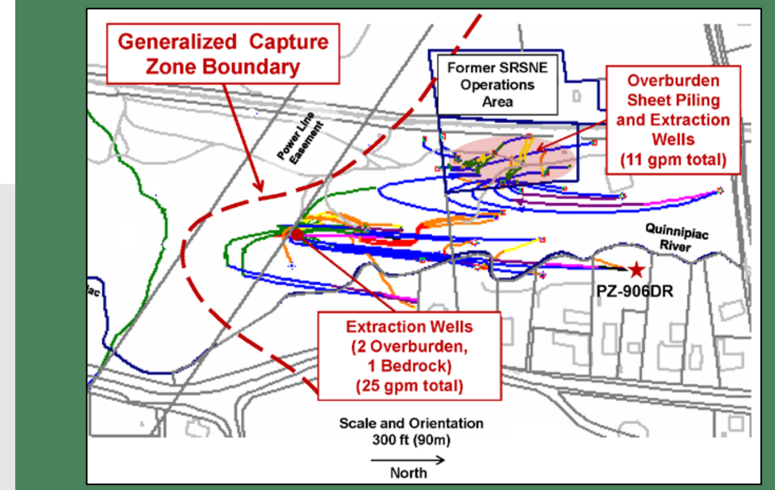
- EVS Model – Looking north-northeast along strike of fractures



DNAPL and Plume Assessment Challenge

- EVS Model – Looking west, in updip direction

Plume Modeling Approach and Results

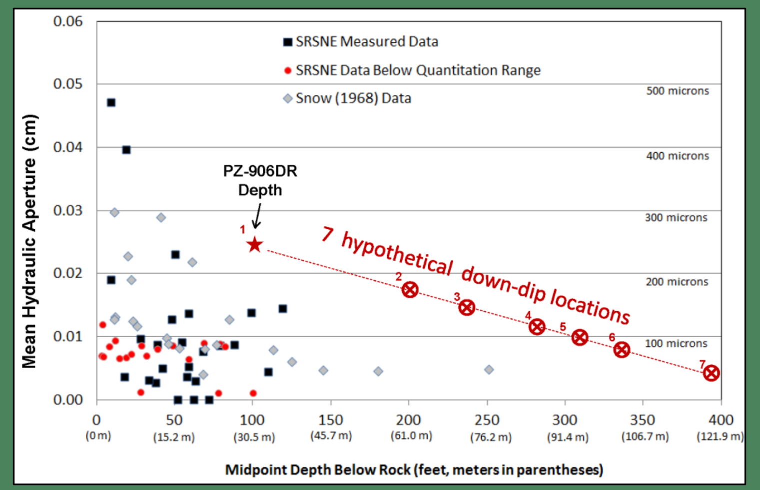


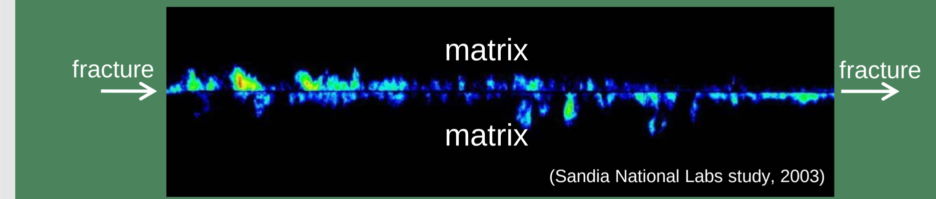
MODFLOW Model (with MODPATH)

Plume Containment Simulation

- Regional, 3-D numerical GW flow model
- 9 Layers up to 700 feet (210 m) deep
- 90 calibration targets
- 20:1 bedrock anisotropy in plan view

