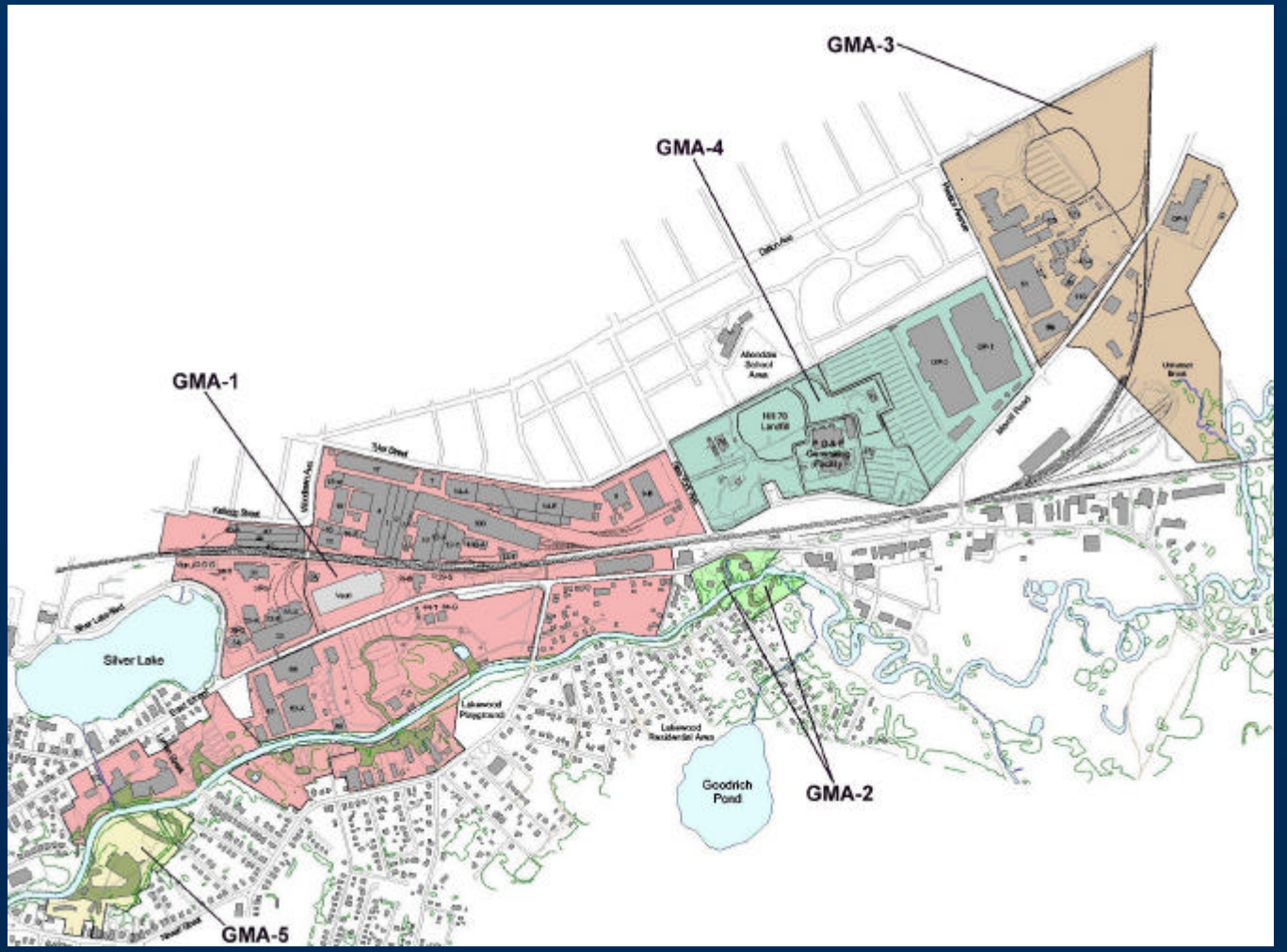
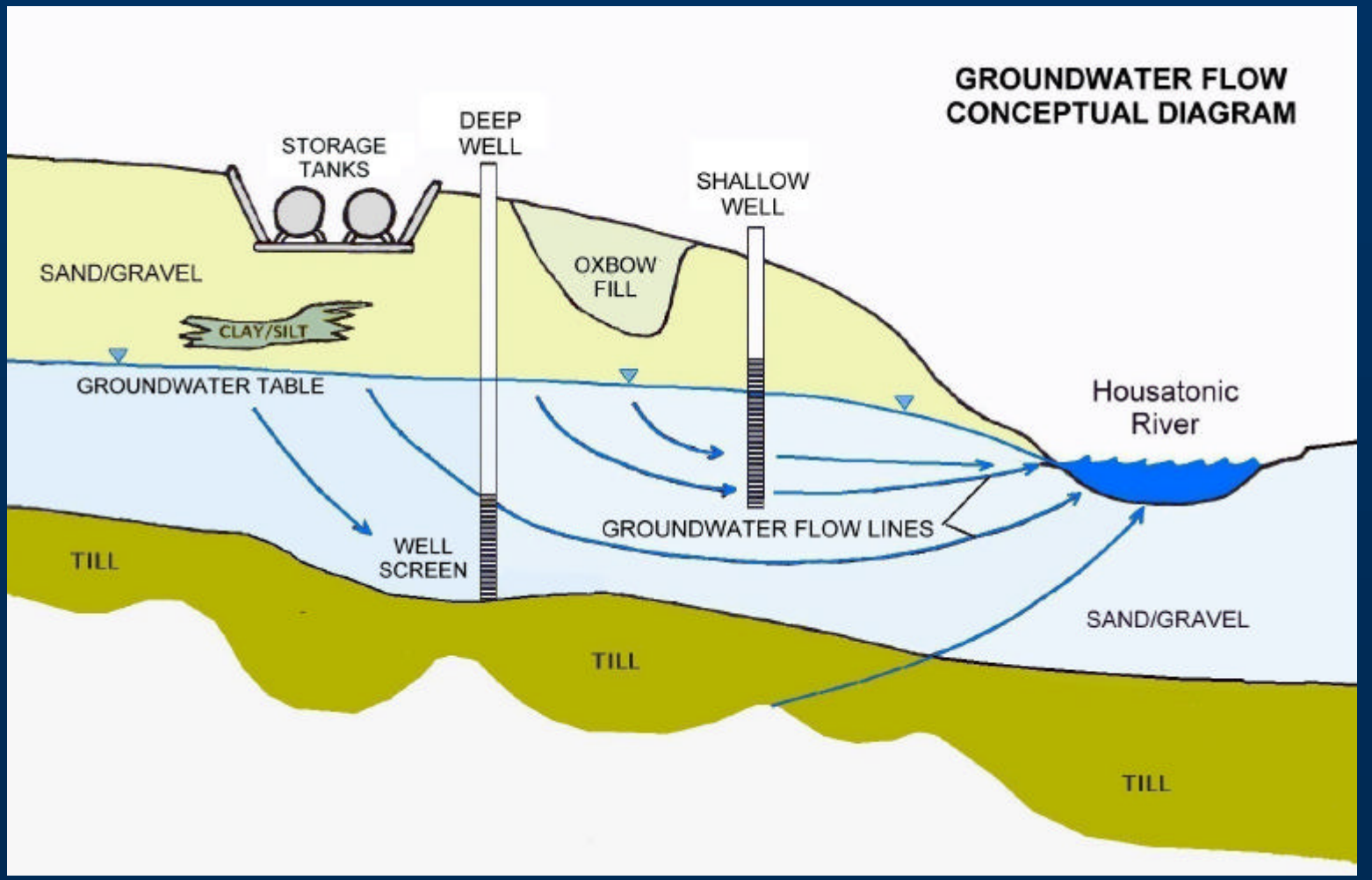
Overview of NAPL and Groundwater Programs

Mike Nalipinski
EPA New England

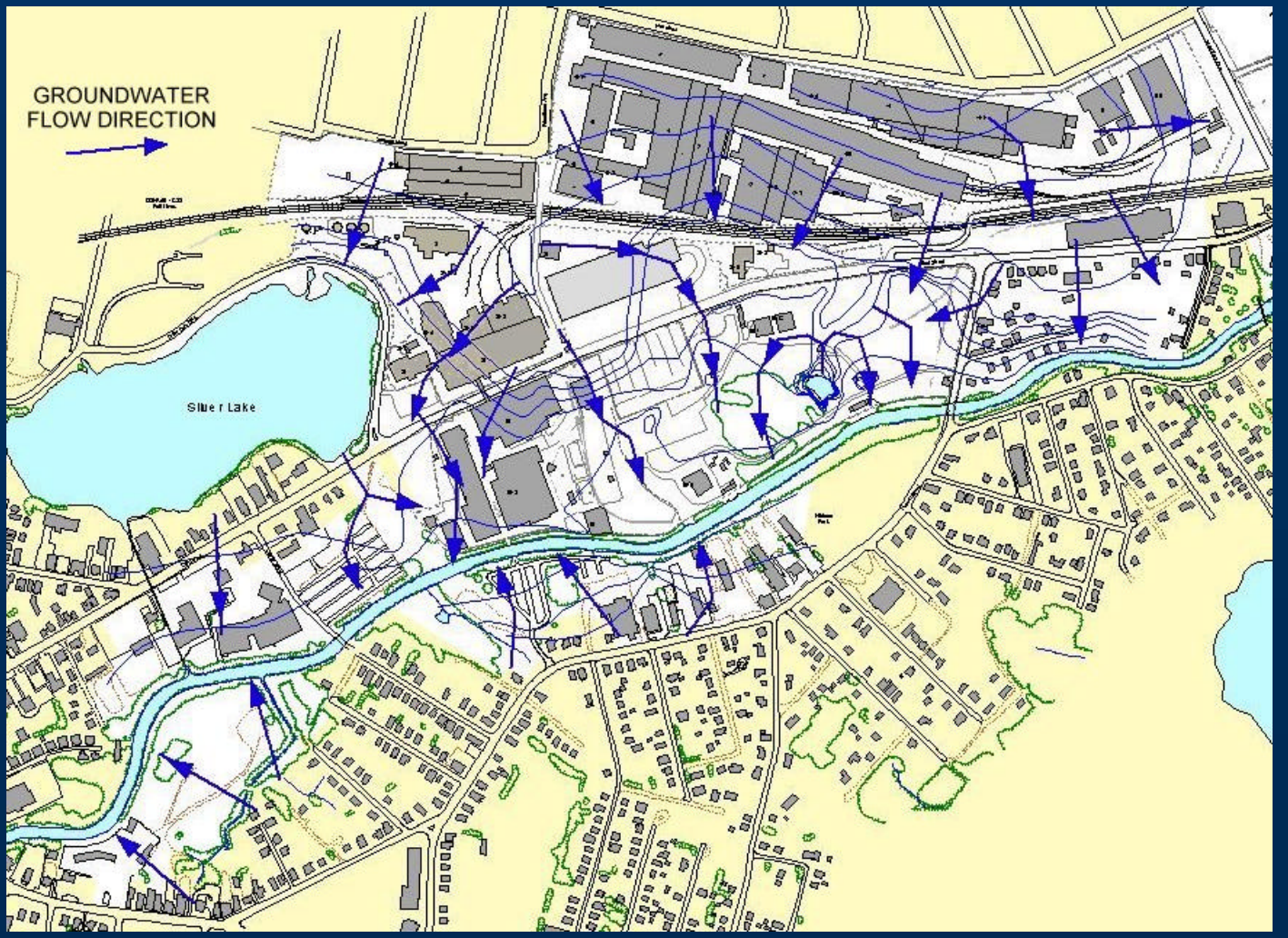
Groundwater Management Area (GMA) Map



Generalized Groundwater Flow Diagram



Generalized Groundwater Flow Map for GMA-1



Non-Aqueous Phase Liquids (NAPLs)

