# Nyanza Chemical Superfund Site

## Update for Ashland Board Of Health

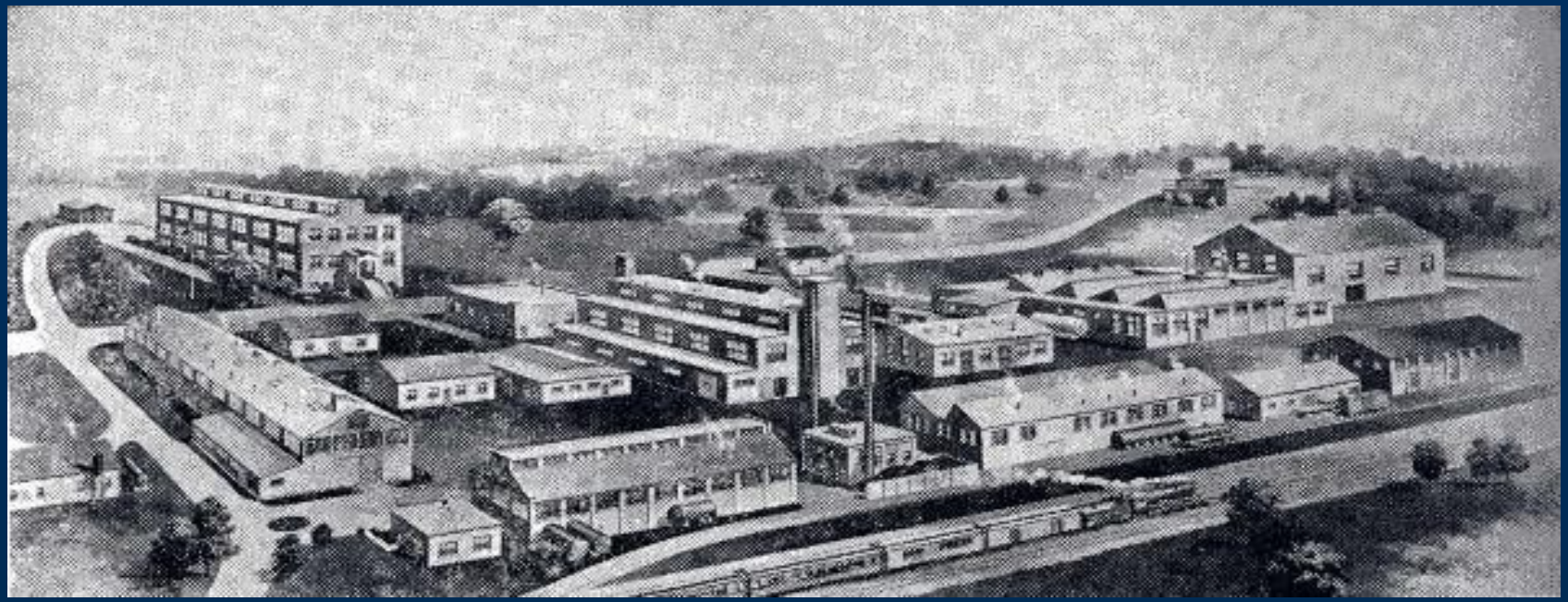
**April 12th, 2016**

# Presentation Objectives

- My background:
  - Life-long Massachusetts resident (Metrowest)
  - 23 years in the environmental field
  - EPA Project Manager since 2007 (Nyanza - Sudbury River)
  - Currently manage 4 Superfund site
- EPA has a long history on this site (dating back to 1980).
- Will try my best to answer your questions.
- The goal of this meeting is just to **share information** and update the Board and residents with what we've been up to last few years.
- No agenda, no proposals

# Historical Overview

- Nyanza Chemical originally operated on a 35-acre parcel located at the end of Megunko Road in Ashland.
- Nyanza operated from 1917 to 1978 manufacturing textile dyes and dye intermediates.



# Historical Overview


- 1980 Superfund Legislation is enacted.
- 1983 – “Nyanza Chemical Waste Dump” added to the National Priorities List (or “NPL”).
- 1993 – Responsible Parties “cash-out” – pay 13 million

# Historical Photo Analysis

(1938, 1952,1957, 1963, 1970, 1973, 1979, 1981)

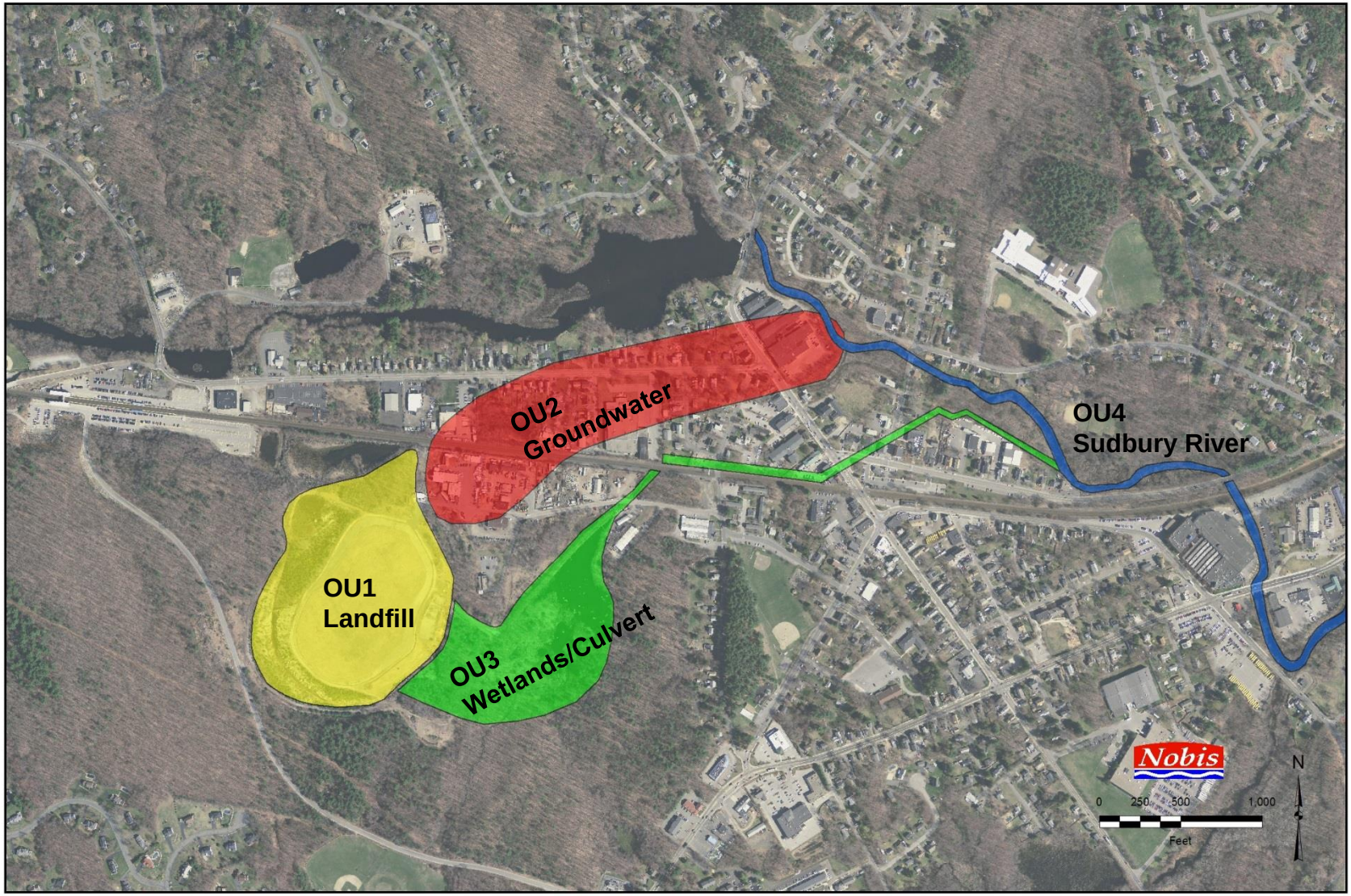
# EPA Operable Units (OUs)

Nyanza Chemical Site currently consists of four Operable Units (or “OUs”):