Apertures Used in TCE Transport Model



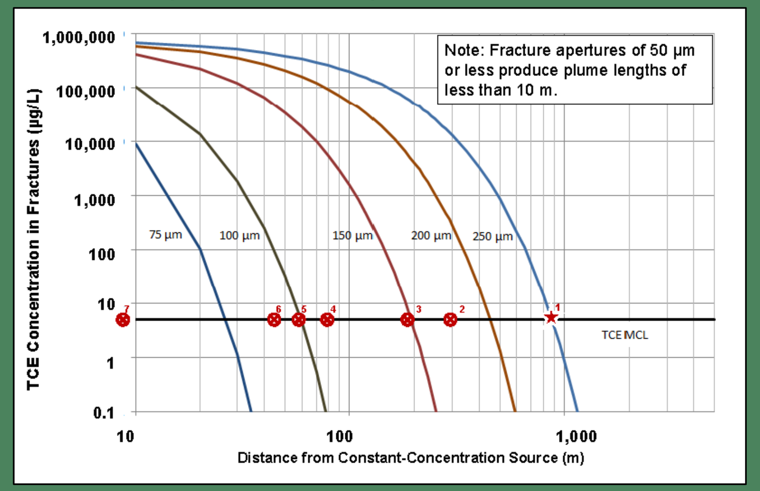


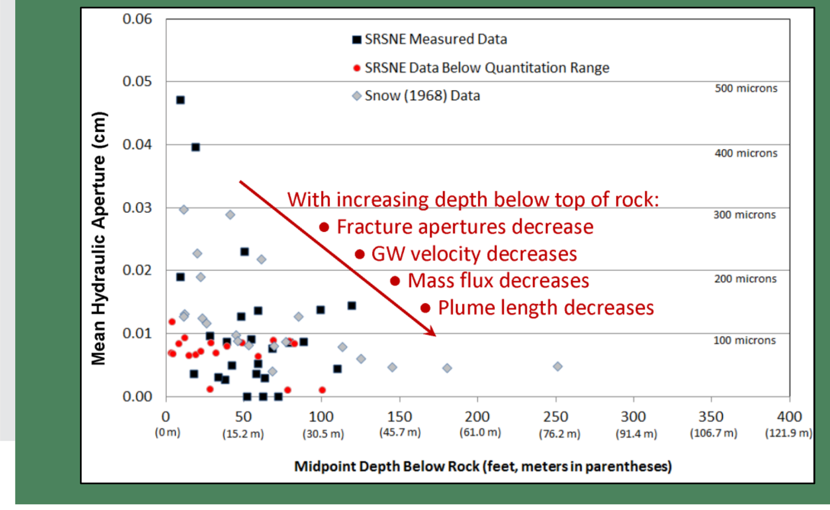
Solute Transport Model (TCE)
CRAFLUSH Description and Key Parameters

- Sudicky and Frind (1982); Lipson et al. (2005)
- Advection and dispersion in parallel, equally-spaced fractures
- Diffusion into matrix, sorption, first-order decay
- Fracture hydraulic aperture = 50 to 250 µm
- Hydraulic gradient = 0.005
- Fracture spacing = 155 cm
- Half life = 1,350 days*
- Duration = 50 yrs (steady state)

* Aronson and Howard, 1997

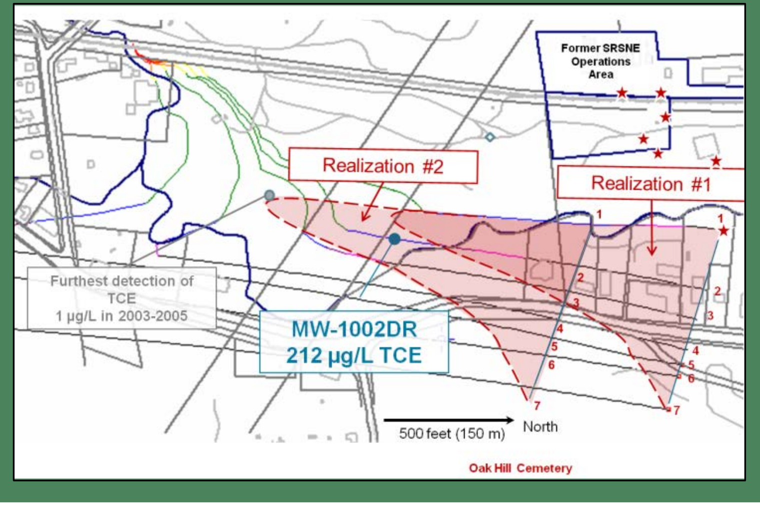
Steady-State TCE Plume Length Versus Fracture Aperture –Transport Model Results