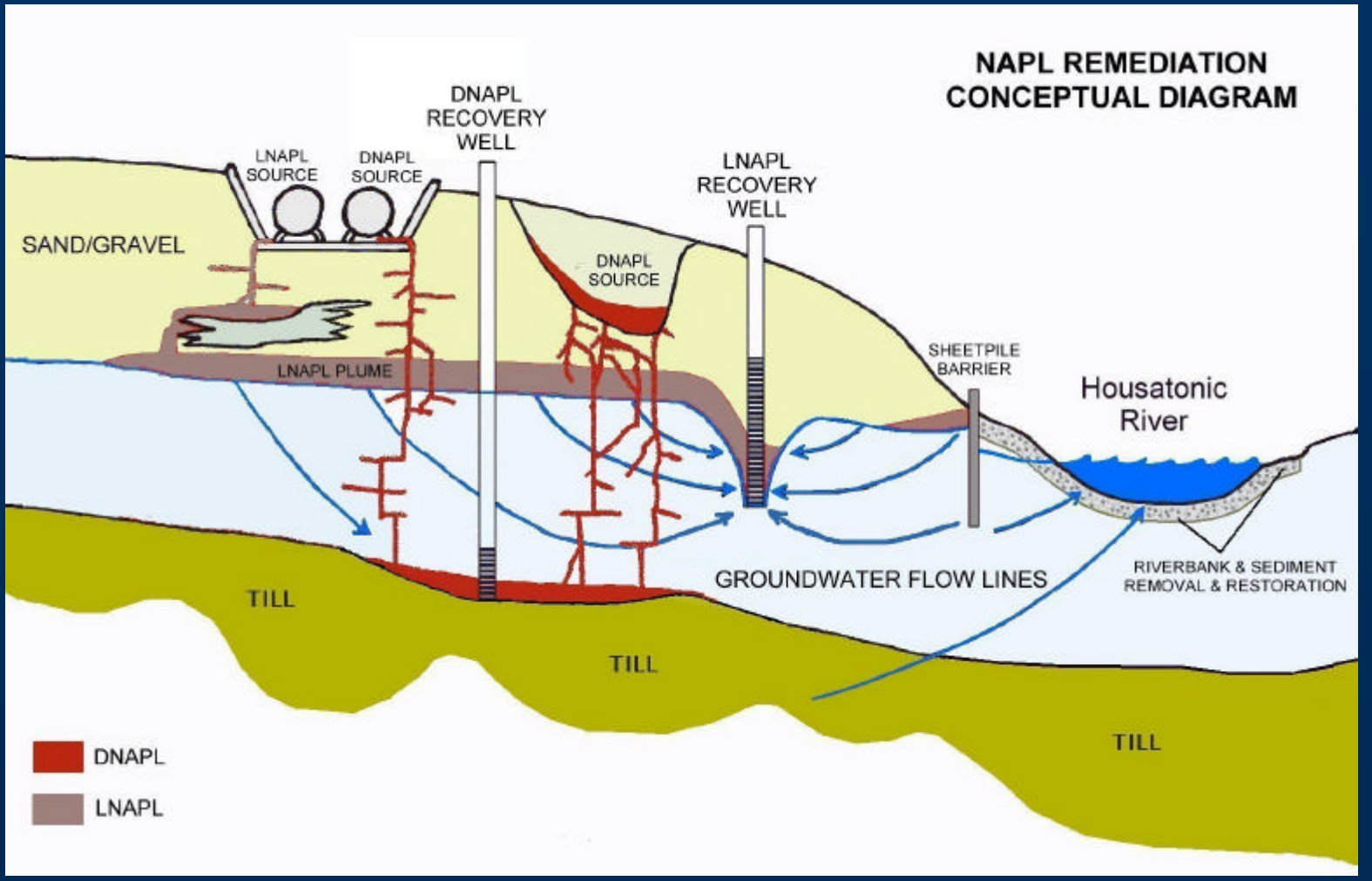
- Definition: Hydrocarbon Liquids (Commonly Called Oils) That Do Not Readily Mix With or Dissolve in Water (Non-Aqueous).

- Dense NAPLs (DNAPLs) Tend to Sink in Water.
- Light NAPLs (LNAPLs) Tend to Float on Water.

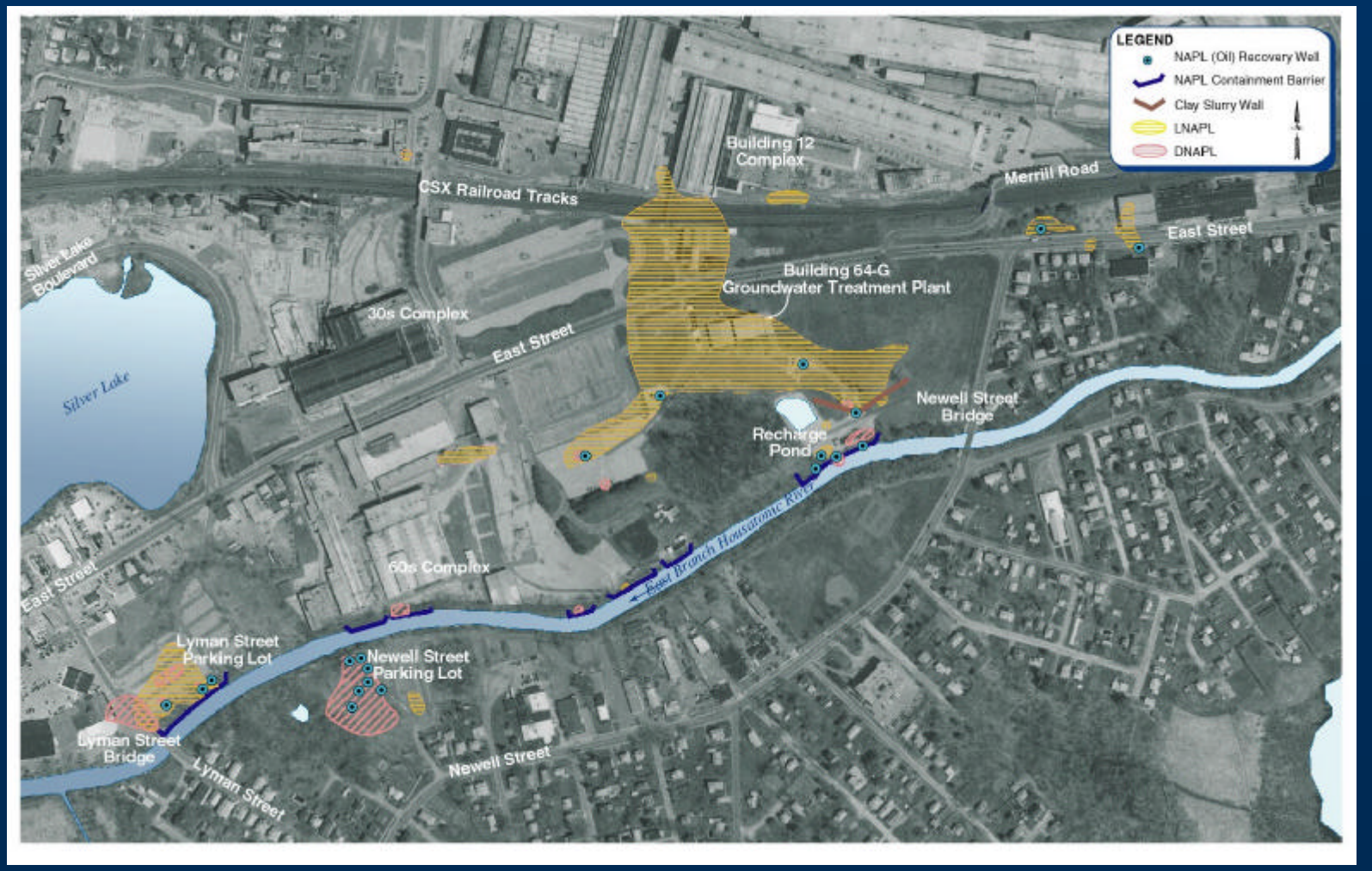
NAPLs at the GE - Housatonic River Site

- Pyranol: Mixture of PCBs (Aroclors 1254 or 1260) with Trichlorobenzene. Acts as a DNAPL.
- Aroclor 1260: PCB oil. Acts as a DNAPL.
- 10C Insulating Oil: Petroleum distillate (mineral oil). Acts as an LNAPL.
- Coal Tar: Manufactured Gas Plant sludge and liquids. Acts as an LNAPL or DNAPL.

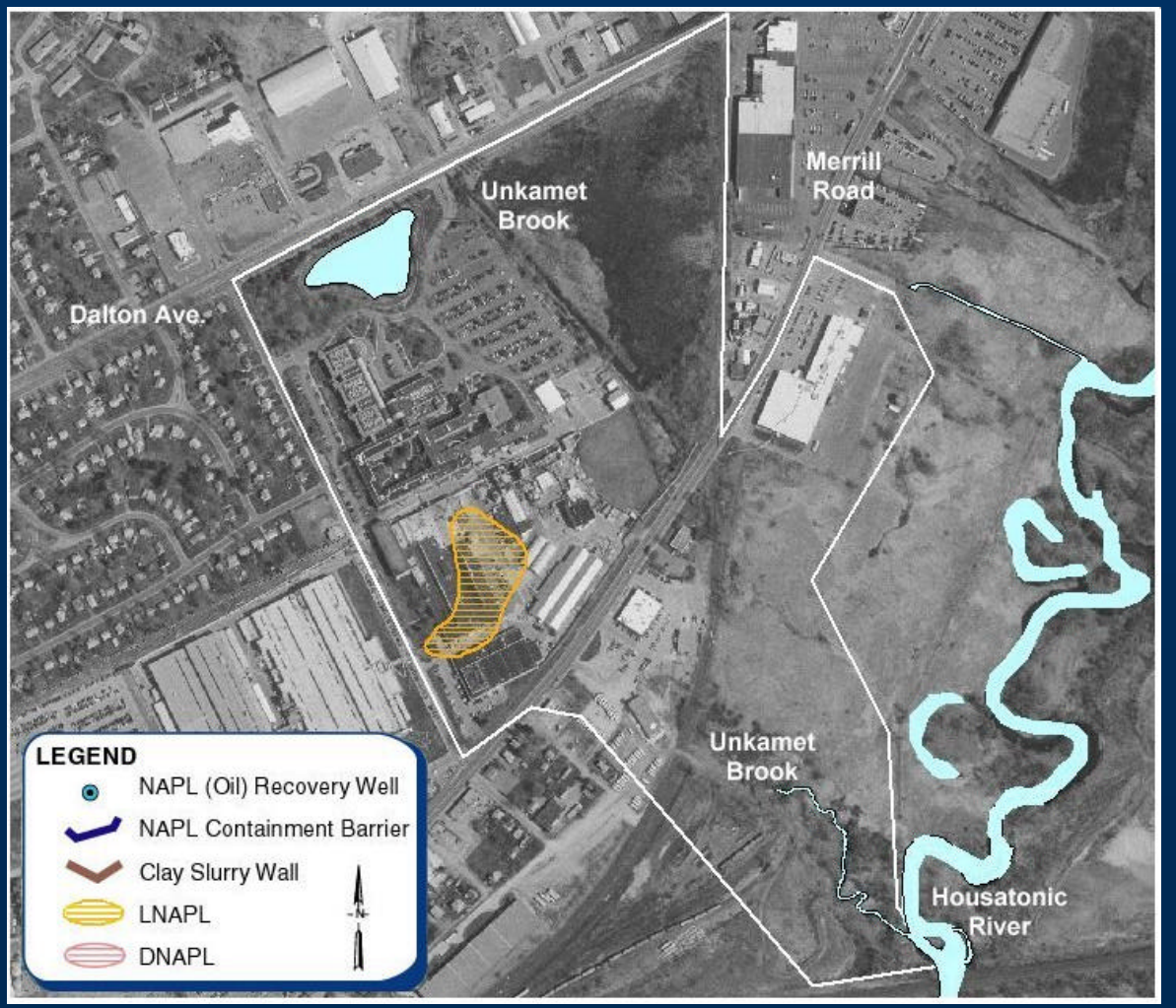
NAPL Conceptual Diagram



Approximate Extent of LNAPL & DNAPL – Spring 2001



Approximate Extent of LNAPL at Unkamet Brook Area

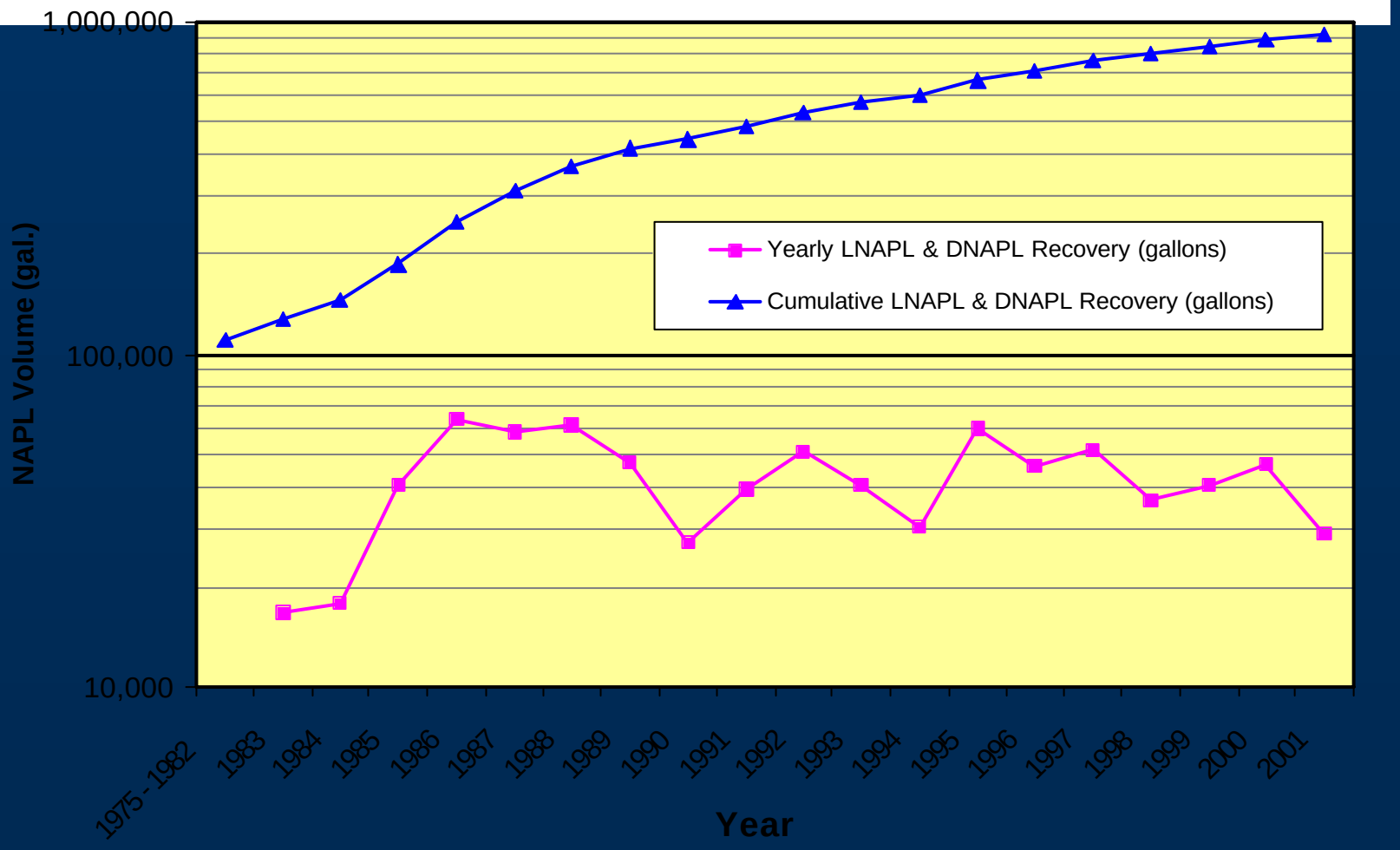


NAPL Performance Standards

- No Discharge of NAPL to Surface Water or Sediments Around or Under Barriers.
- Eliminate NAPL from Wells Near River and Lake Banks.
- Reduce NAPL in all Wells to Minimize Potential NAPL Migration to Surface Water and Help Achieve Groundwater Standards.
- Demonstrate that NAPL Near Buildings Doesn't Adversely Affect Indoor Air Quality.