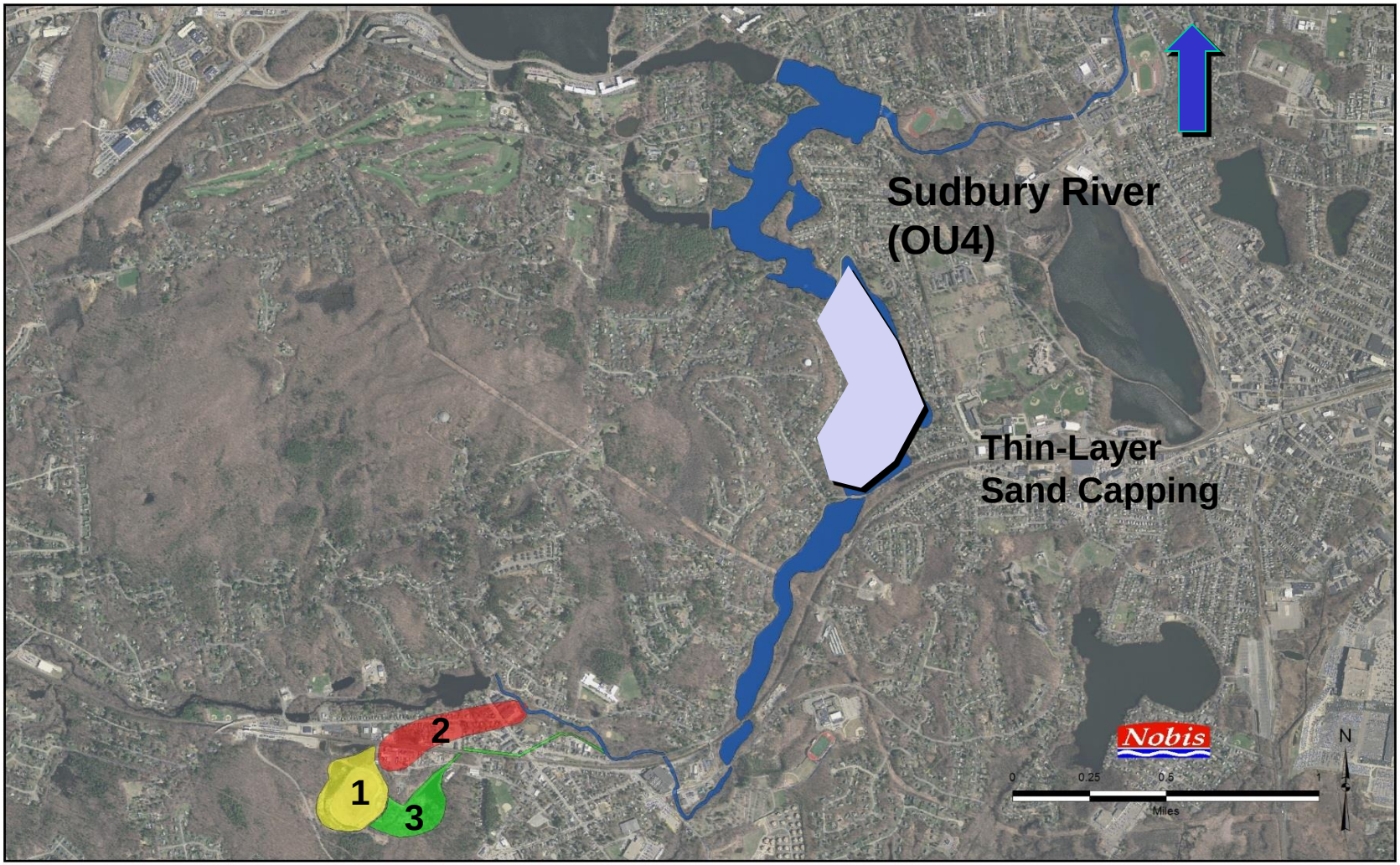
- OU1 - On-site soil remediation/capping **(complete)**
- OU2 - Groundwater contamination/Indoor Air (on-going)
- OU3 - Eastern Wetlands/Trolley Brook (**complete**)
- OU4 – Sudbury River (on-going)

* Complete ≠ no continued involvement or activity

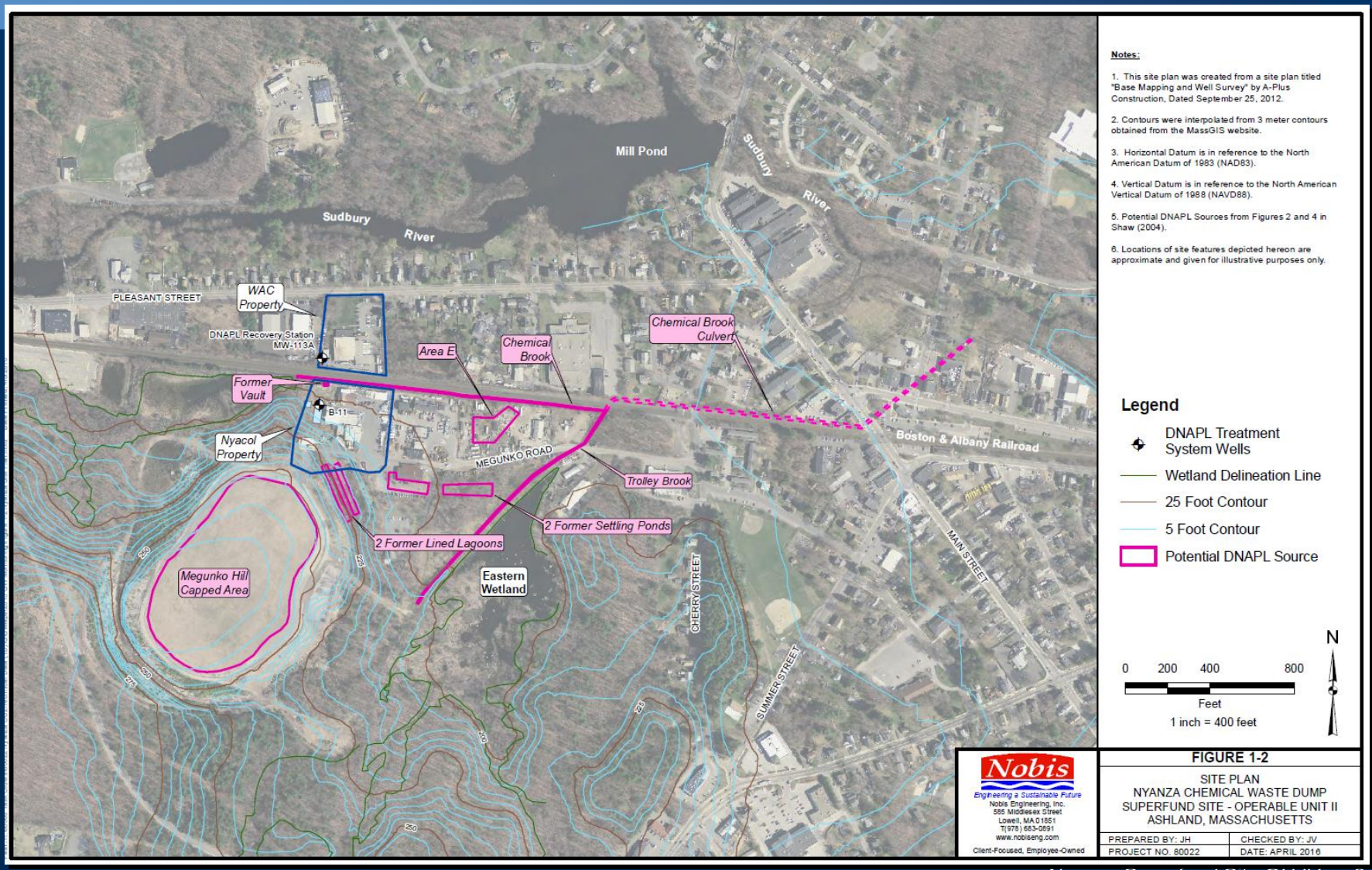
# Nyanza Operable Units (OUs)



# Operable Unit Map



# Site Features (2016)



# OU1 (Cap) / OU3 (Wetlands)

- OU1 (cap) was completed in 1991
- OU3 (Eastern Wetland/culvert) completed in 2001
- Long-term “Maintenance” conducted by State (i.e., MassDEP)
  - Bi-annual inspections, samples, and (as necessary) repairs (e.g., fence, animal burrows, signage, etc..)

# OU2 (Groundwater)

- 1991 – Interim Clean-up Decision
  - Pump and Treat System (planned operation for 5 years)
  - Monitoring
  - Land use controls/restrictions

- 1994 (Treatment System Design)
  - System never constructed due to levels of contamination (i.e., pure product or “NAPL”)