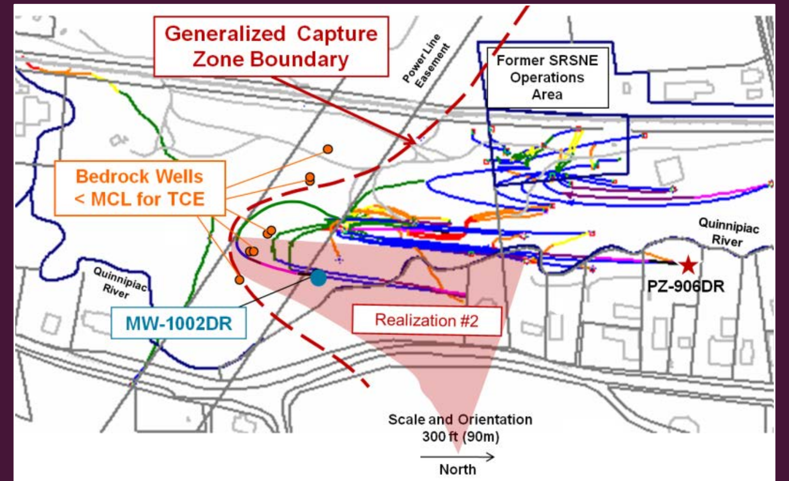


Fracture hydraulic aperture versus depth

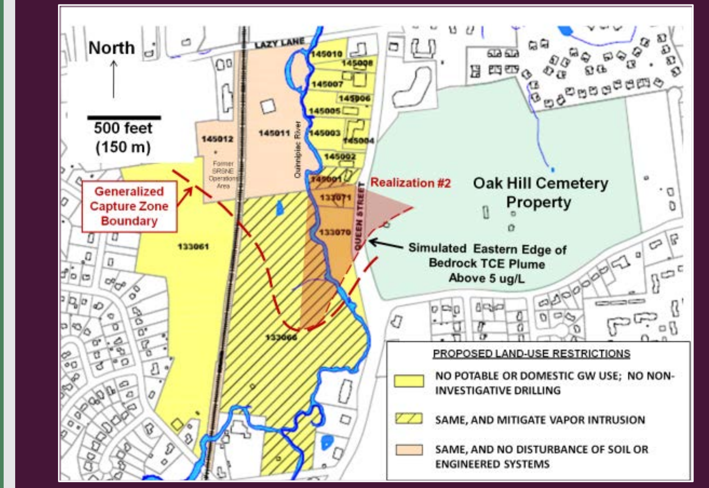
Verification – Results from New Deep Bedrock Monitoring Well



Risk Management



Plume containment simulation with verification well and Realization #2



Planned land use/ deed restrictions

Conclusions – Minimal Risk of Exposure

- Bedrock VOC plume length decreases with increasing depth
- Plume may be under a cemetery, and is under properties with pending land-use restrictions
- Public water supply available - potable water wells already forbidden by town ordinance
- Accessing deep VOC plume would be very expensive
- Plume hydraulically controlled
- VOC concentrations stable or decreasing
- Plume will continue to be monitored

Direct delineation of down-dip edge of DNAPL and associated deep VOC plume is not necessary to prevent exposure and control risk.

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Poster selected for presentation at the March 2013 Remediation Technologies Summit in Westminster, Colorado