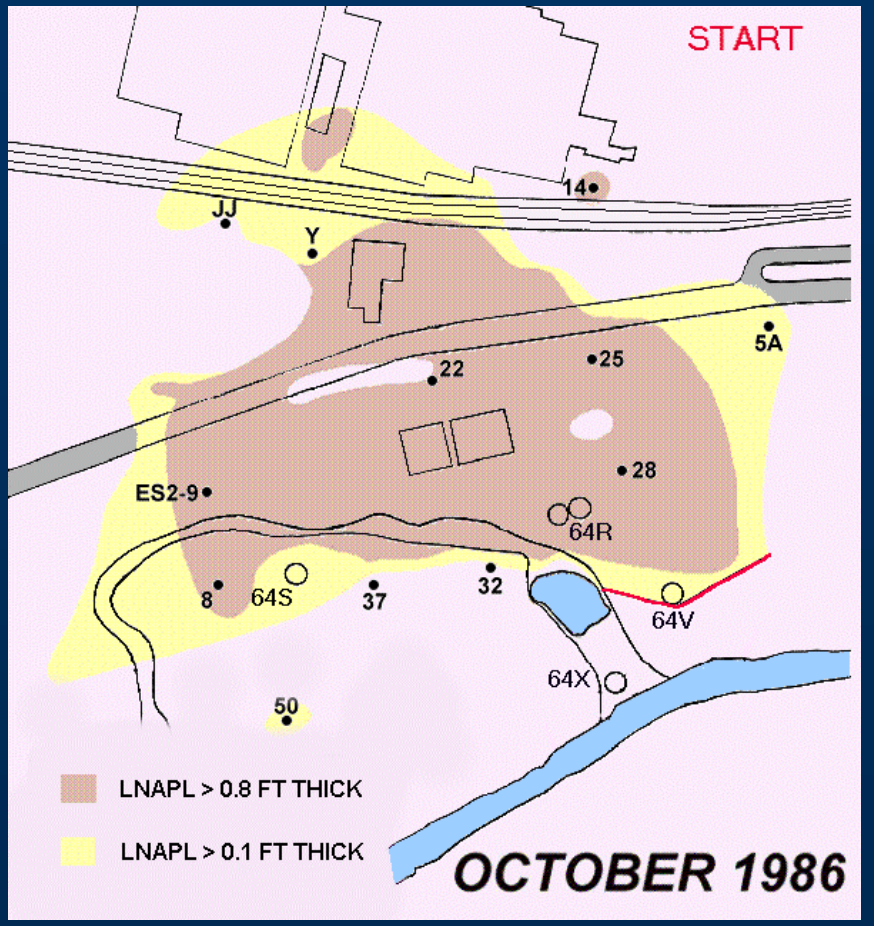
Sheetpile Containment Barrier & NAPL Recovery Well