# NAPL (= Industrial, Process Waste)

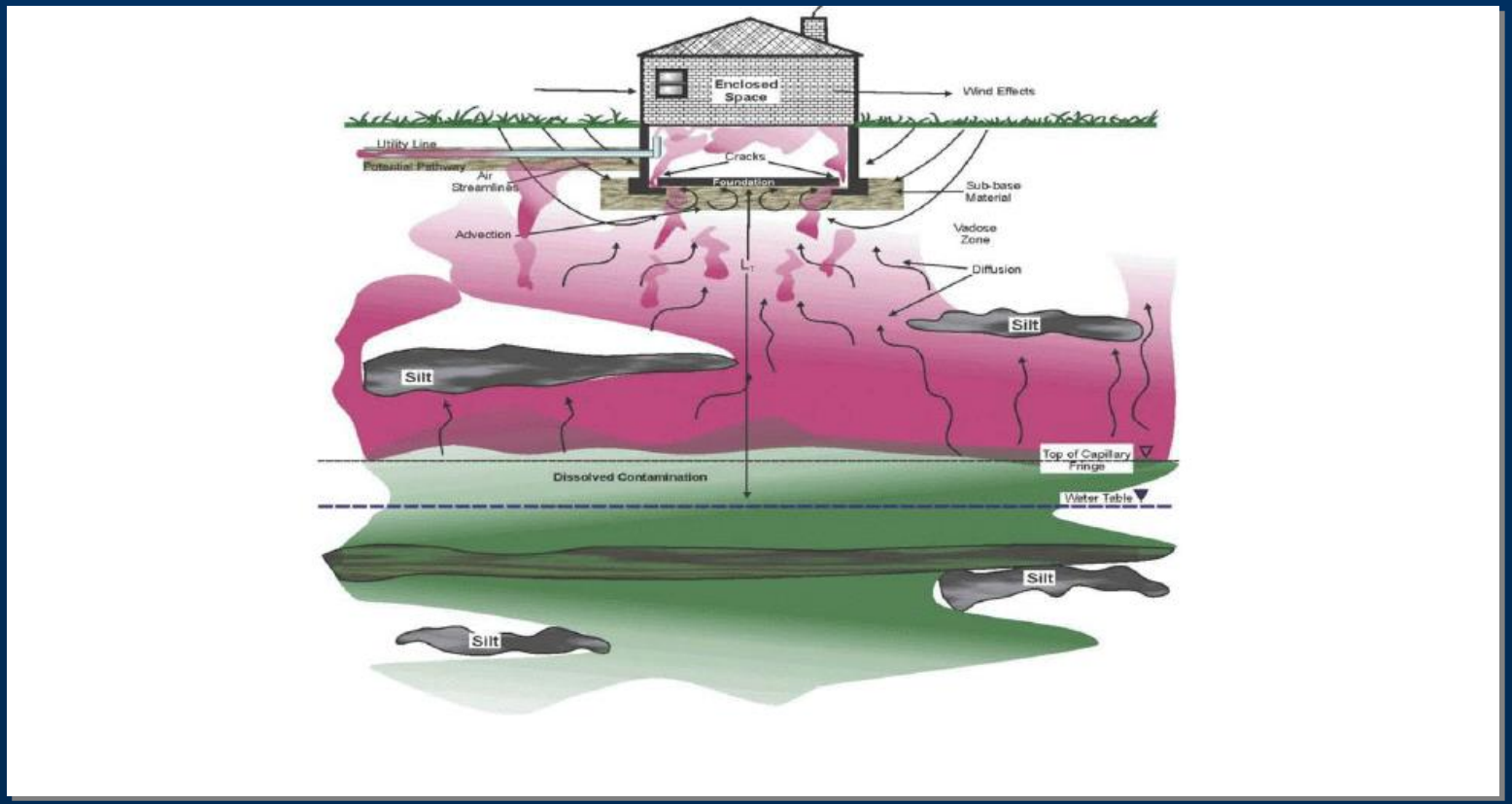

NAPL = Non-Aqueous Phase Liquid

# Compounds in NAPL

| Chemical | Percent of Total |
|---|---|
| 1,2 Dichlorobenzene | 30.9% |
| Nitrobenzene | 28.0% |
| 1,4 Dichlorobenzene | 10.6% |
| Chlorobenzene | 10.3% |
| Trichloroethene (TCE) | 3.5% (35,000 ppm) |
| 1,3 Dichlorobenzene | 2.8% |
| 1,2,4 Trichlorobenzene | 2.4% |
| Petroleum hydrocarbons | 11.5% |

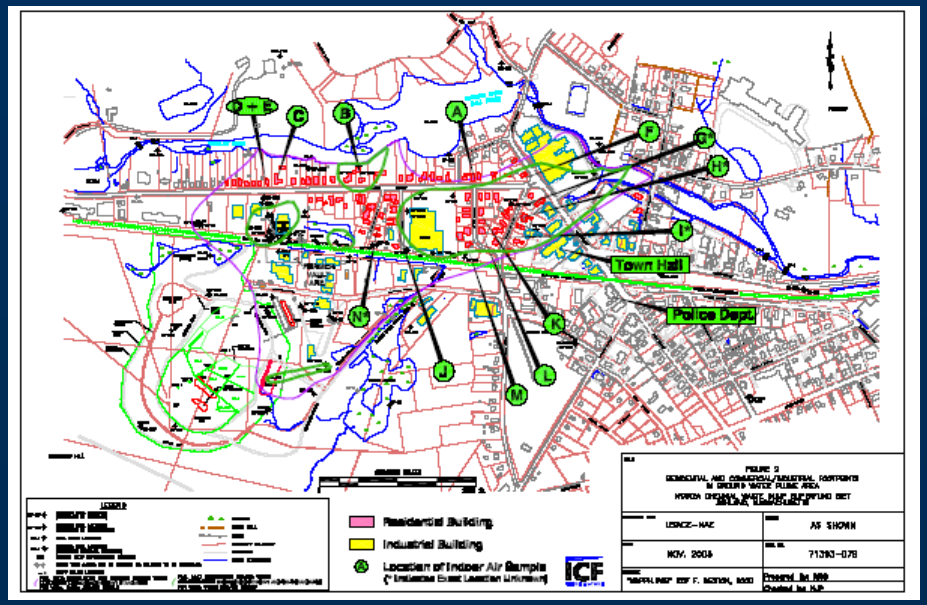
# What is Vapor Intrusion (VI)

The migration of volatile chemicals (such as TCE) from the subsurface into overlying buildings.



# Vapor Intrusion (VI) Studies

- 1990, 1998, 2004
  - Conducted Indoor air monitoring
  - Compounds such as TCE have:
    - High vapor pressure
    - Low toxicity values
    - Can breakdown into other toxic volatiles

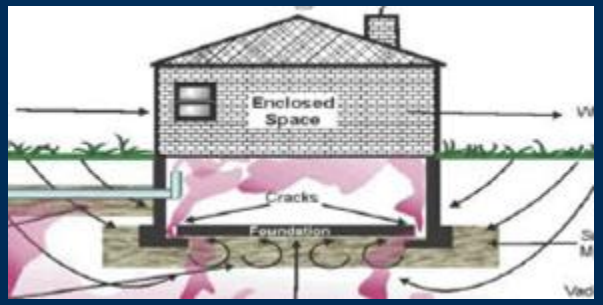


# Explanation of Significant Difference (ESD)

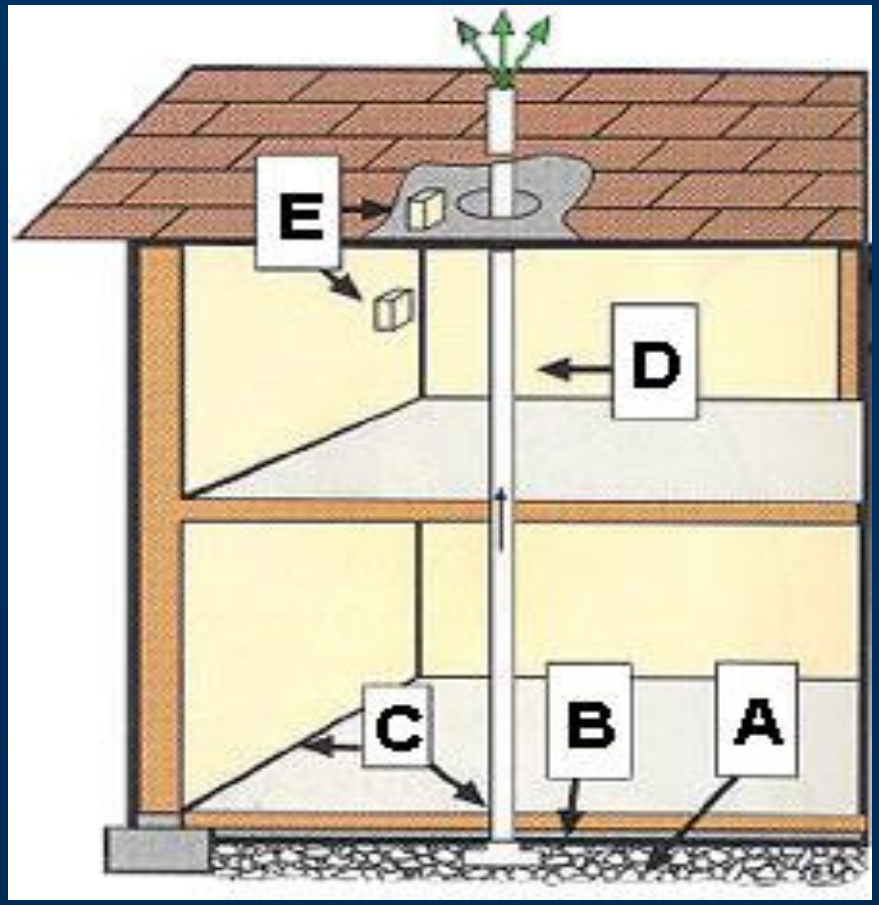
- ESD used to modified the Interim GW Remedy
- ESD signed (2006) calls for:
  1. Installing Vapor Mitigation system
  2. DNAPL Recovery Systems (up to 20) to recover NAPL
  3. Supplemental VI Evaluation(s), as needed
  4. Groundwater Monitoring Program