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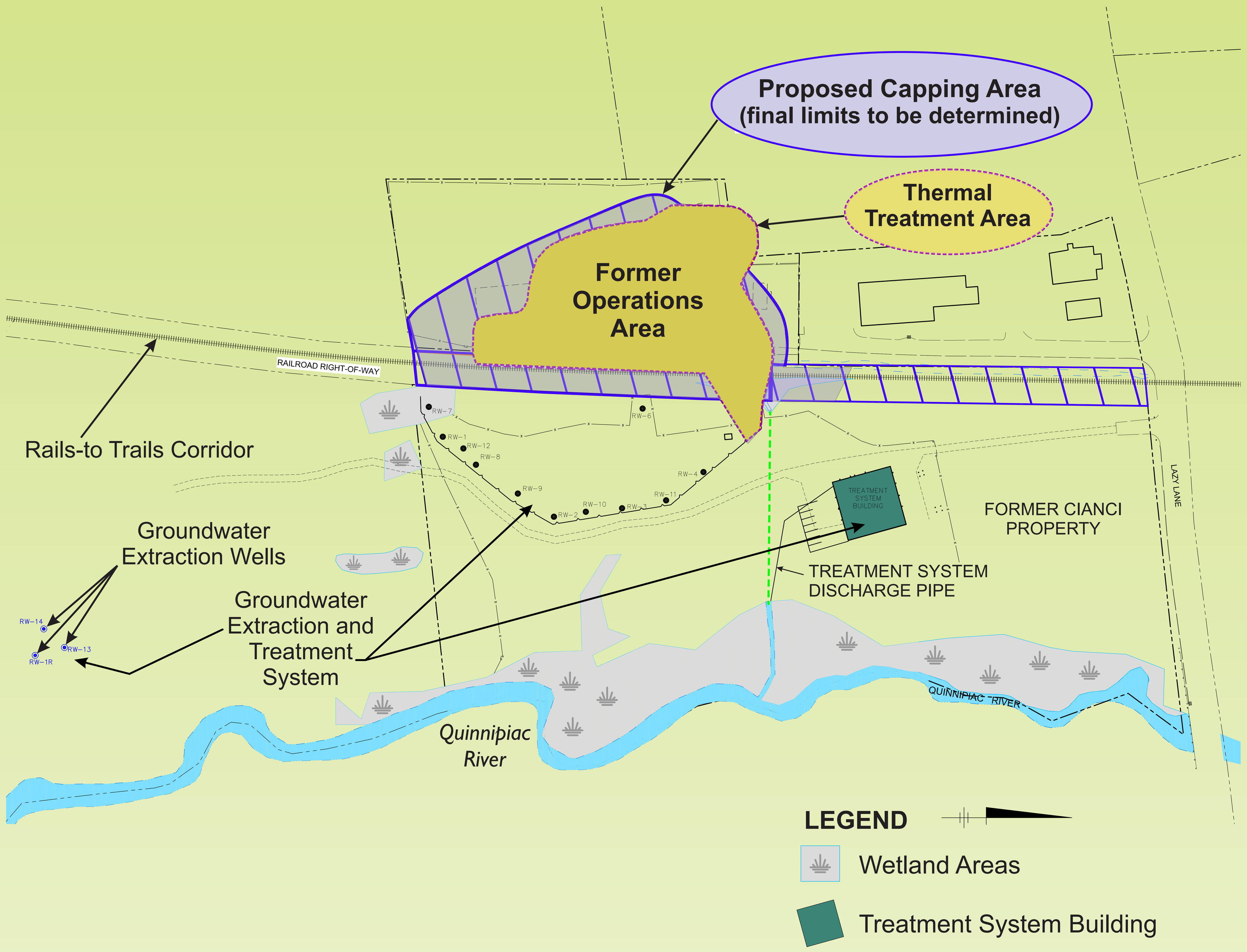
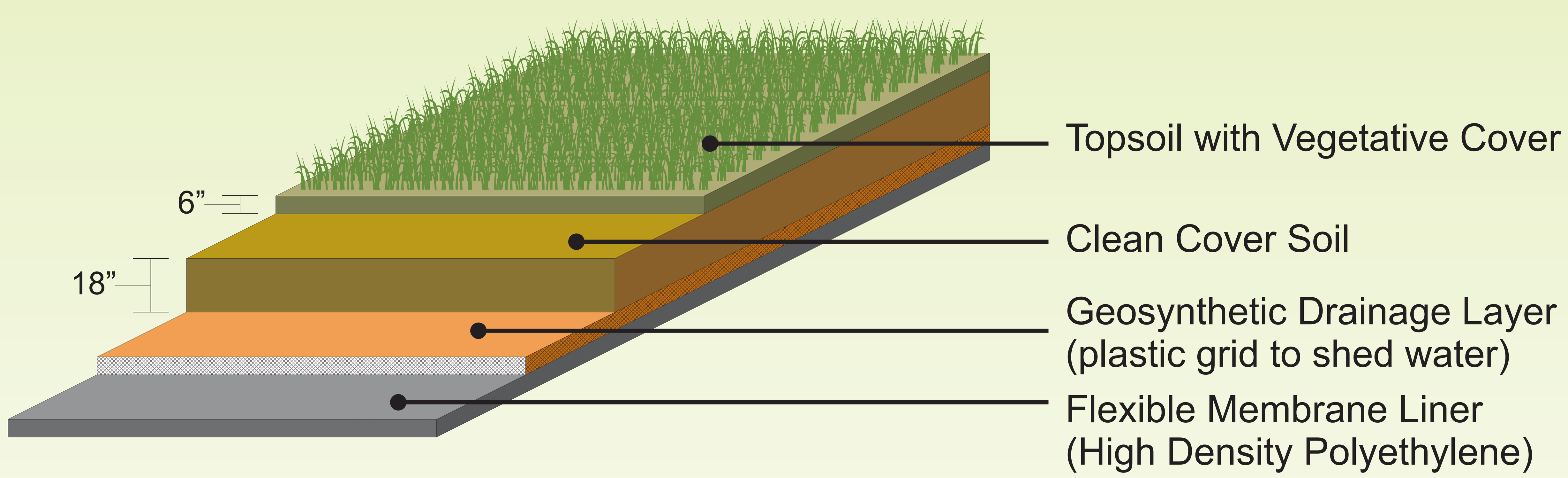
Solvents Recovery Service of New England, Inc. Superfund Site
Remedy Component: Capping