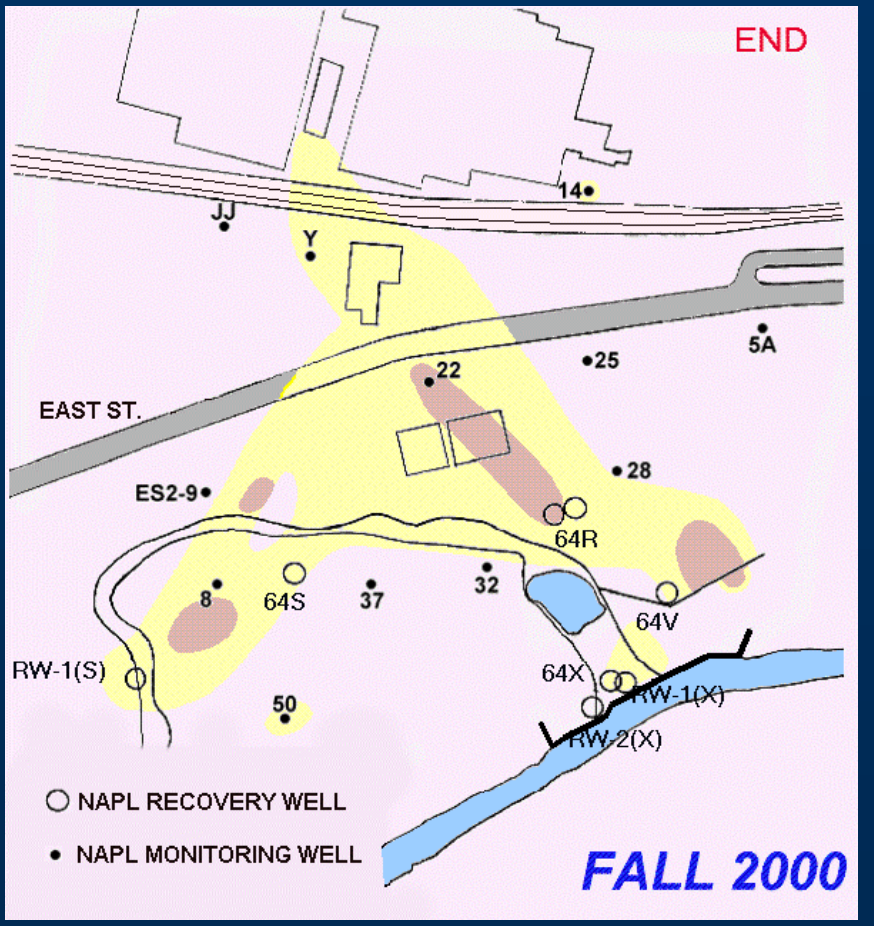
Summary of GMA-1 NAPL Recovery by GE

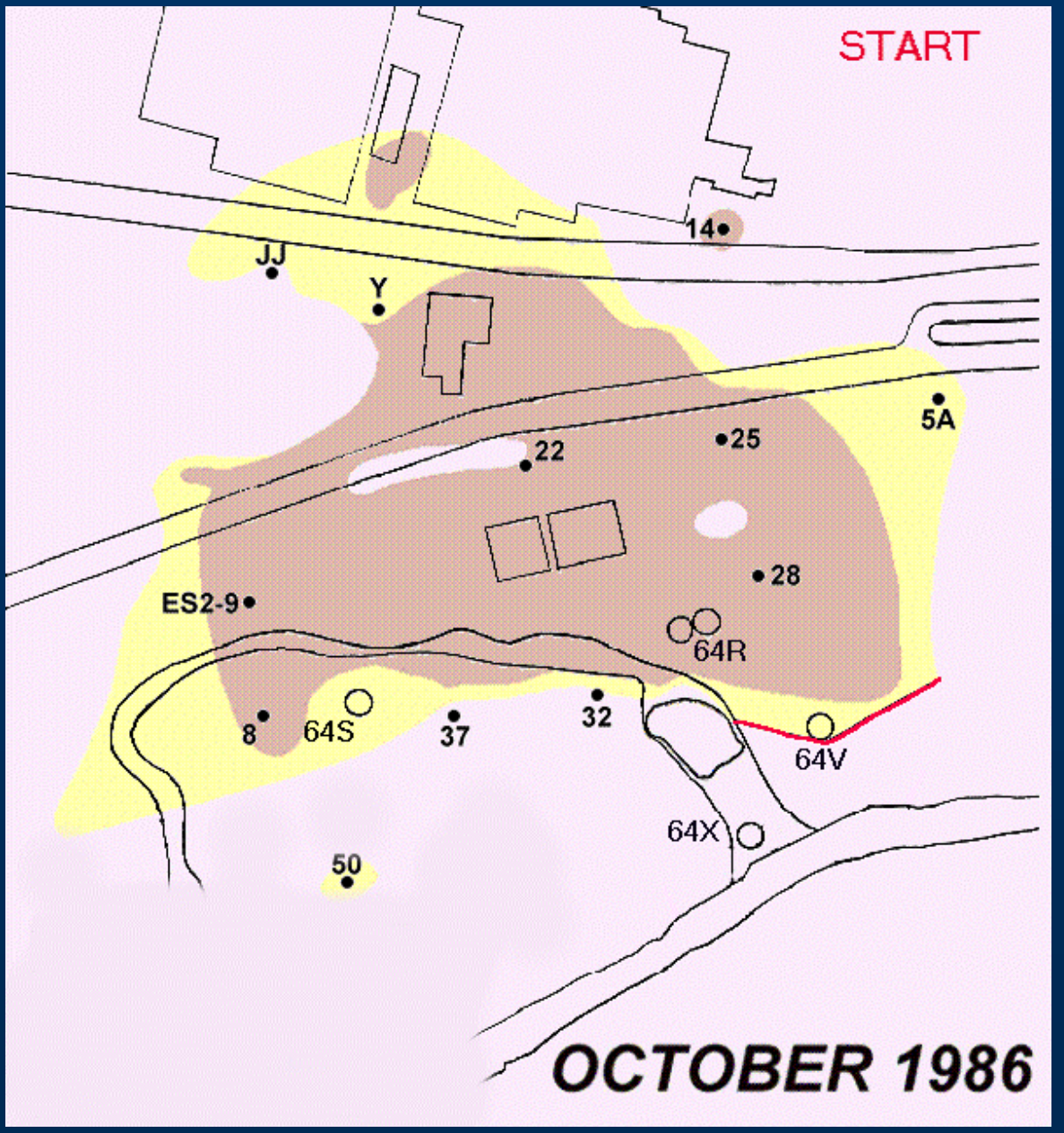


Groundwater Treatment Plant and Recovery Well 64-R

NAPL Remediation Animation, 1986 - 2000



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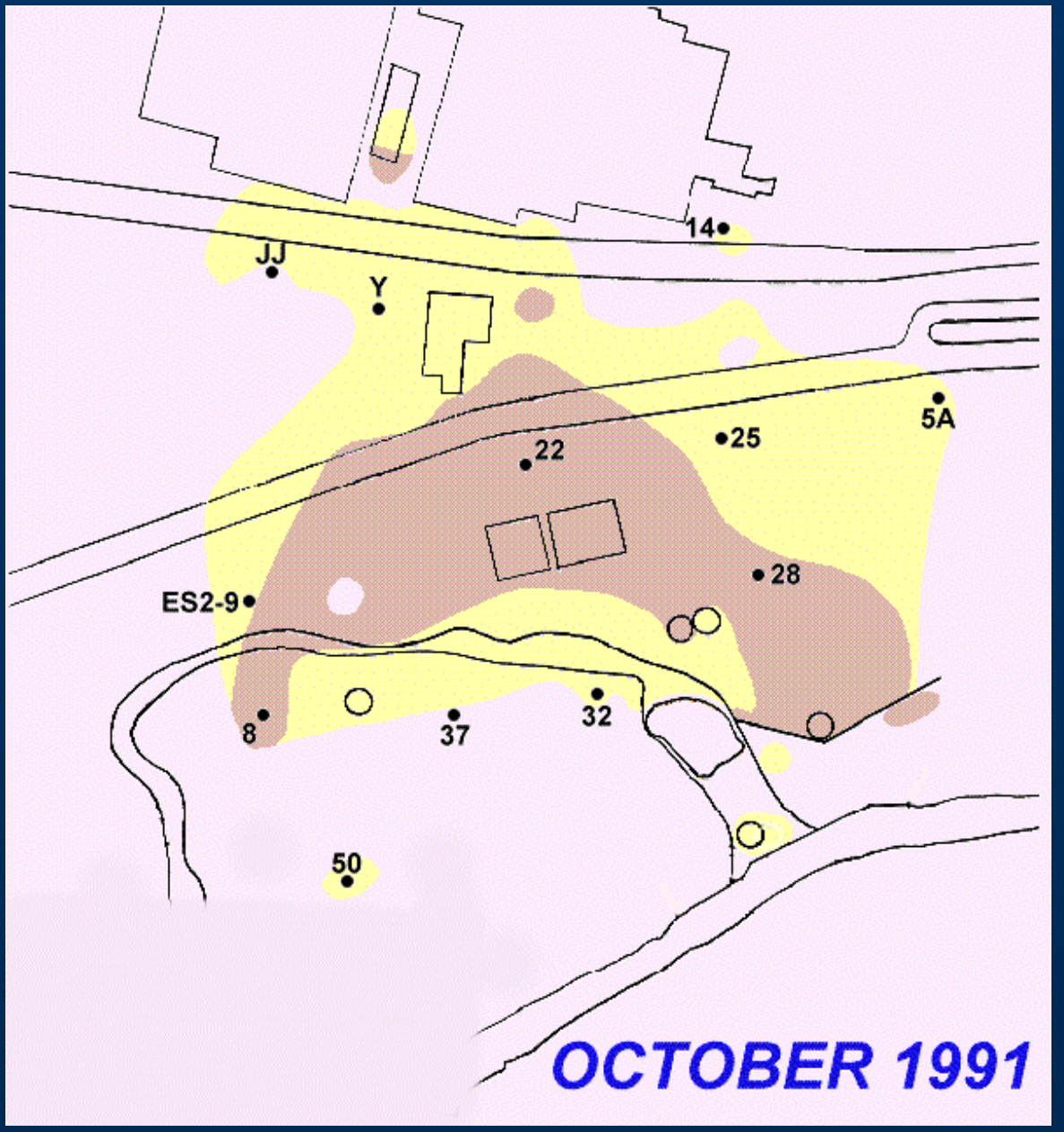
OCTOBER 1986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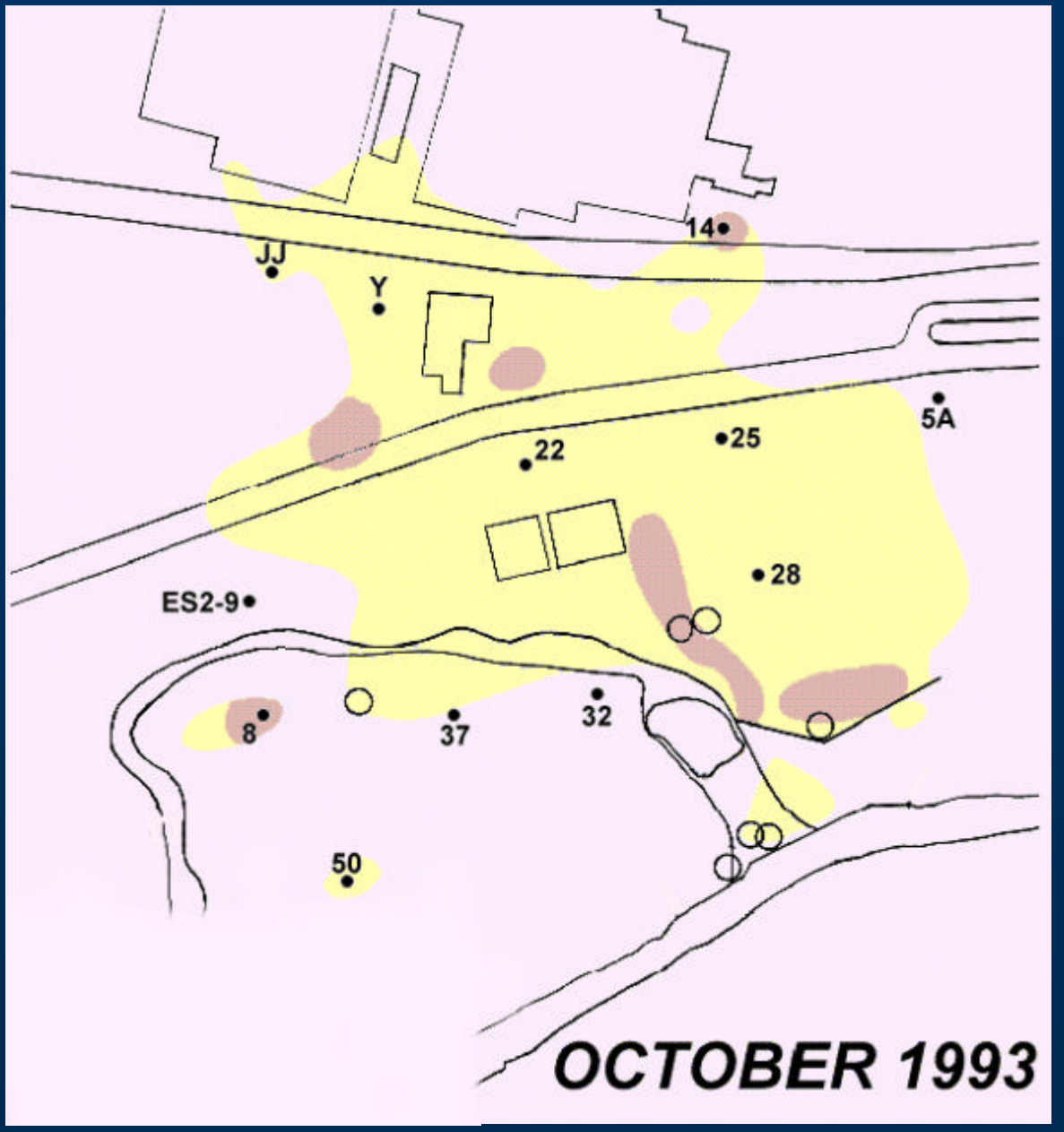
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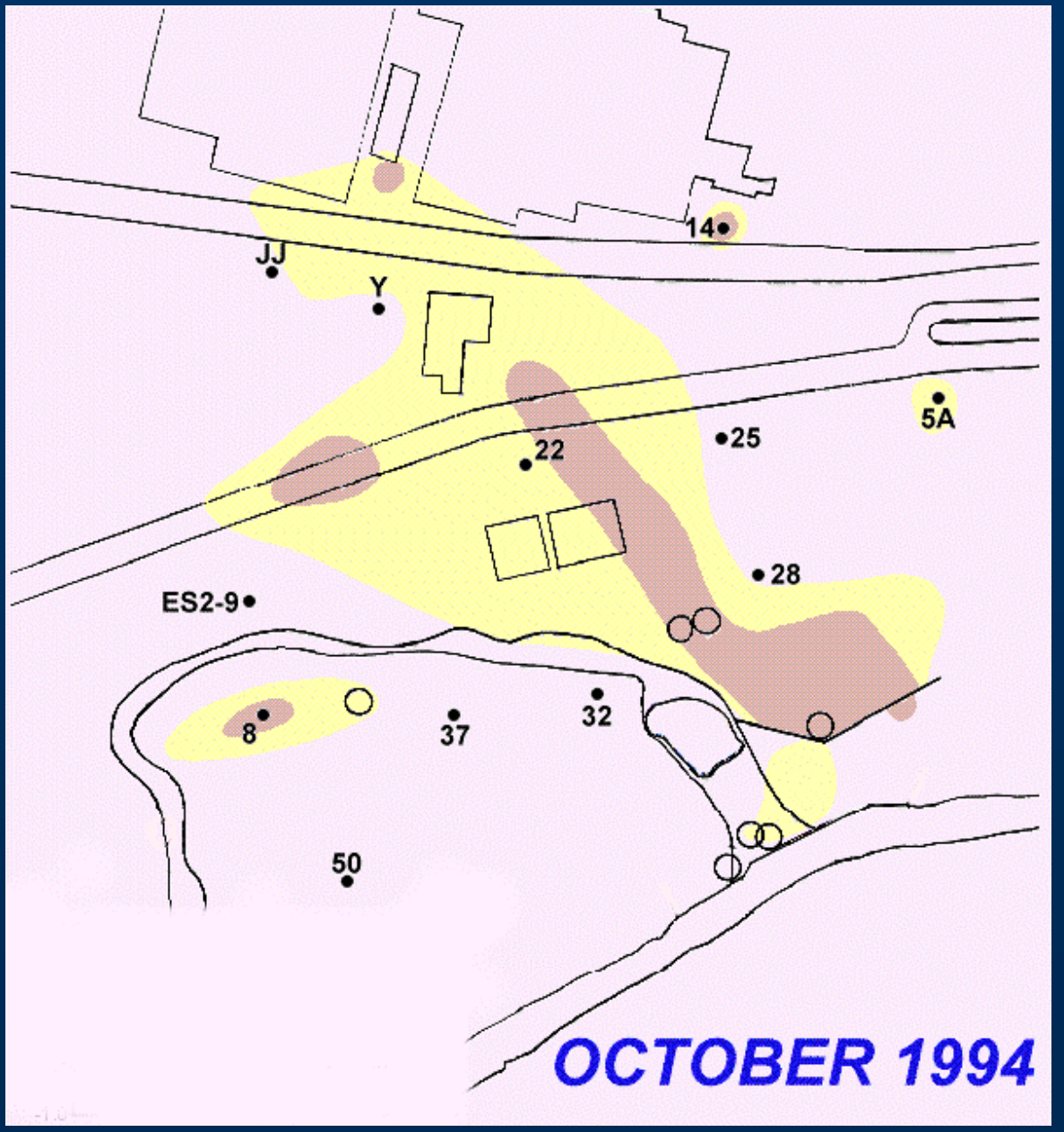
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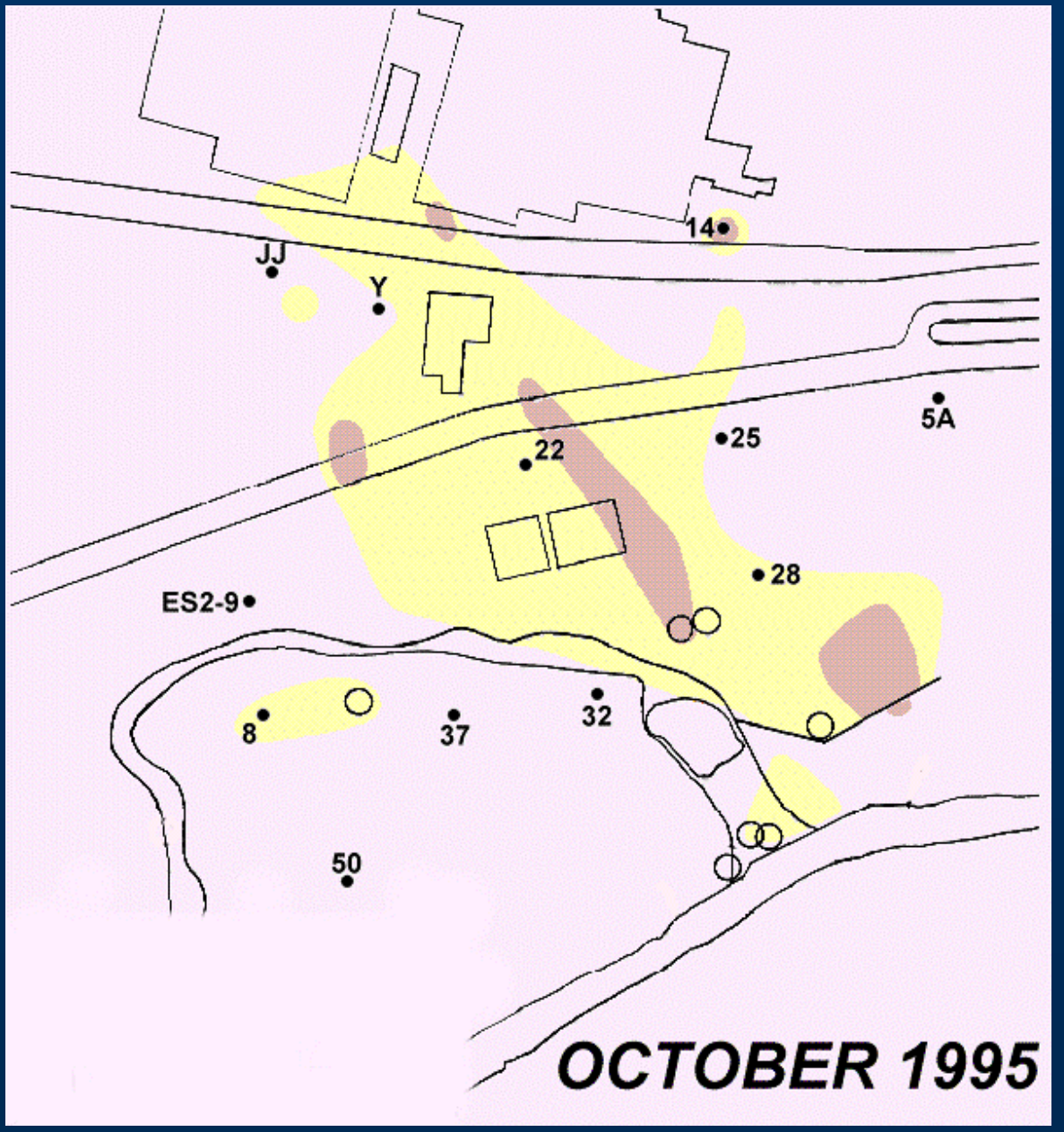