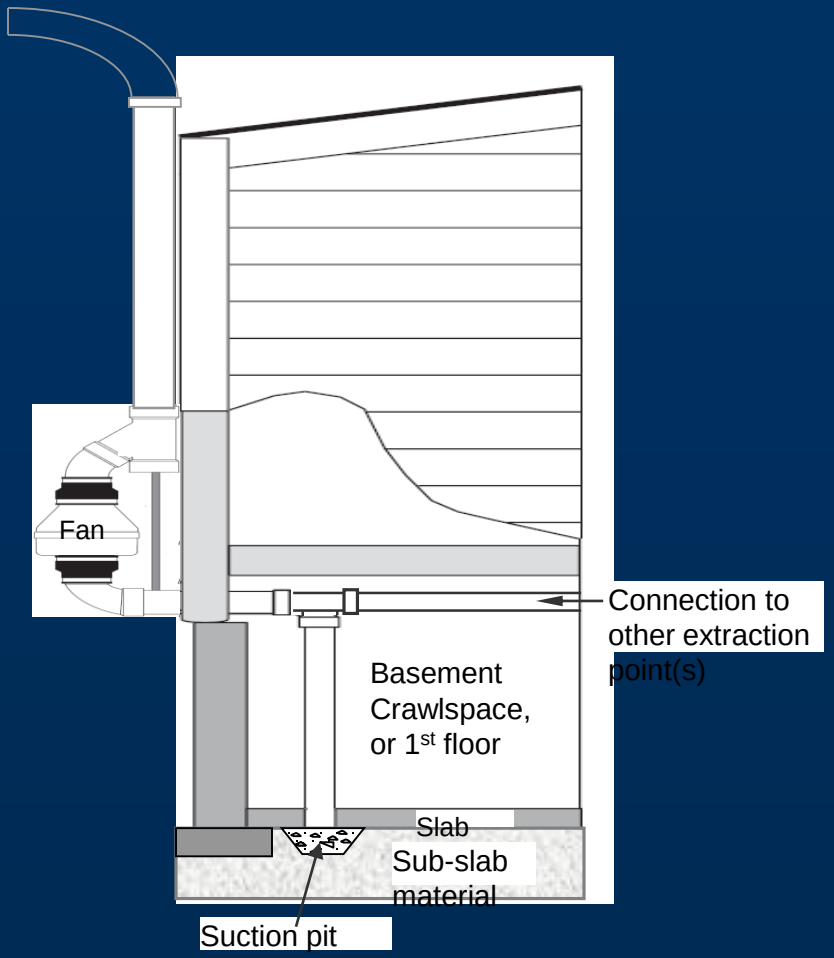
# 1. Vapor Mitigation Systems

- 41 systems installed in 2007
- Nearly identical to a Radon system
- Prevents vapors from entering indoors by reducing the pressure below structure
- Post-construction, MassDEP:
  - performs annual inspection
  - conduct maintenance
  - make repairs

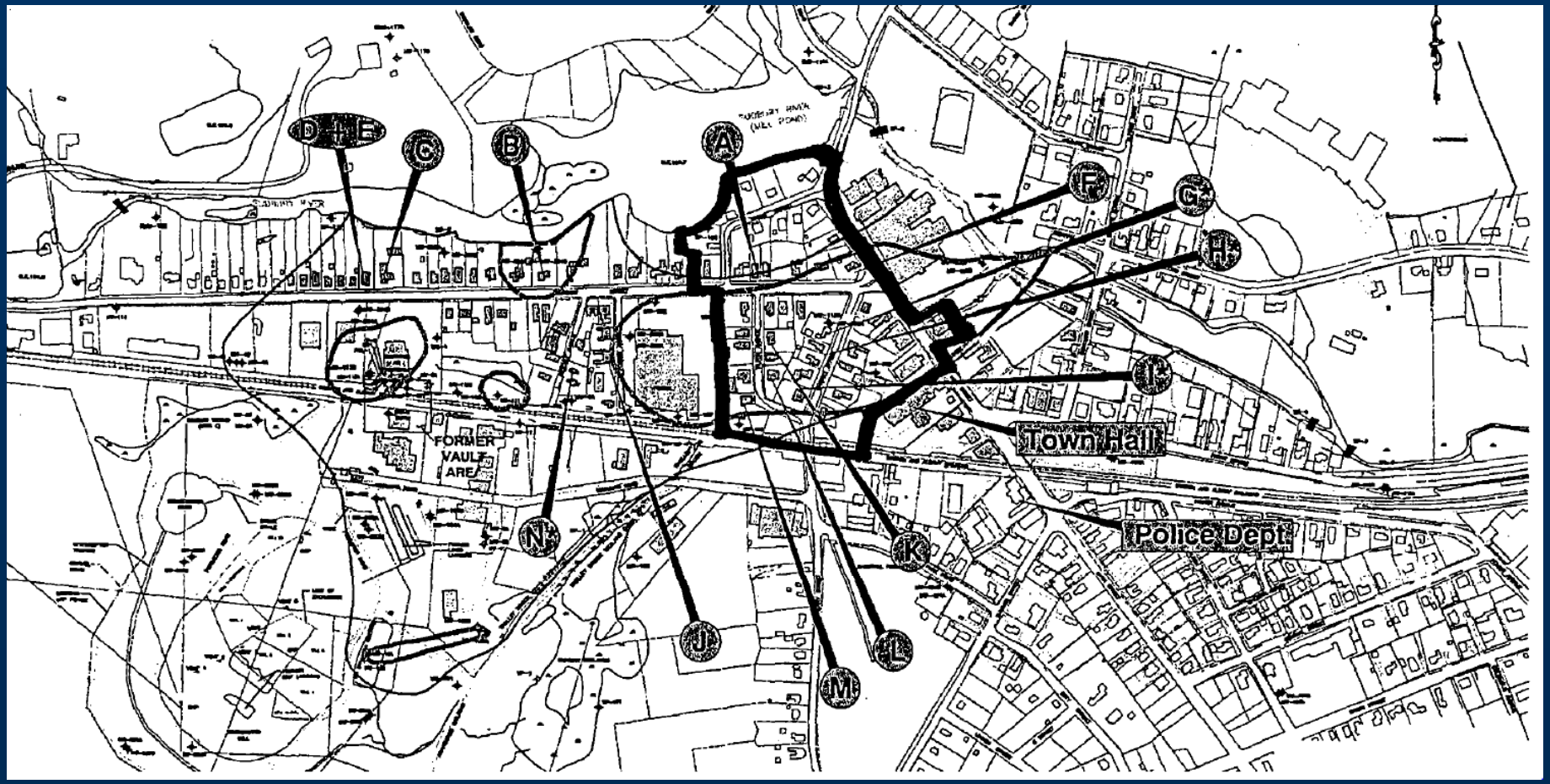


# 1. Vapor Mitigation System



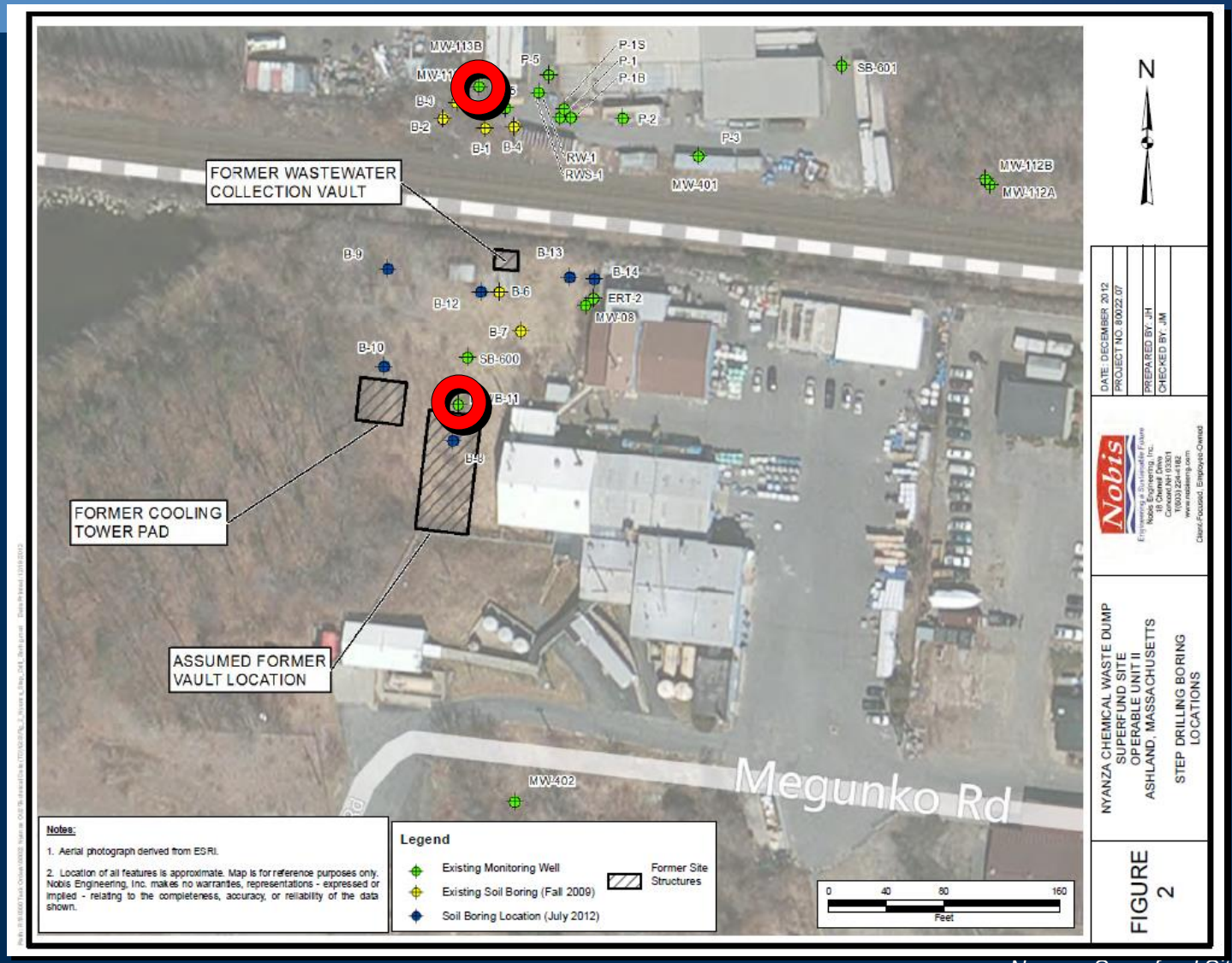
# 1. Vapor Mitigation Systems



# 2. NAPL Extraction Systems

- Conduct multiple drilling programs to located NAPL (2009, 2012)
- Borings advanced 15’ into bedrock
- NAPL no longer easily identified/located
- Identify two (2) locations with recoverable NAPL