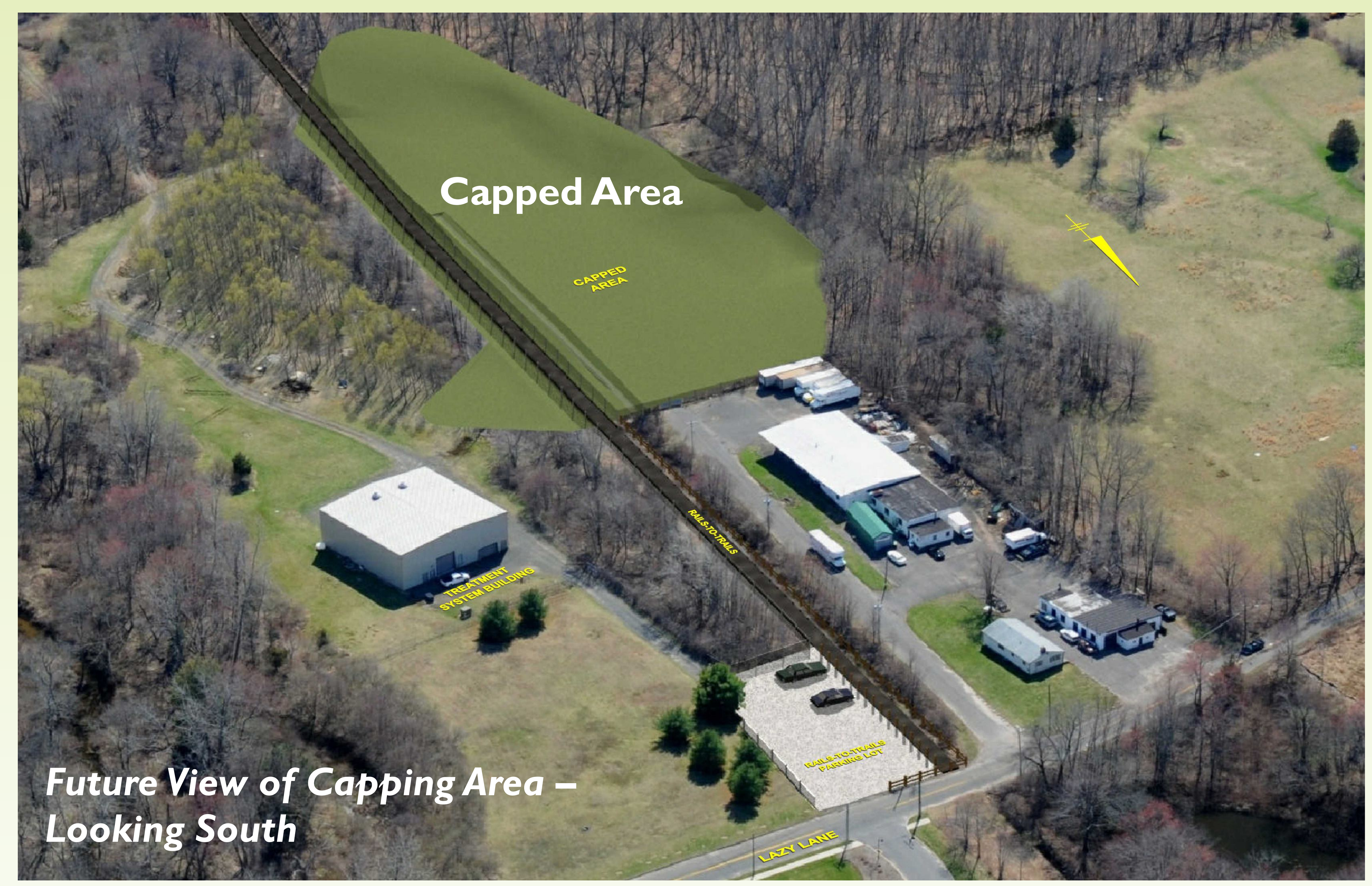
After thermal treatment of the soils in the former Operations Area of the SRSNE Site is complete, the area will be covered with a **multiple-layer waterproof cap** (the thermal treatment component is described in Tent #4). The cap will be designed to **isolate treated soils and materials excavated from other areas of the Site**.