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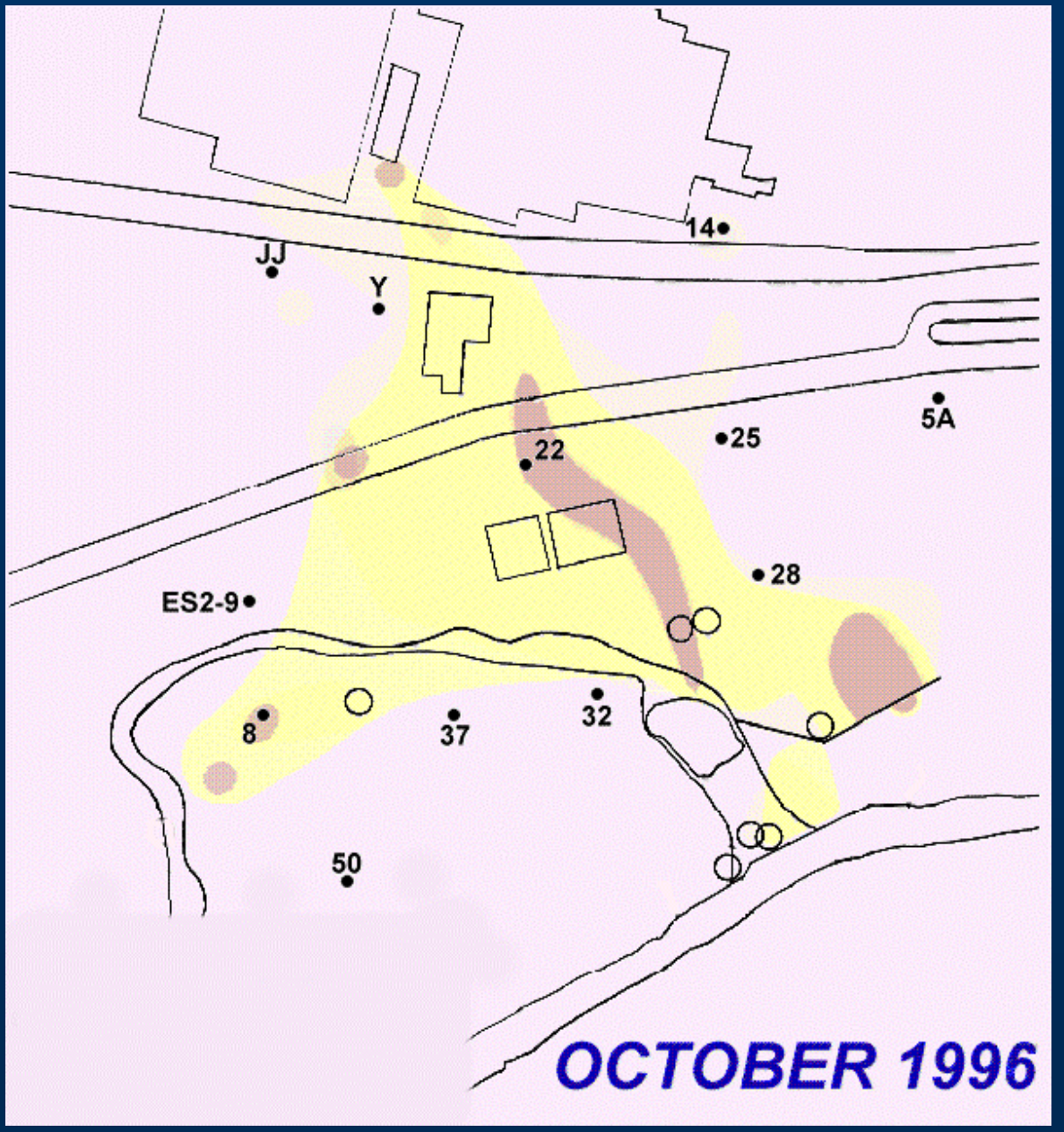
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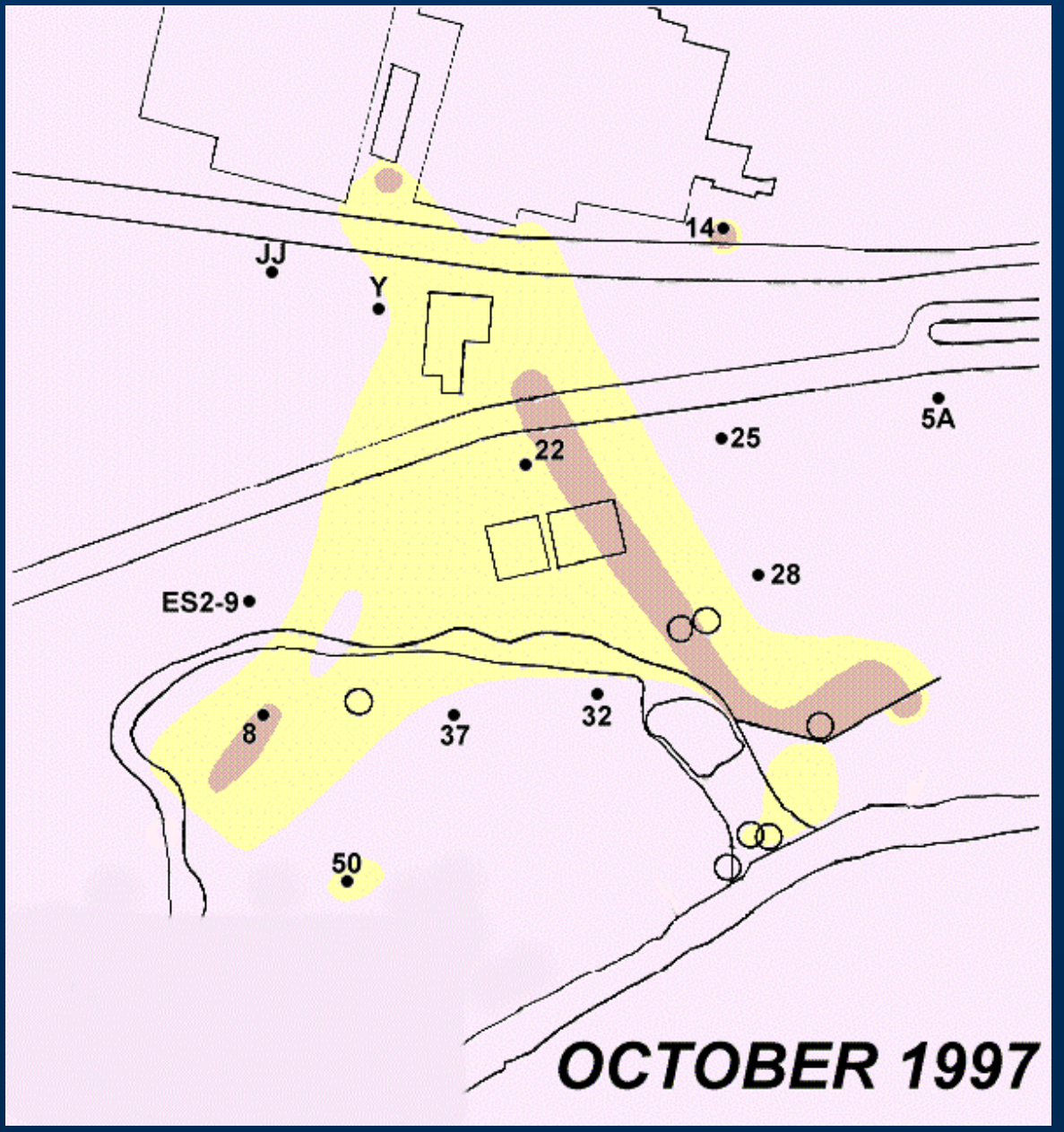
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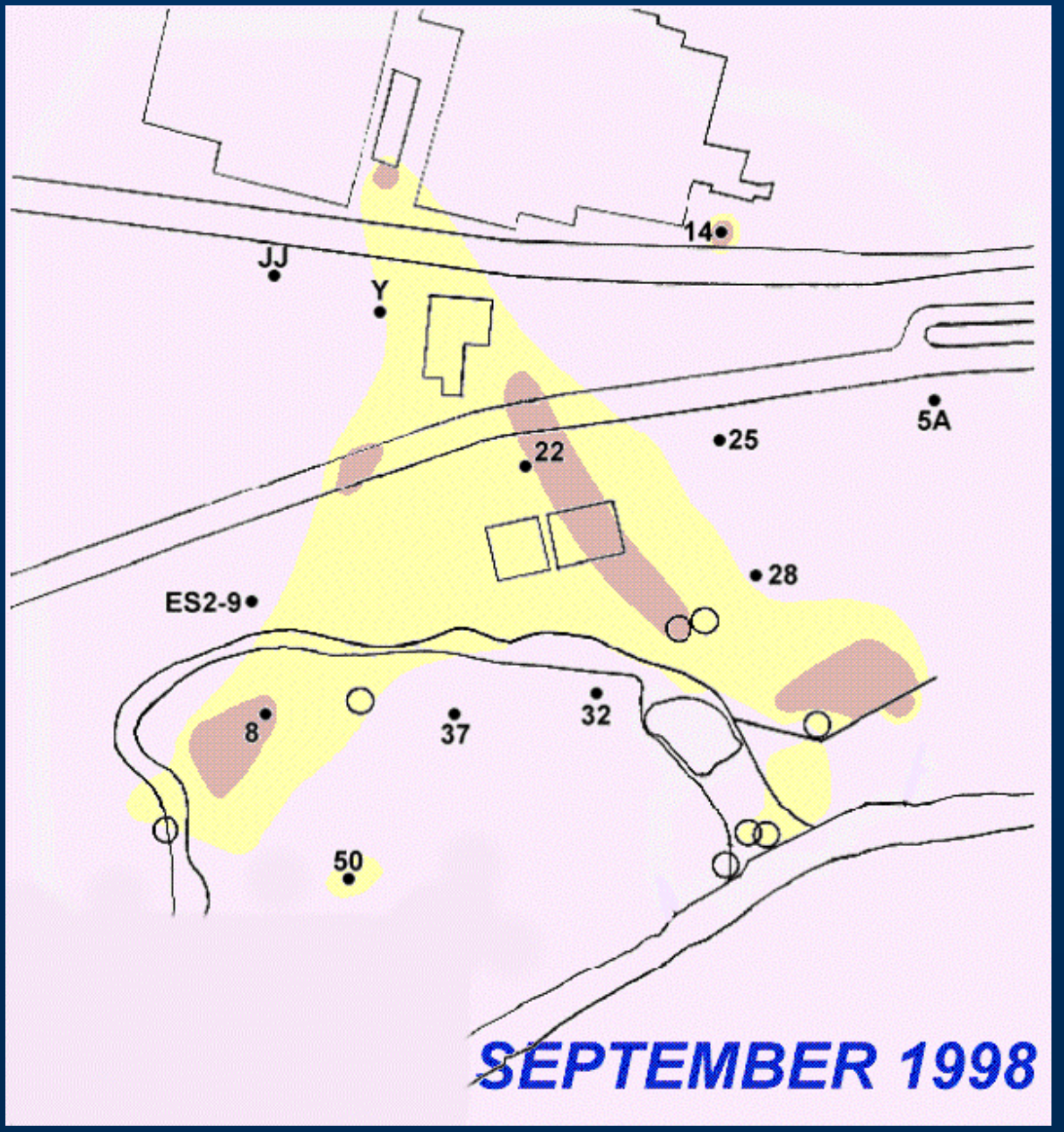
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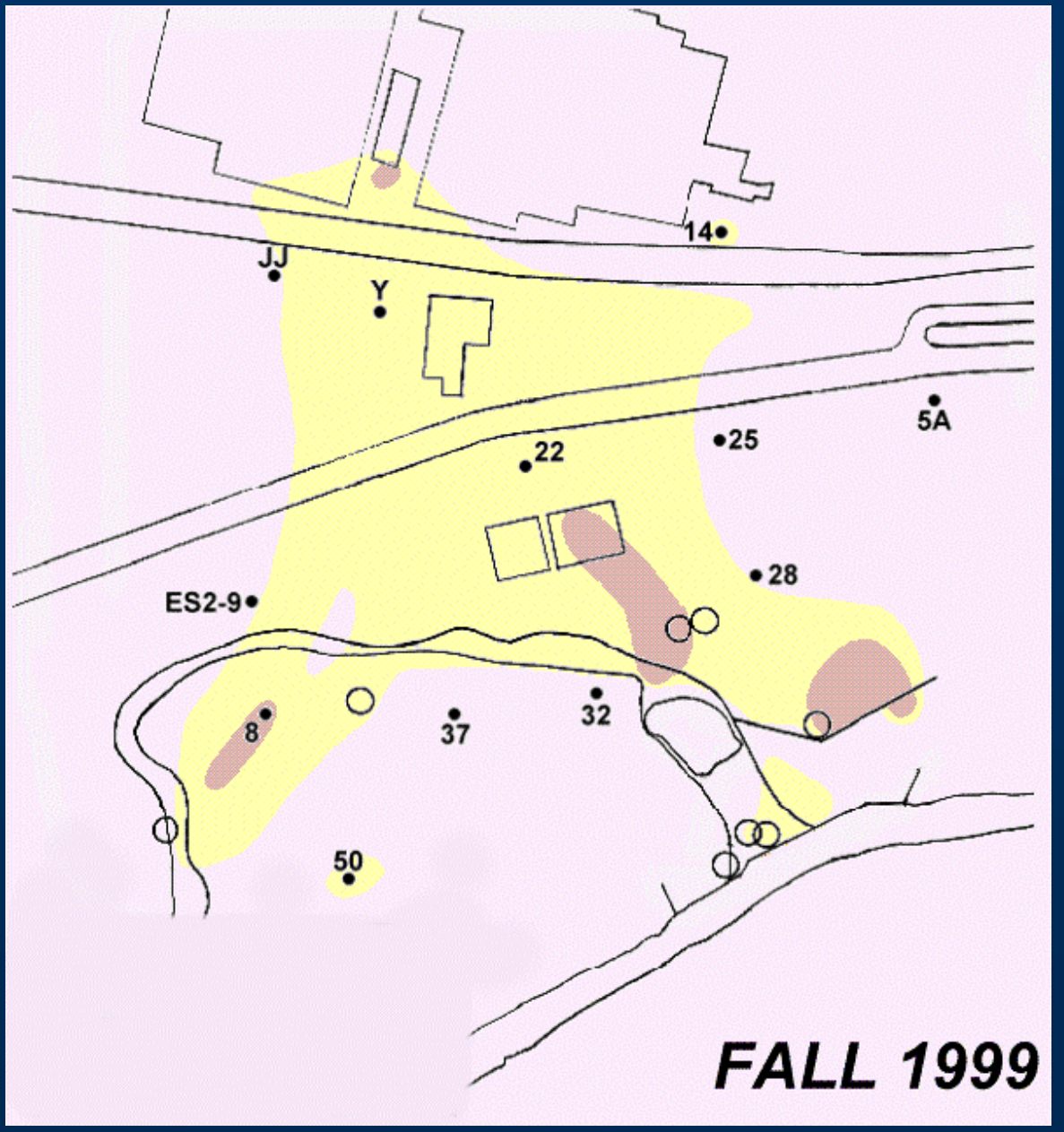
SEPTEMBER 1998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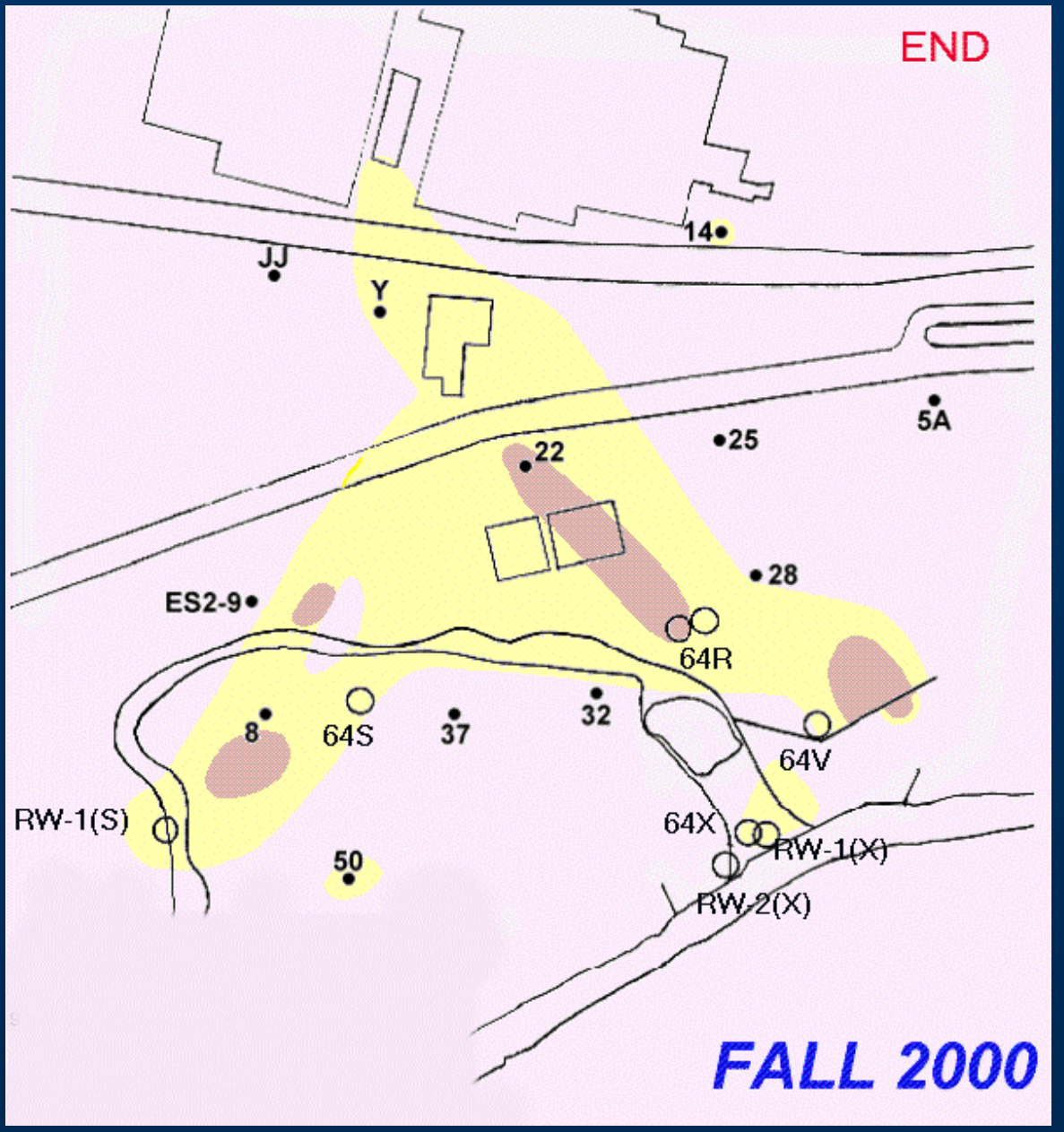
FALL 1999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RW-1(X)
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RW-2(X)
FALL 2000