# 2. NAPL Extraction Systems



# 2. NAPL Extraction Systems

- Two (2) extraction systems constructed
  - Soil boring BW-11 (Nyacol property near vault)
  - MW-113 (Worcester Air Conditioning)
- Operational since September 2013
- NAPL (i.e., “product”) accumulates and a pump runs ~1x per day to transfer material to enclosed storage tank.

# 2. NAPL Extraction Systems

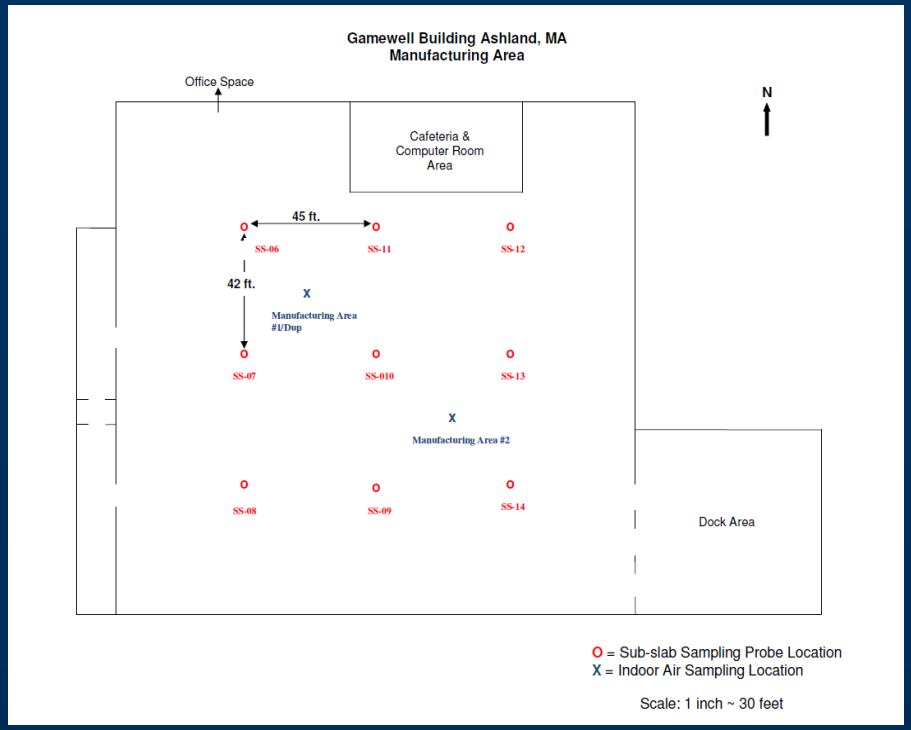



# 3. Supplemental VI Assessments

- EPA conducted indoor assessments at:
  - 48 Cherry Street (2013)
  - 60  Pleasant Street (2014/2015)
  - 148 Pleasant Street (2015)
- Installed sub slab soil gas probes
  - Collected 8/24 hour time-weighted samples
- Commercial properties use different exposure assumptions
- Complete Pathway? (GW→ Soil Gas → Indoor Air)

# 3. Supplemental VI Assessments






No new mitigation systems required.

# 4. Groundwater Monitoring

- Conduct a comprehensive (site-wide) monitoring program
- Samples collected 2x per year for 4 years
  - From 2012 -2015
  - Evaluate changes in dissolved-phase plume
- Natural Processes in GW:
  - Dilution
  - Migration
  - Break-down (attenuate)
- Draft Report available on website

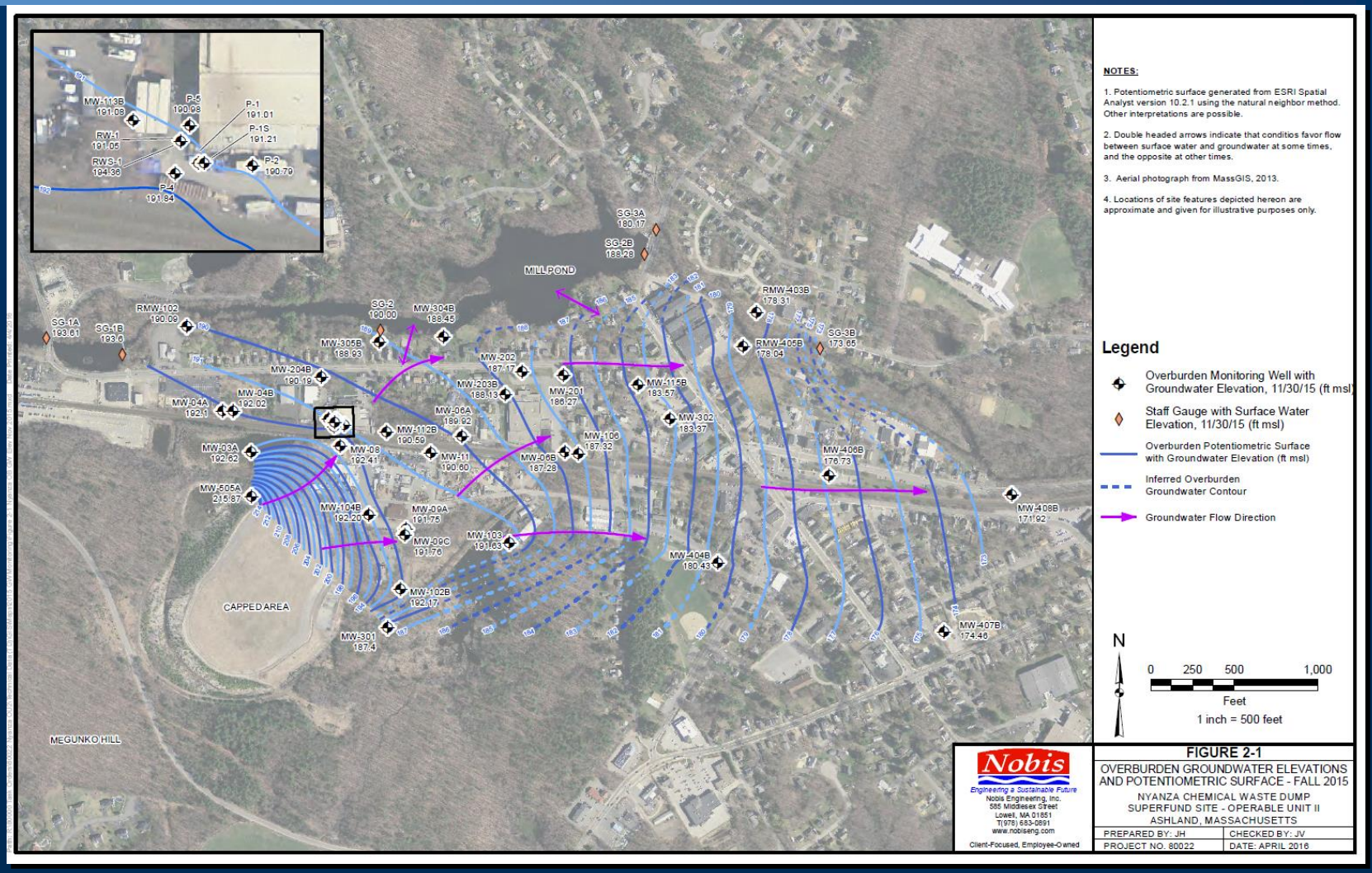
# 4. Groundwater Monitoring

- Monitoring the Dissolved-phase plume
  - This is different that NAPL
- Physical properties of contaminants
  - Density (sink or float)
  - Solubility (movement with groundwater)
  - Toxicity (varies significantly)
- Shallow groundwater (i.e, overburden) versus Bedrock layers