The boundaries of the area to be capped are not yet finalized. **Additional sampling** is planned as part of the preparatory work for the thermal treatment component of the remedy, and the results of that effort will be used to establish the capping area.

The cap will include waterproof liners to separate the isolated materials from the clean fill and soil added on top. These liner layers will keep rain water from soaking down into the consolidation area and spreading the remaining contamination into the groundwater. They will also keep animals from burrowing down into the treated and consolidated soils. After the liner and drainage layers are in place, clean soil will be added across the entire capping area, and the soil will be planted with native grasses. The final cap, which will be about 18 inches thick, will be inspected over the long term and repaired as necessary to ensure that it continues to function as intended.



Typical Layers of an Engineered Cap



Future View of Capping Area – Looking South

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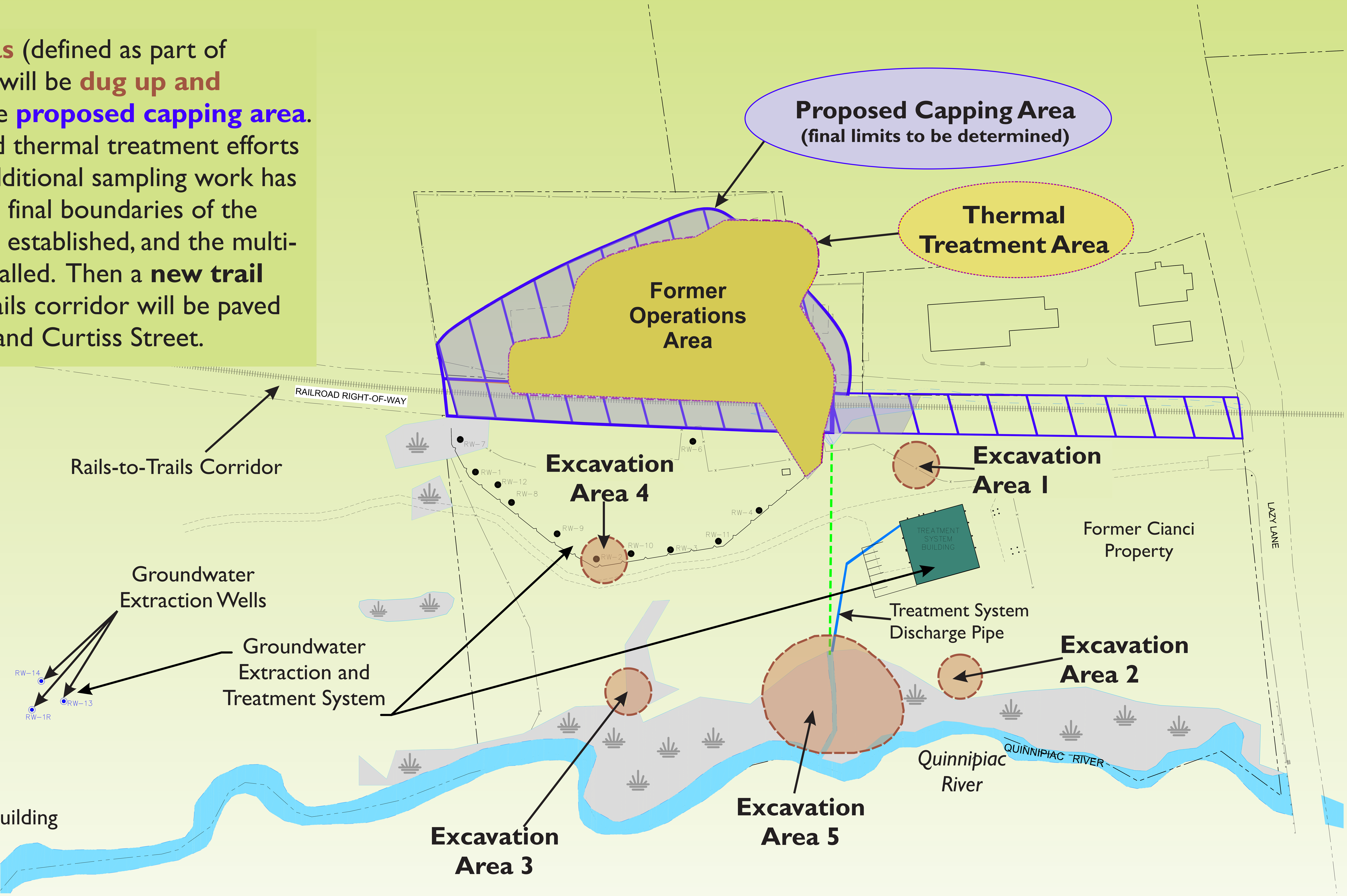
Solvents Recovery Service of New England, Inc. Superfund Site
Remedy Component: Excavation

Soils from **five areas** (defined as part of sampling programs) will be **dug up and consolidated** in the **proposed capping area**. After excavation and thermal treatment efforts are complete and additional sampling work has been conducted, the final boundaries of the capping area will be established, and the multi-layer cap will be installed. Then a **new trail** along the rails-to-trails corridor will be paved between Lazy Lane and Curtiss Street.



LEGEND

- Wetland Areas
- Treatment System Building

Solvents Recovery Service of New England, Inc. Superfund Site