Groundwater Quality Standards

Massachusetts Contingency Plan (MCP)

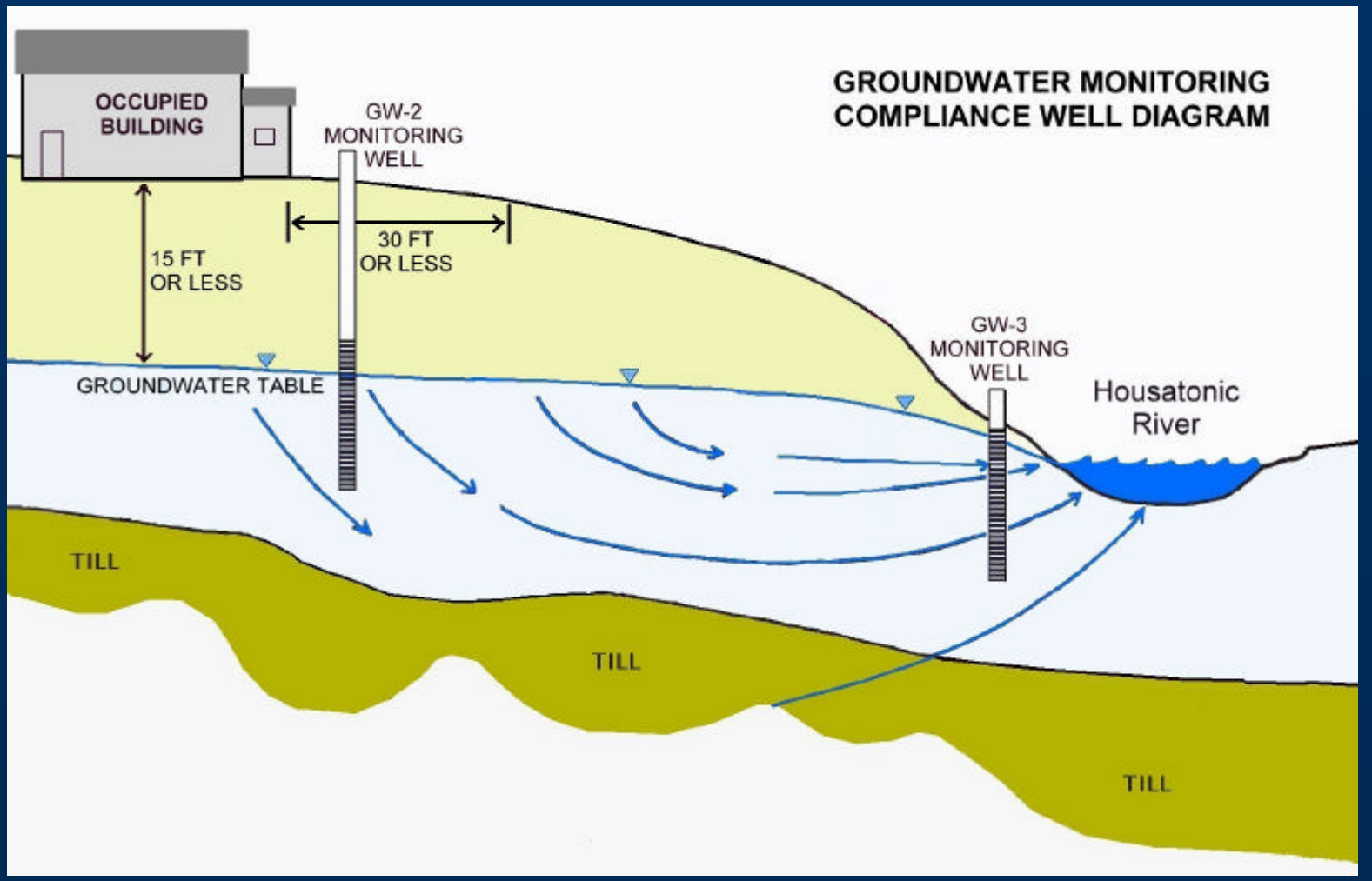
- MCP GW-2 Standards – Do not Exceed GW-2 Concentrations in Compliance Wells Near Buildings to Prevent Adverse Effects to Indoor Air Quality.

- MCP GW-3 Standards – Do not Exceed GW-3 Concentrations in Monitoring Wells to Protect Surface Water from Contaminated Groundwater Discharge.

MCP Groundwater Quality Standards - Example Table

Analyte	GW-2 Standard (ppm)	GW-3 Standard (ppm)
Total PCBs	Not Applicable	0.0003
Chlorobenzene	1	0.5
1,2,4-Trichlorobenzene	10	0.5
Trichloroethene (TCE)	0.3	20
Naphthalene	6	6

GW-2 & GW-3 Compliance Wells



Groundwater Monitoring Well Installation & Sampling

Groundwater Monitoring Program

Baseline Groundwater Monitoring Program

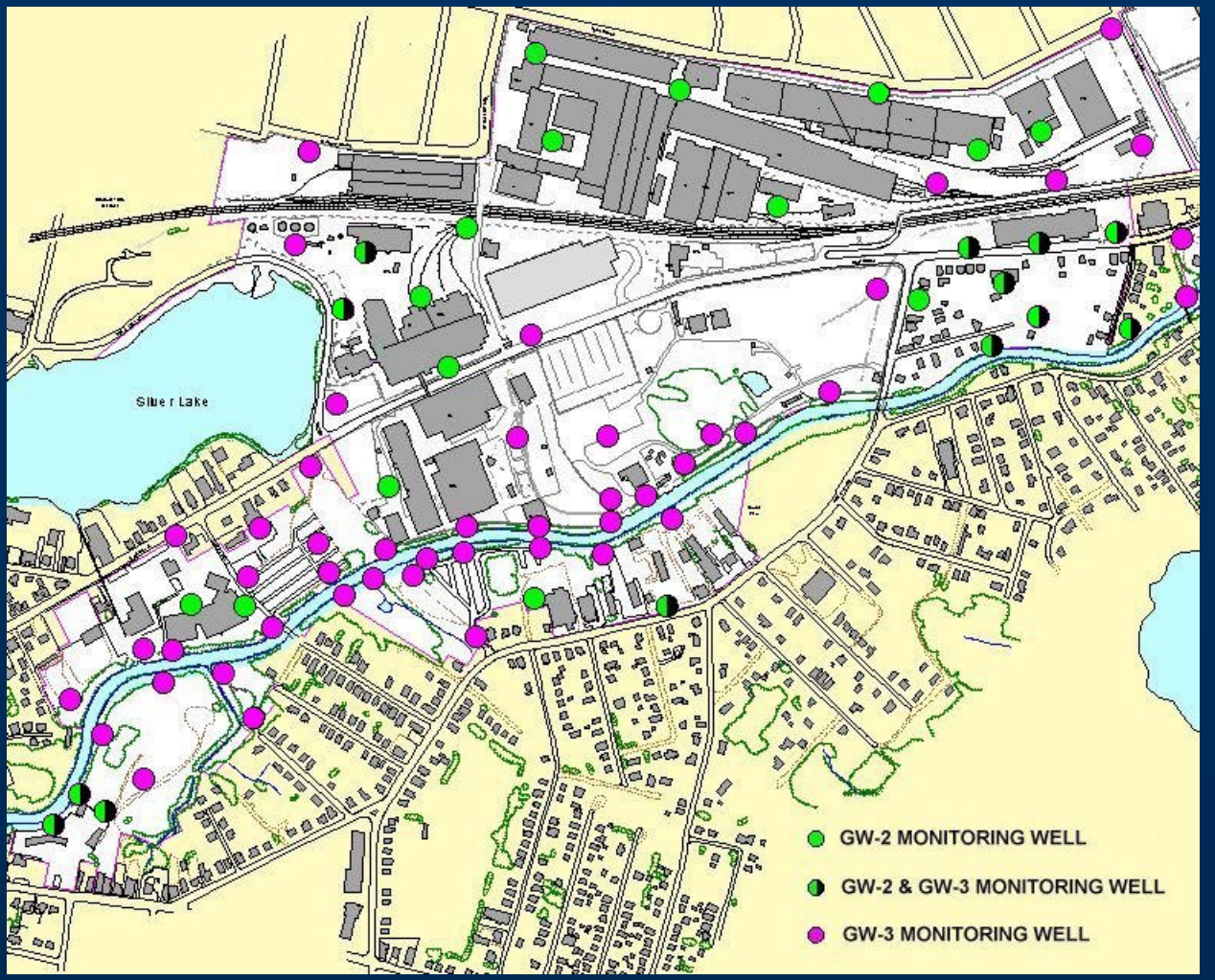
- Designed to Establish Current Conditions
- Quarterly Water Level Monitoring
- Semi-annual Groundwater Quality Sampling for Two Years