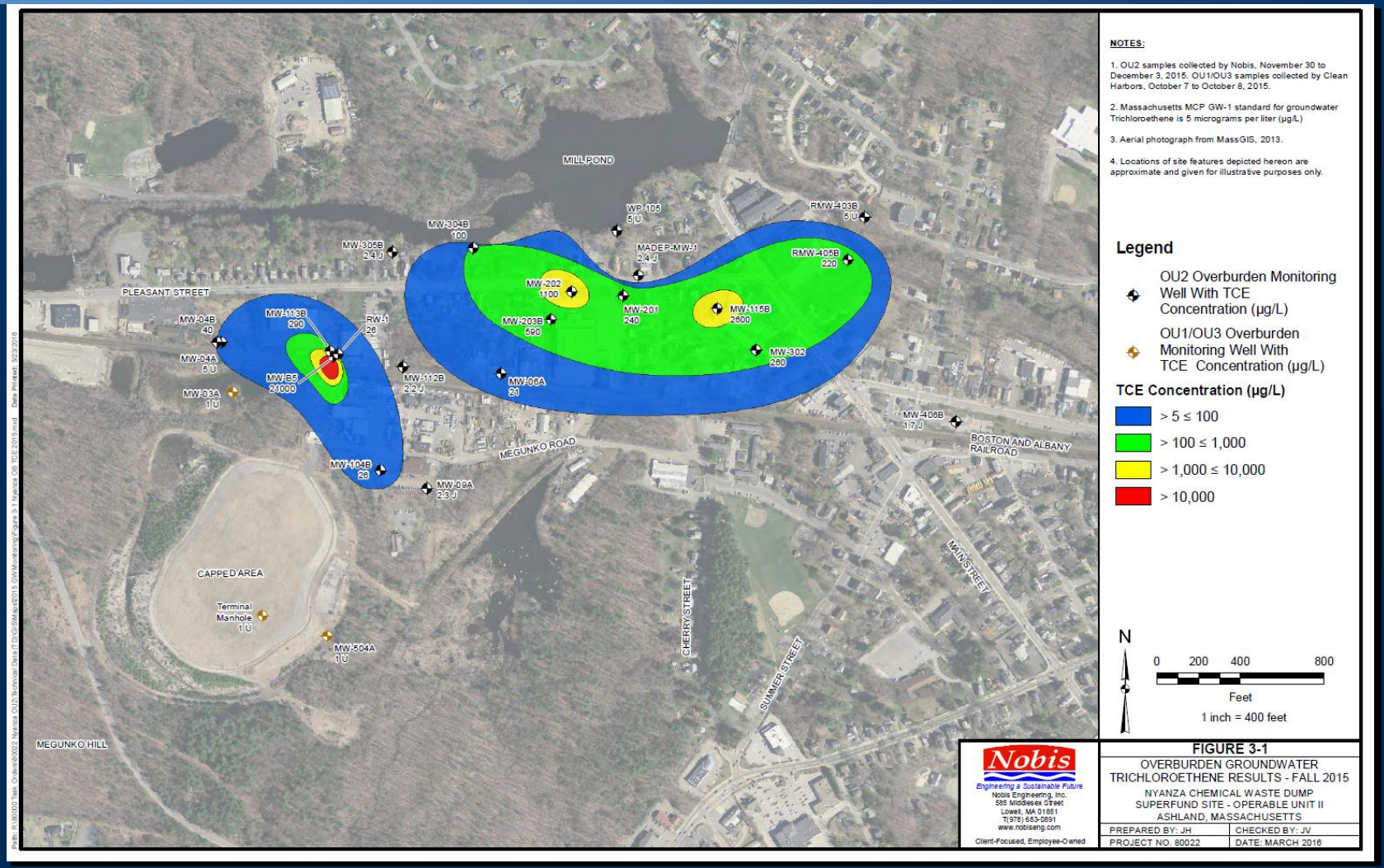
# 4. Groundwater Monitoring

- Contamination in Bedrock present many unique challenges:
  - Bedrock fractures (degree and orientation)
  - Difficult to characterize
  - Difficult to remediate
  - Different Level of Risk (typically no VI)

# Figures from Groundwater Report



# Figures from Groundwater Report



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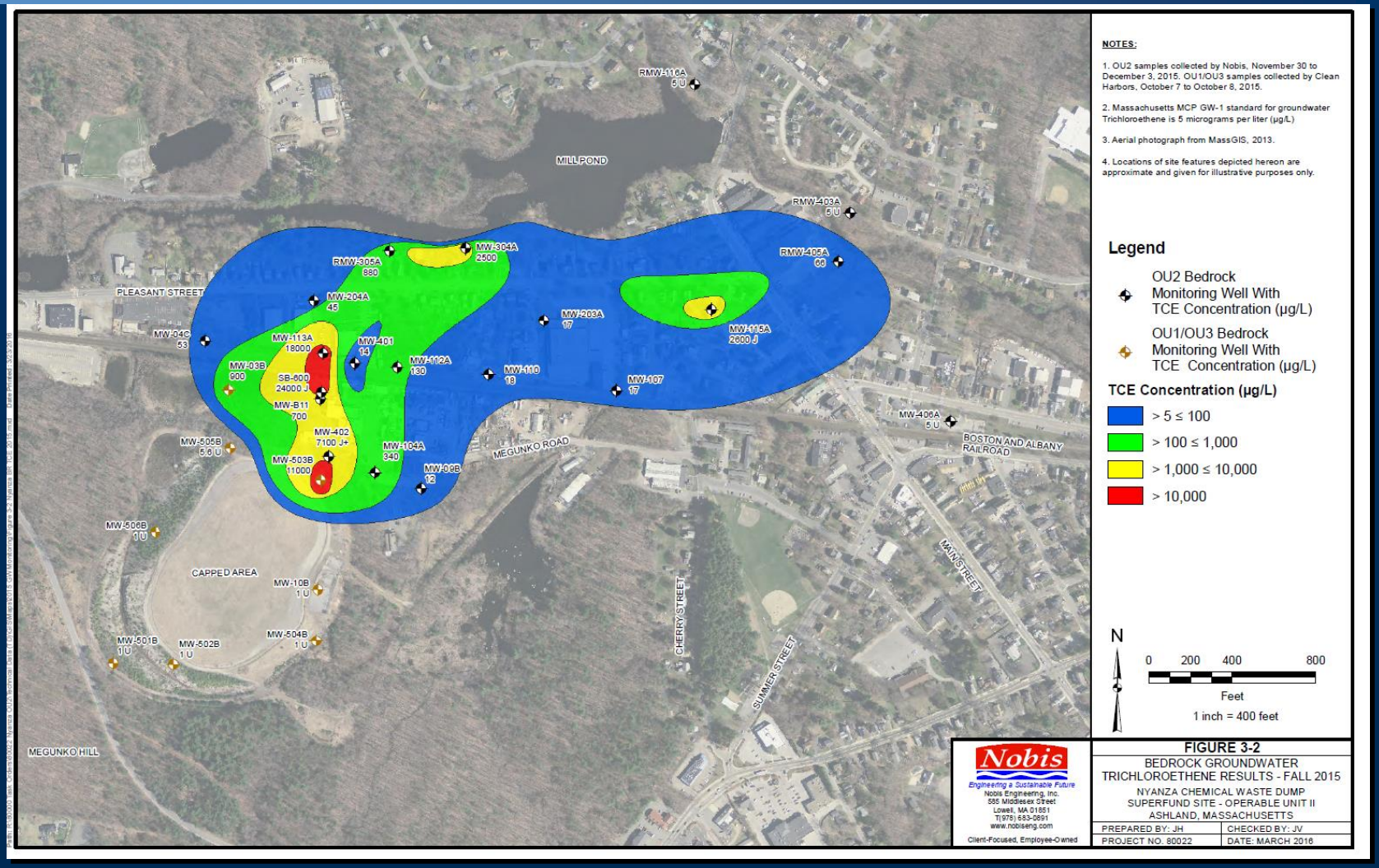
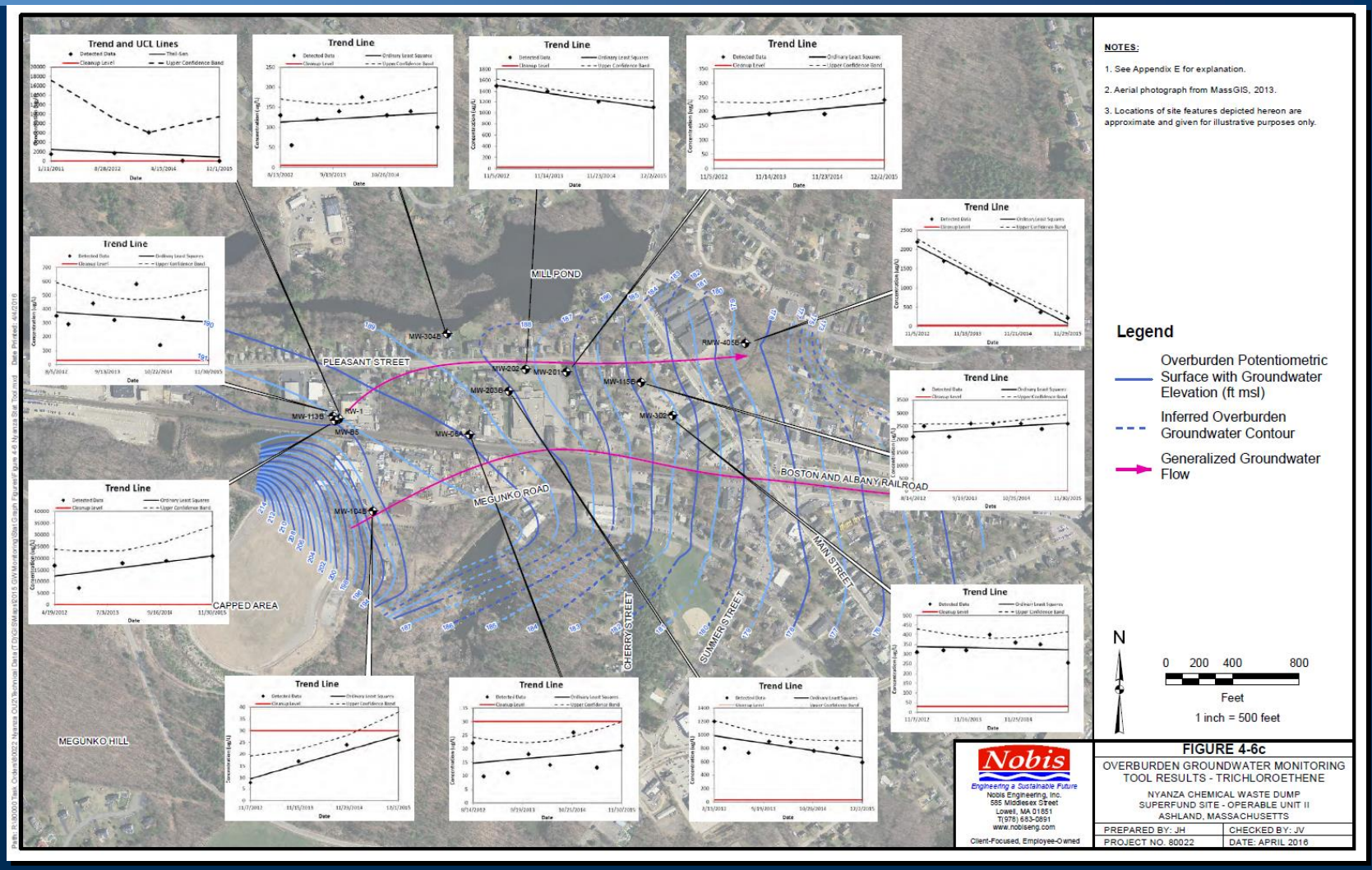