Remedy Component: Thermal Treatment Preparation

Since 2008, much of the work has been focused on **preparing the Site for thermal treatment**. These activities included (completion dates in parentheses):

- Mapping the locations of wetlands and evaluating conditions of local habitat – this will guide replanting and restoration work after cleanup is done (Fall 2010)
- Clearing work areas and building temporary access roads (Fall 2010)
- Moving the property fence to enclose the entire work zone (December 2010)
- Grading/leveling soils across the entire treatment area (December 2010)
- Installing additional groundwater wells to expand the monitoring network (Spring 2011)
- Rerouting an existing AT&T fiber optic line so it would no longer cross through the construction zone (August 2012)
- Excavating targeted soils from along the railroad tracks (October 2012)
- Relocating a drainage culvert (November 2012)
- Installing extensions to an underground barrier wall to reduce the amount of groundwater that will flow into the thermal treatment zone – this will make the soils easier to heat up to the desired temperature (October 2012)
- Installing the components of the thermal treatment system (April 2013 - present)

The eastern hognose snake and the eastern box turtle are species of special concern in Connecticut. Measures are in place to protect these species if encountered at the Site.

Left: Excavating along the northern end of the railroad tracks. ***Below:*** Installing the extension to the barrier wall around the treatment zone.

Left: Installing vapor extraction wells for the thermal treatment process. ***Below:*** View of the former Operations Area in December 2010 after completion of grading work.

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