Long-Term Groundwater Monitoring Program

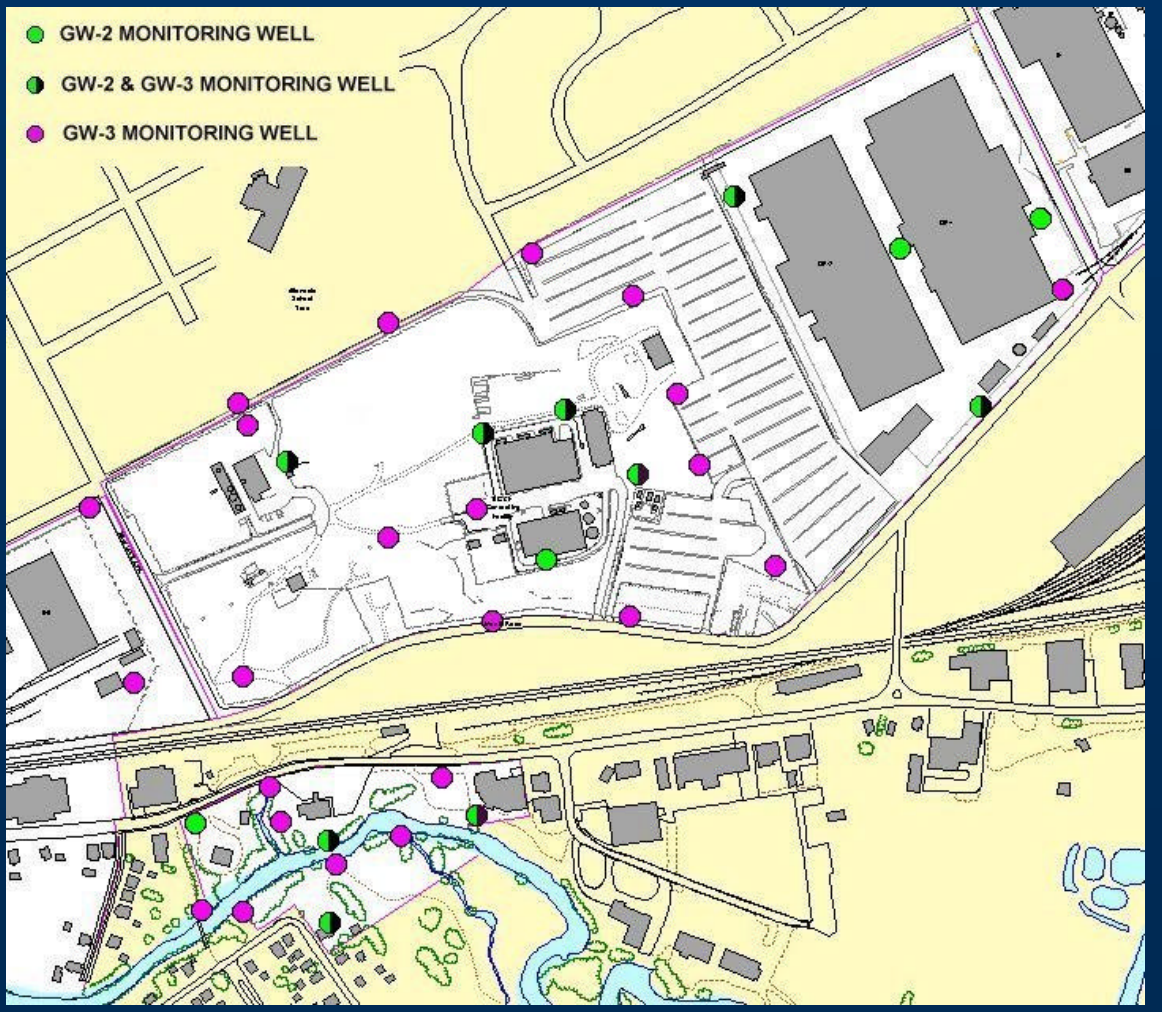
- Designed to Verify Attainment of Standards Over Time
- Program Specifics to be Determined After Baseline Program is Completed
- Monitoring/Sampling to be Conducted at Intervals of No More Than 2 Years.

Groundwater Sampling/Testing Team

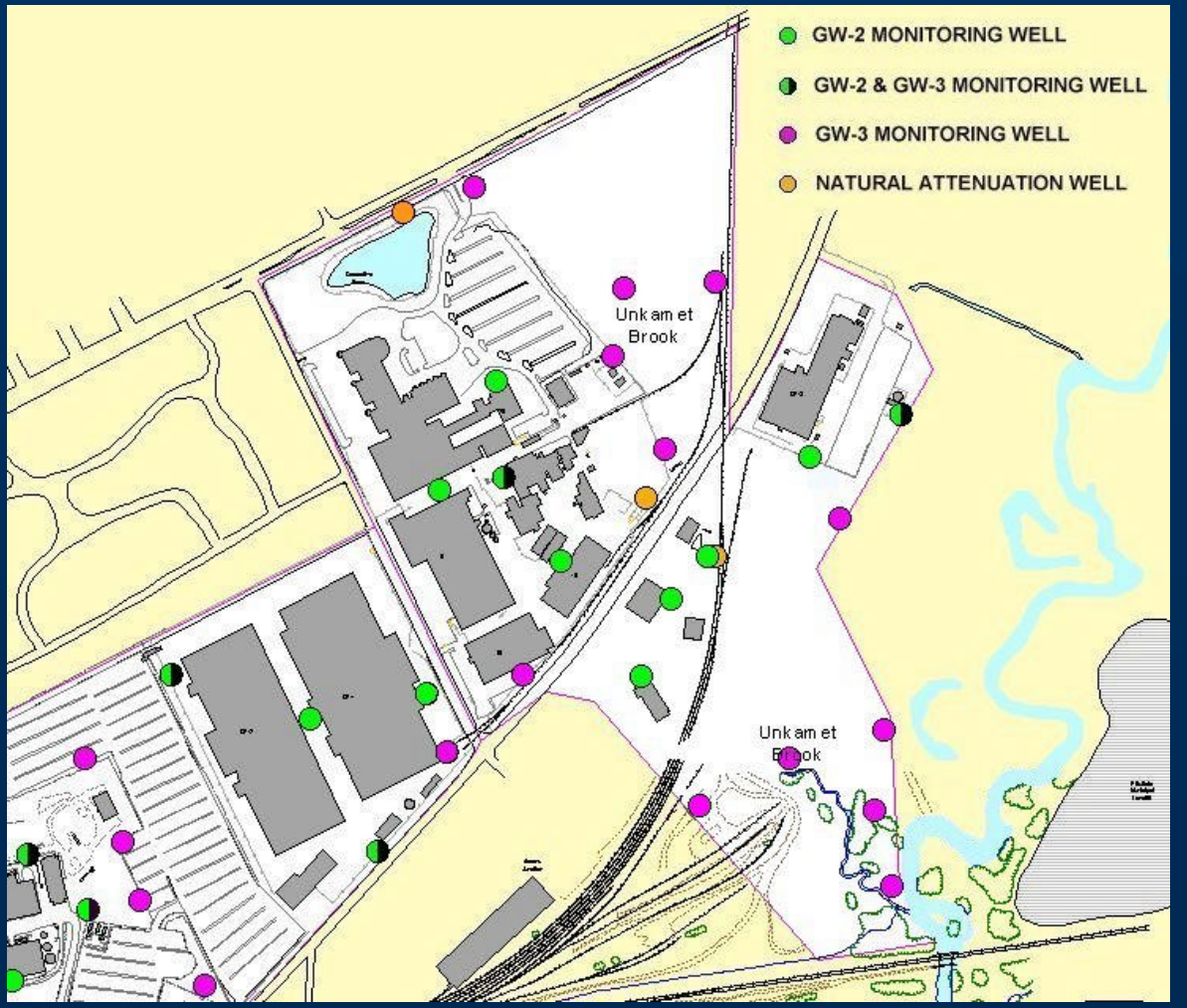
GMA-1 & GMA-5 Compliance Wells



GMA-2 & GMA-4 Compliance Wells



GMA-3 Compliance Wells



Overview of NAPL and Groundwater Programs

Overview of Groundwater Treatment Facility Operations

Pittsfield, MA

November 6, 2002

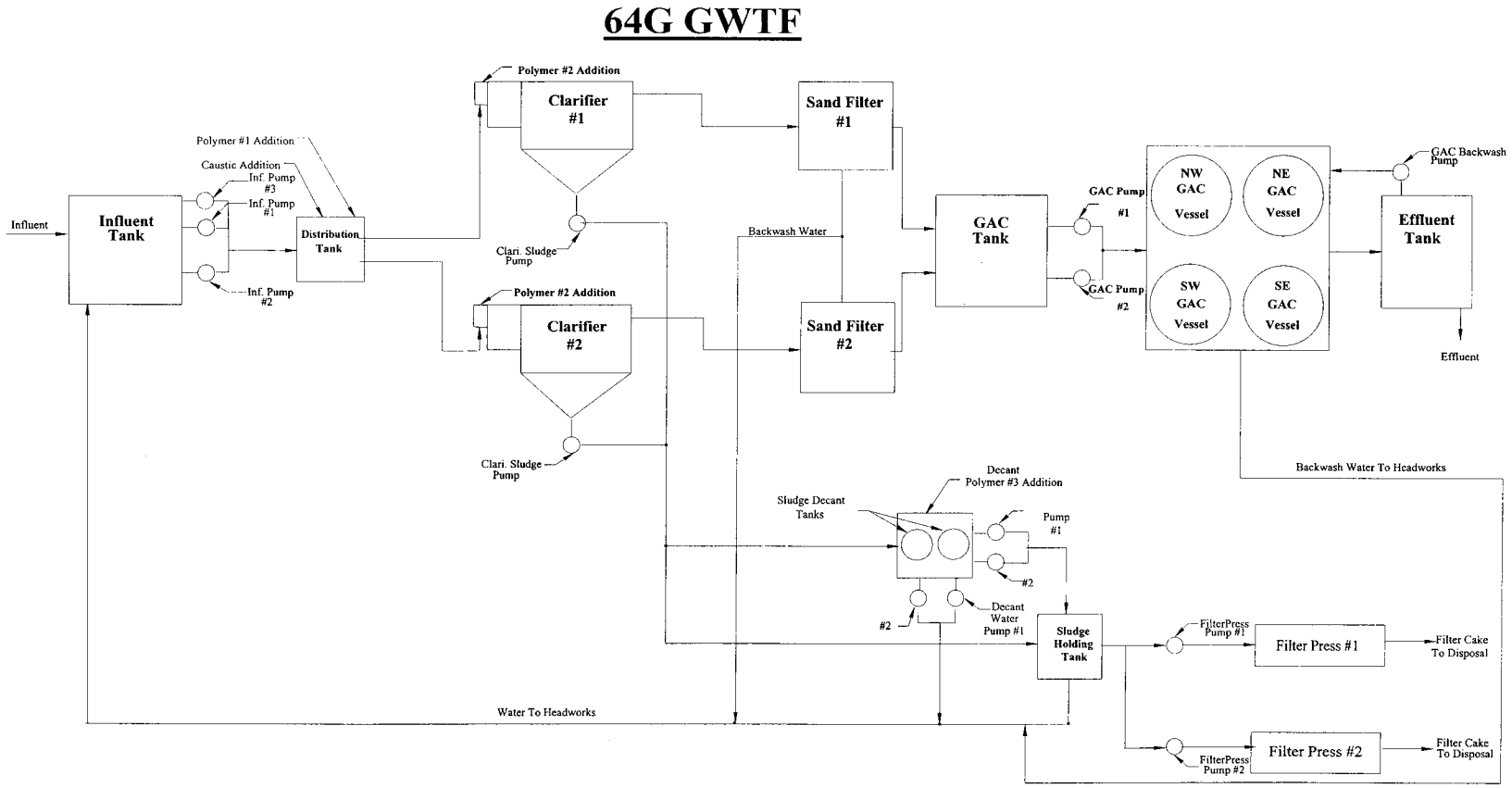
Operational Overview

- **Facility built in 1991. – Operates 24/7.**
- **Treatment of twelve groundwater recovery wells (90-180 gpm)**
- **Approximately 50-60 million gallons of recovery well groundwater processed per year. (East St. Area 1 & 2, Lyman Street)**
- **Maximum operational flow design 600 gpm.**
- **Estimated filter cake processing capacity ~240 cu/ft/day.**