# TCE Trends in Shallow Groundwater



# Groundwater (OU2) Summary

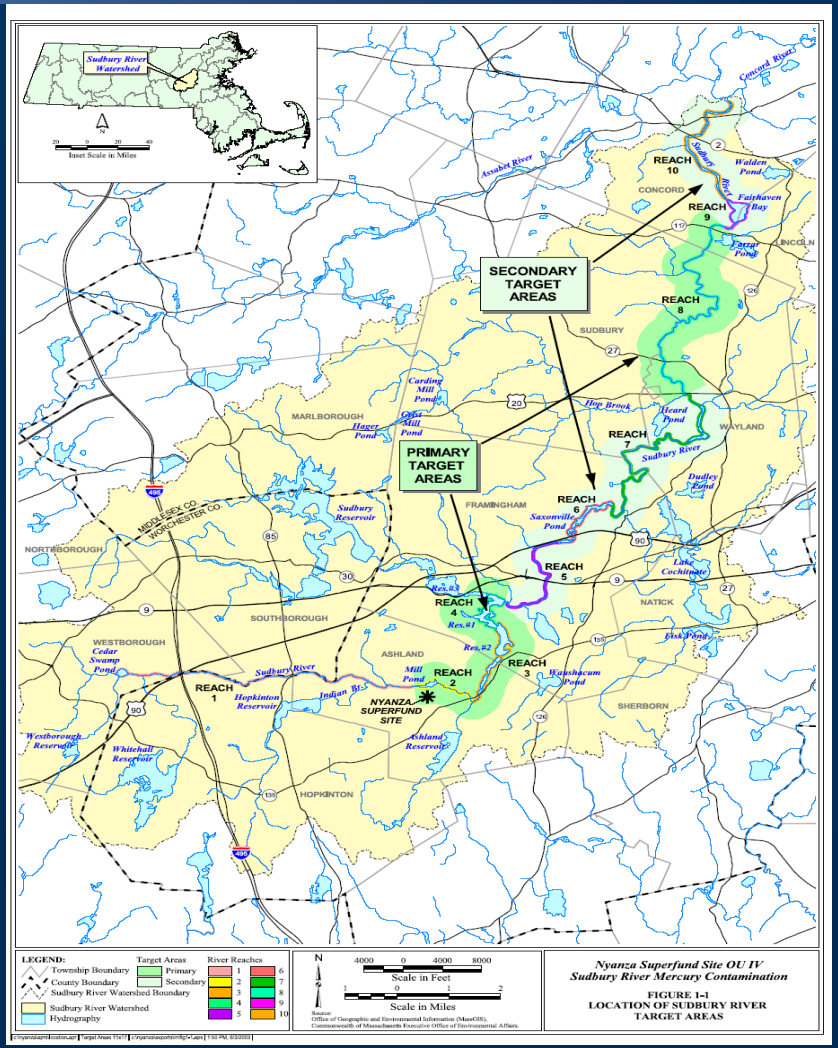
- Indoor air risks are being mitigated with existing VI systems
- EPA continues to evaluate need for additional Vapor mitigations Systems
- Currently operating 2 Wellhead Extraction system
- Plume appears “stable” - with little change over 4 years studied.

- Final Remedy decision is still needed.

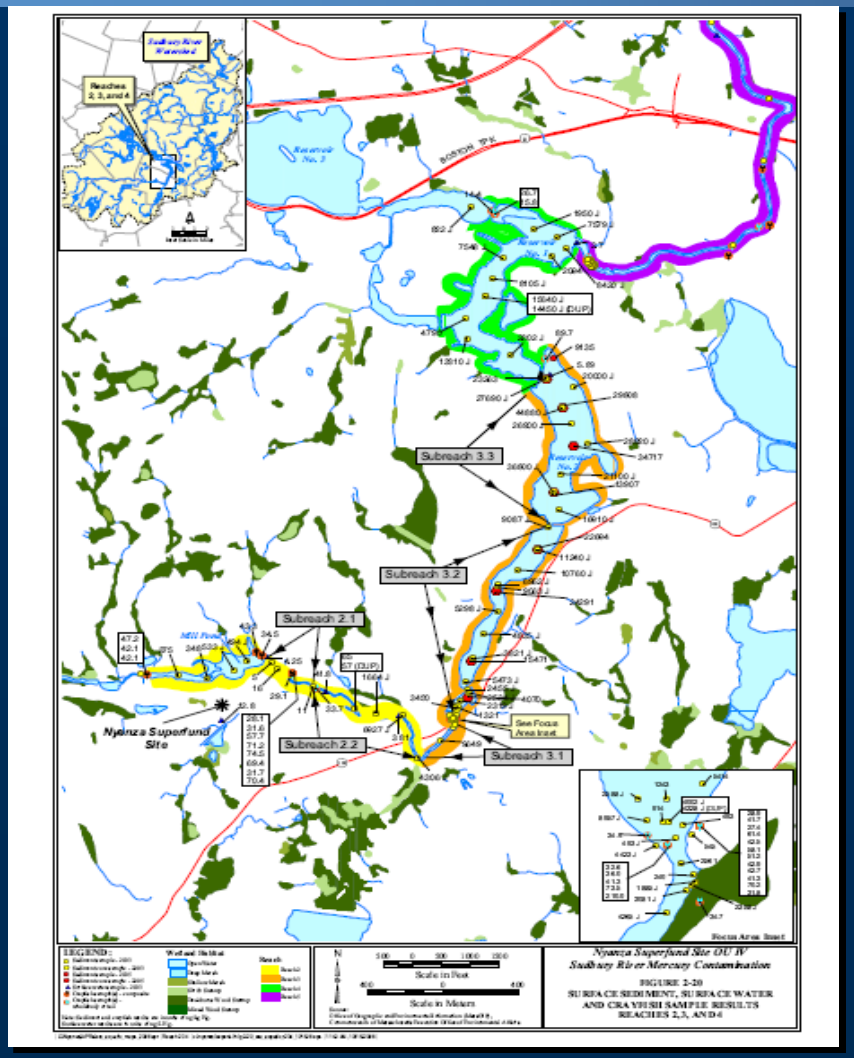
# Break - Questions on Groundwater (OU2)?