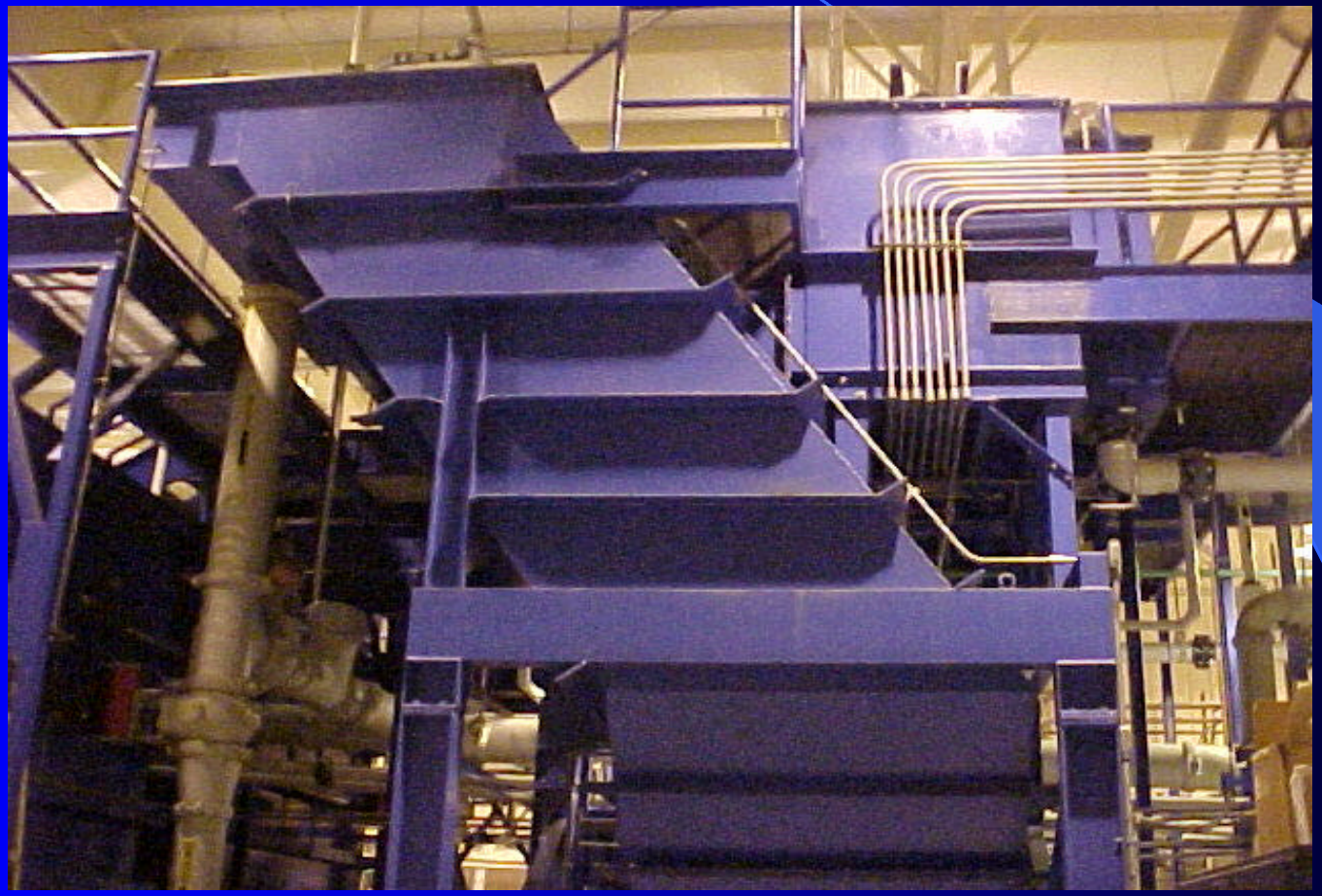
64G Groundwater Treatment Facility

64G GWTF Process Overview

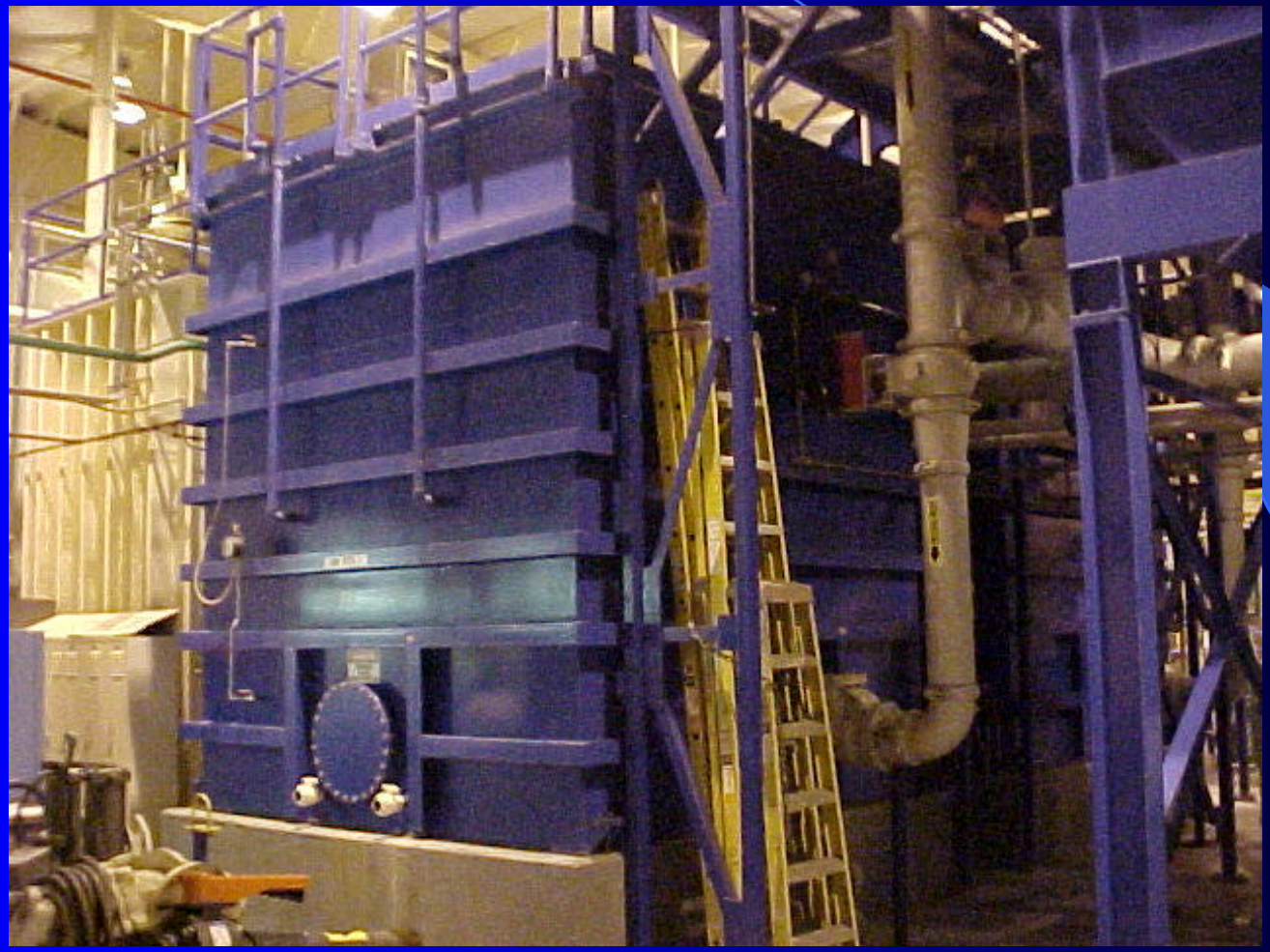
- Designed to remove PCB's and other Appendix IX constituents. (e.g. VOC's, SVOC's) from groundwater.
- Removed groundwater pumped to influent tank, then distribution tank for pH adjustment.
- Polymer addition to promote flocculation of solids.
- Gravity flow through inclined plate clarifiers followed by continuous backwash sand filtration.
- Final removal/polishing through liquid phase activated carbon (four 20,000 lbs units in series – 80,000 lbs total).
- Solids pumped from clarifiers to decant tanks, followed by filter press dewatering.
- Filter cake disposed at regulated landfill.


64G GWTF
Influent
Influent Tank
Polymer #1 Addition
Caustic Addition
Inf. Pump #3
Inf. Pump #1
Inf. Pump #2
Distribution Tank
Polymer #2 Addition
Clarifier #1
Clari. Sludge Pump
Polymer #2 Addition
Clarifier #2
Clari. Sludge Pump
Sand Filter #1
Backwash Water
Sand Filter #2
GAC Tank
GAC Pump #1
GAC Pump #2
NW GAC Vessel
NE GAC Vessel
SW GAC Vessel
SE GAC Vessel
GAC Backwash Pump
Effluent Tank
Effluent
Backwash Water To Headworks
Sludge Decant Tanks
Decant Polymer #3 Addition
Pump #1
#2
#2
Decant Water Pump #1
Sludge Holding Tank
FilterPress Pump #1
Filter Press #1
Filter Cake To Disposal
FilterPress Pump #2
Filter Press #2
Filter Cake To Disposal
Water To Headworks

350 gpm Inclined Plate Clarifier



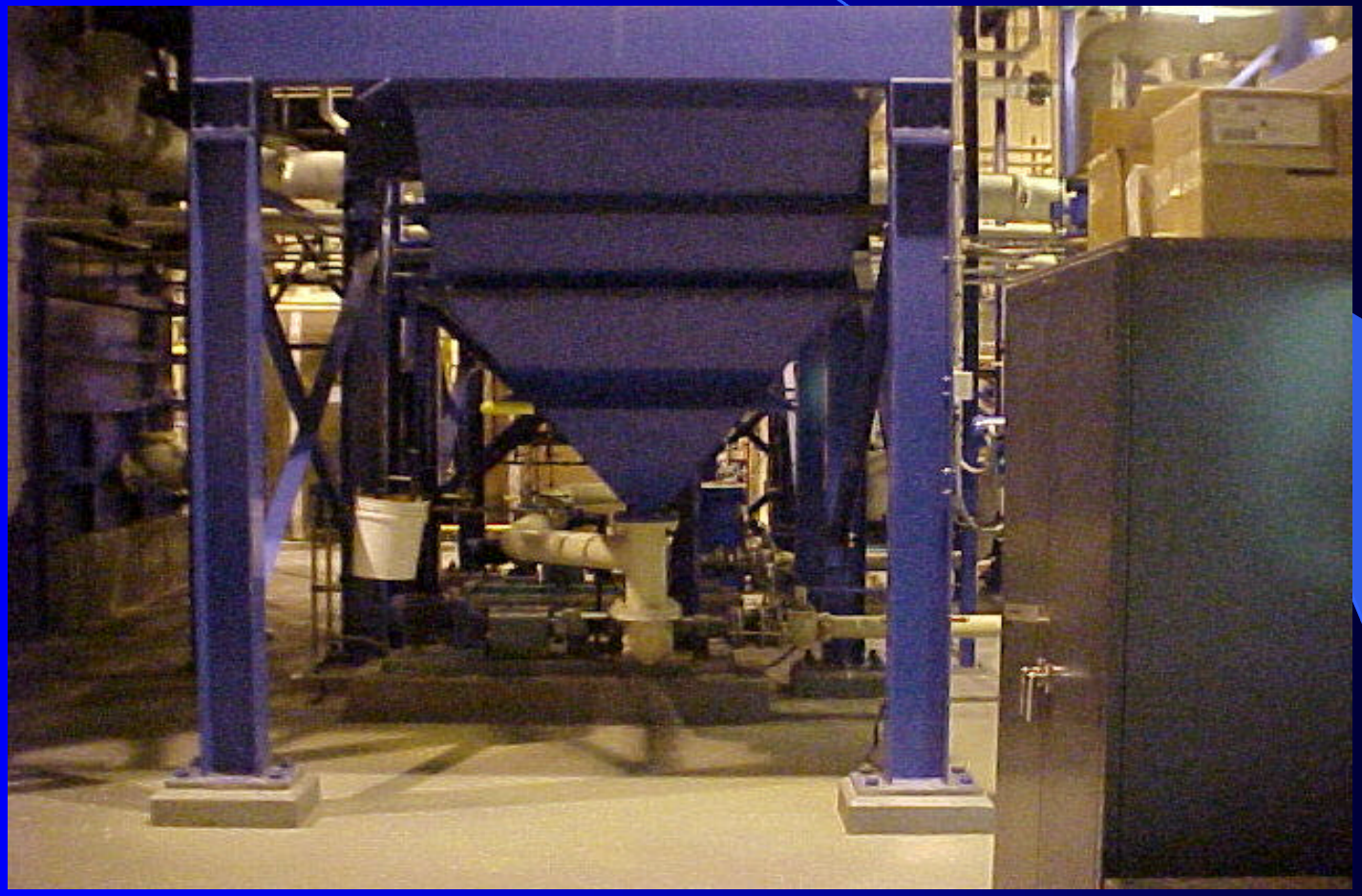
300 gpm Continuous Backwash Sand Filter



GAC Feed Pumps

20,000 lb LPCA Unit

Inclined Plate Clarifier Sludge Hopper



Sludge Decant Tank

Filter Press