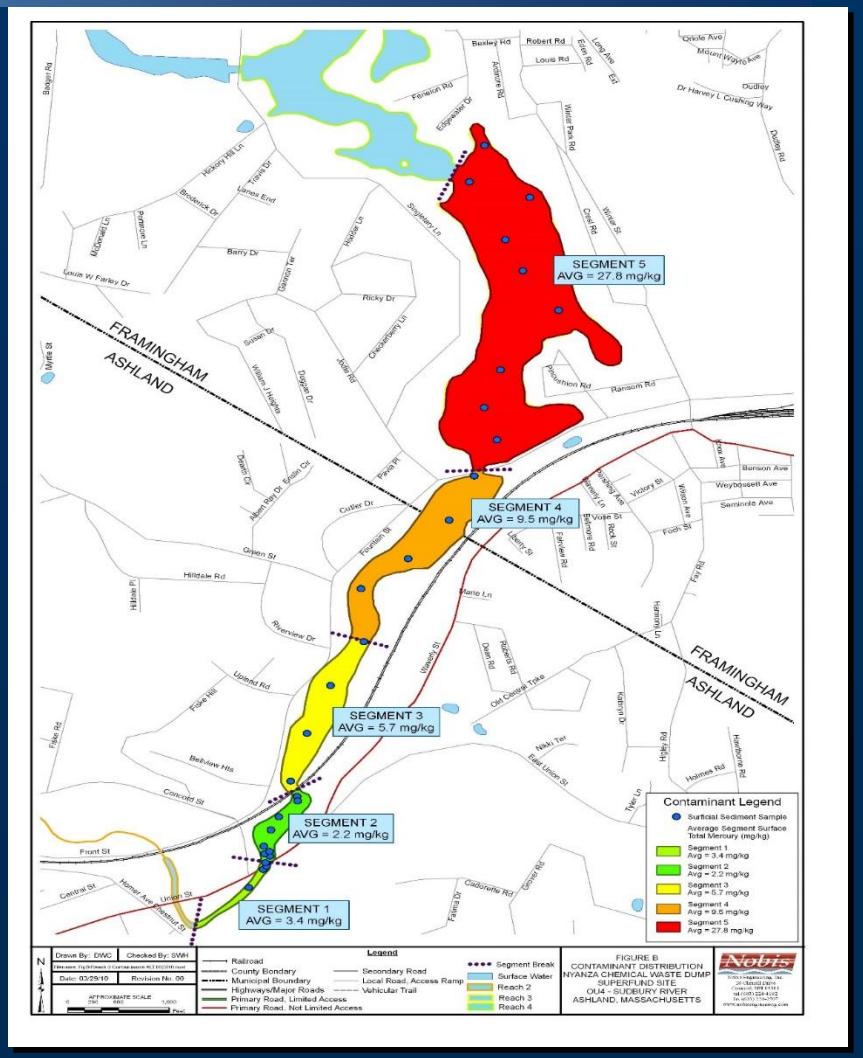
# Sudbury River (OU4)

- 26 downstream river miles;
- Divided into 10 segments;
- Operable Unit was “created” in 1993 due to additional characterization and special consideration;
- Multi-agency contributions
- Many, many samples collected (sw, sed, fish, birds (blood, egg, feather), crayfish, mink



# OU4 - Mercury Distribution



# Ecological Assessment Update

- Ecological Risk Assessment (December 2008)
- 229 *Measurement Endpoints* –
  - combination of food chain modeling results and site-specific/species-specific measurements
  - More weight given to actual measurements
- Conclusion: **No population–level ecological risk***

# Human Health Assessment

- Multiple Human Health Risk Assessments (1992, 1999, 2006)
  - Mercury the only chemical of concern
  - No adverse health effects from contact or ingestion of Surface Water or Sediment
  - Health effects attributable to consumption of mercury-contaminated fish

# Human Health Risks from Fish Consumption

| Reach | Recreational Angler | |
|---|---|---|
| | Child | Adult |
| Reach 2 - | 1.8 | |
| Reach 3 – Res 2 | 2.1 | 1.2 |
| Reach 4 – Res 1 | 1.3 | |
| Reach 5 | | |
| Reach 6 - Saxonville | 1.3 | |
| Reach 7 | | |
| Reach 7 – Heard Pond | | |
| Reach 8 – Great Meadows | 1.3 | |
| Reach 9 | 1.5 | |
| Reach 10 | 1.4 | |

Mercury – Not a carcinogen. Evaluate the risk of adverse health effects.

# OU4 – Sudbury River Remedy

- Remedy selected in 2010 after multiple informational meetings and public hearing.
- Combination remedy :
  1. Education/Outreach
  2. Long-term Monitoring (every ~10 years)
  3. Thin-Layer Sand Capping (portion of Res. 2)

Thin Layer Caps of Varying Grain Size

Photos courtesy of Germano & Associates, Inc.

# OU4 – Remedial Design

- First step after Remedy Selection
- RD completed in May 2013
  - Contains plans and specification for constructing thin-layer sand cap
- While awaiting construction funding (2014) conducted baseline fish sampling
  - Prior estimate of risk based on fish caught in 2003
  - Baseline samples typically used to determine remedy effectiveness (before/after construction)

| Reach | Recreational Angler (2003) | | Recreational Angler (2014) | |
|---|---|---|---|---|
| | Child | Adult | Child | Adult |
| Reach 2 - | 1.8 | | | |
| Reach 3 – Res 2 | 2.1 | 1.2 | **1.6** | 0.8 |
| Reach 4 – Res 1 | 1.3 | | | |
| Reach 5 | | | | |
| Reach 6 - Saxonville | 1.3 | | | |
| Reach 7 | | | | |
| Reach 7 – Heard Pond | | | | |
| Reach 8 – Great Meadows | 1.3 | | | |
| Reach 9 | 1.5 | | | |
| Reach 10 | 1.4 | | | |

Update Risk Estimates for other Reaches – Summer 2016

# Reach 3 Trend Analysis

Figure 1.1: Whole body total Hg in 3- and 4-year old (or age-equivalent) largemouth bass collected from reach 3 (Reservoir 2) in the Sudbury River

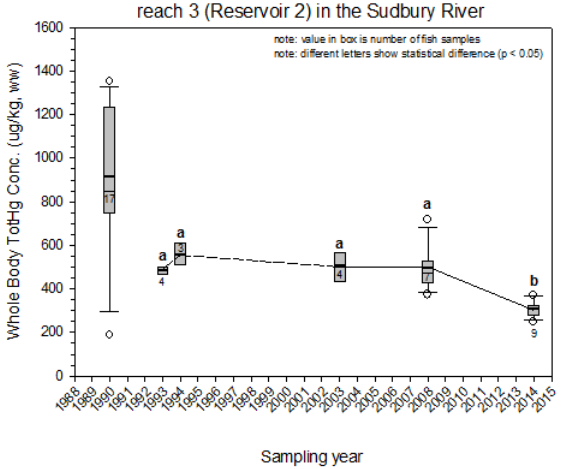



Figure 1.2: Whole body total Hg in 3- to 5-year old (or age-equivalent) largemouth bass collected from reach 3 (Reservoir 2) in the Sudbury River

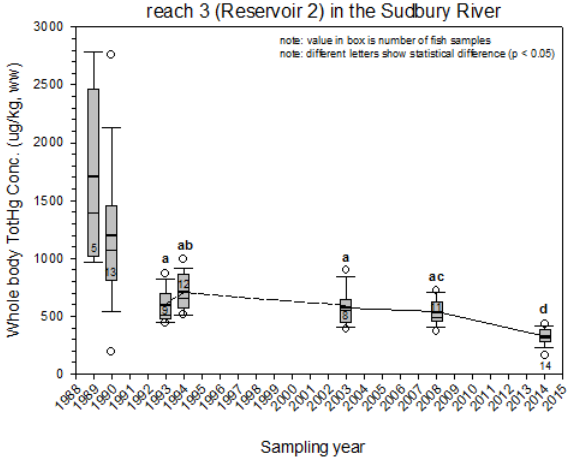



Figure 1.3: Whole body total Hg in 5- to 7-year old (or age-equivalent) largemouth bass collected from reach 3 (Reservoir 2) in the Sudbury River

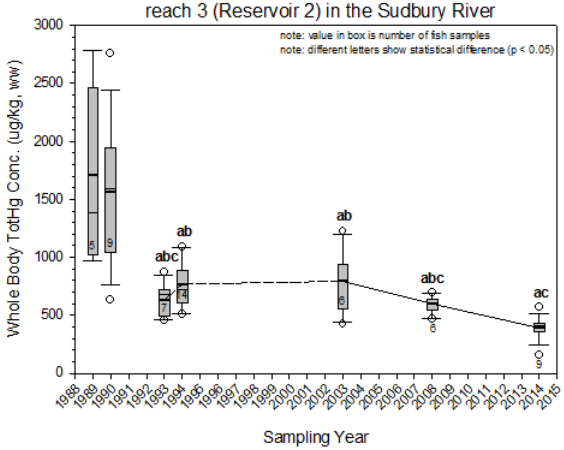
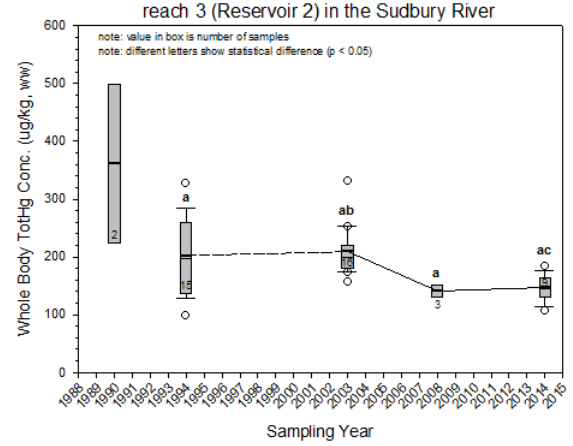



Figure 1.4: Whole body total Hg in 1- to 3-year old (or age-equivalent) yellow perch collected from reach 3 (Reservoir 2) in the Sudbury River



# OU4 – Education/Outreach


Warning sign inspection annually since 2009.

Contact each town prior to inspection to solicit new locations (if any).

Send updated maps annually.

# QUESTIONS