



Air
Land
Sea
Space
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Innovation. In all domains.

Site Status Update

December 8, 2010

**Former Raytheon Facility
Wayland, Massachusetts**

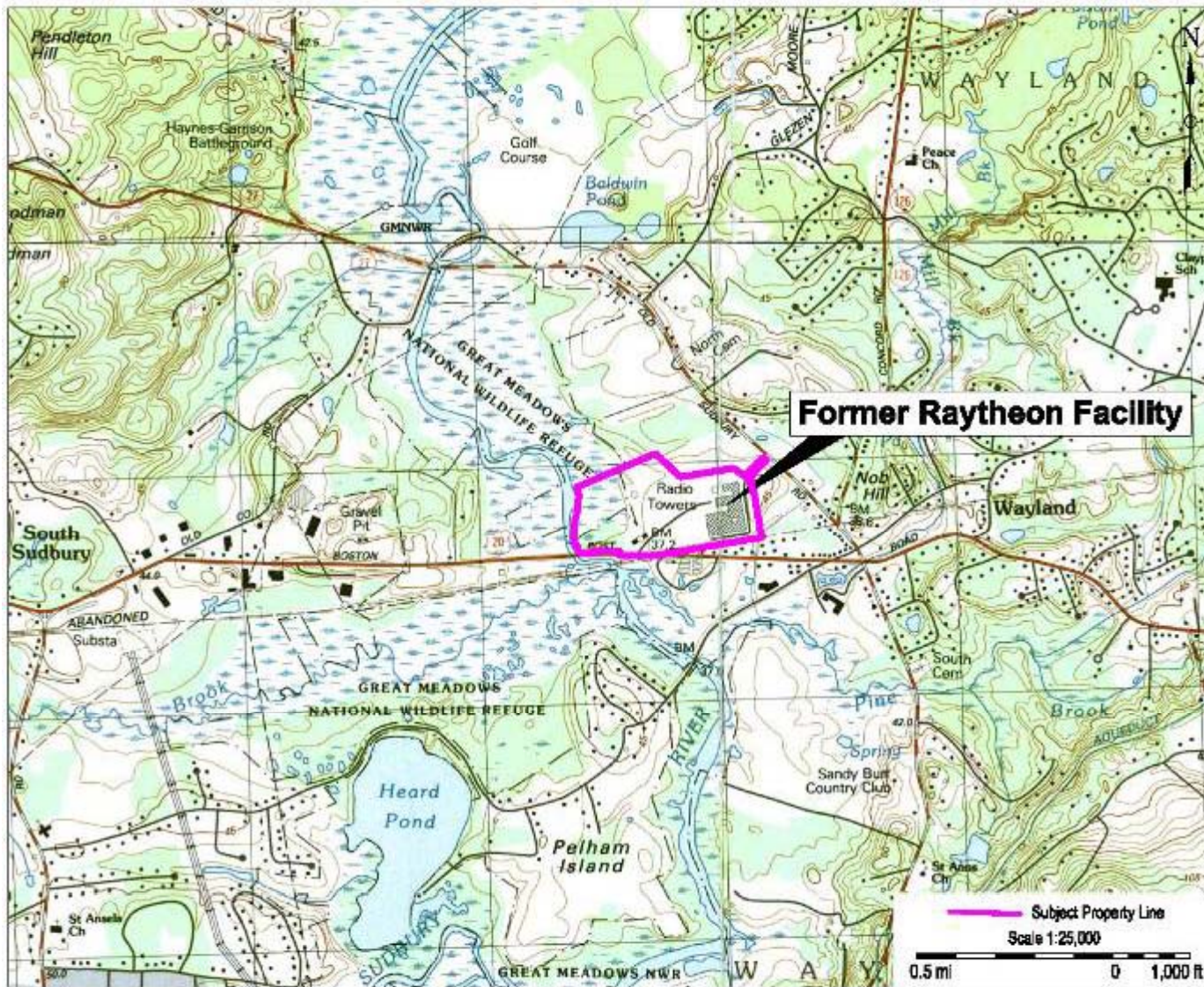
Chip Burkhardt, P.G.

Outline

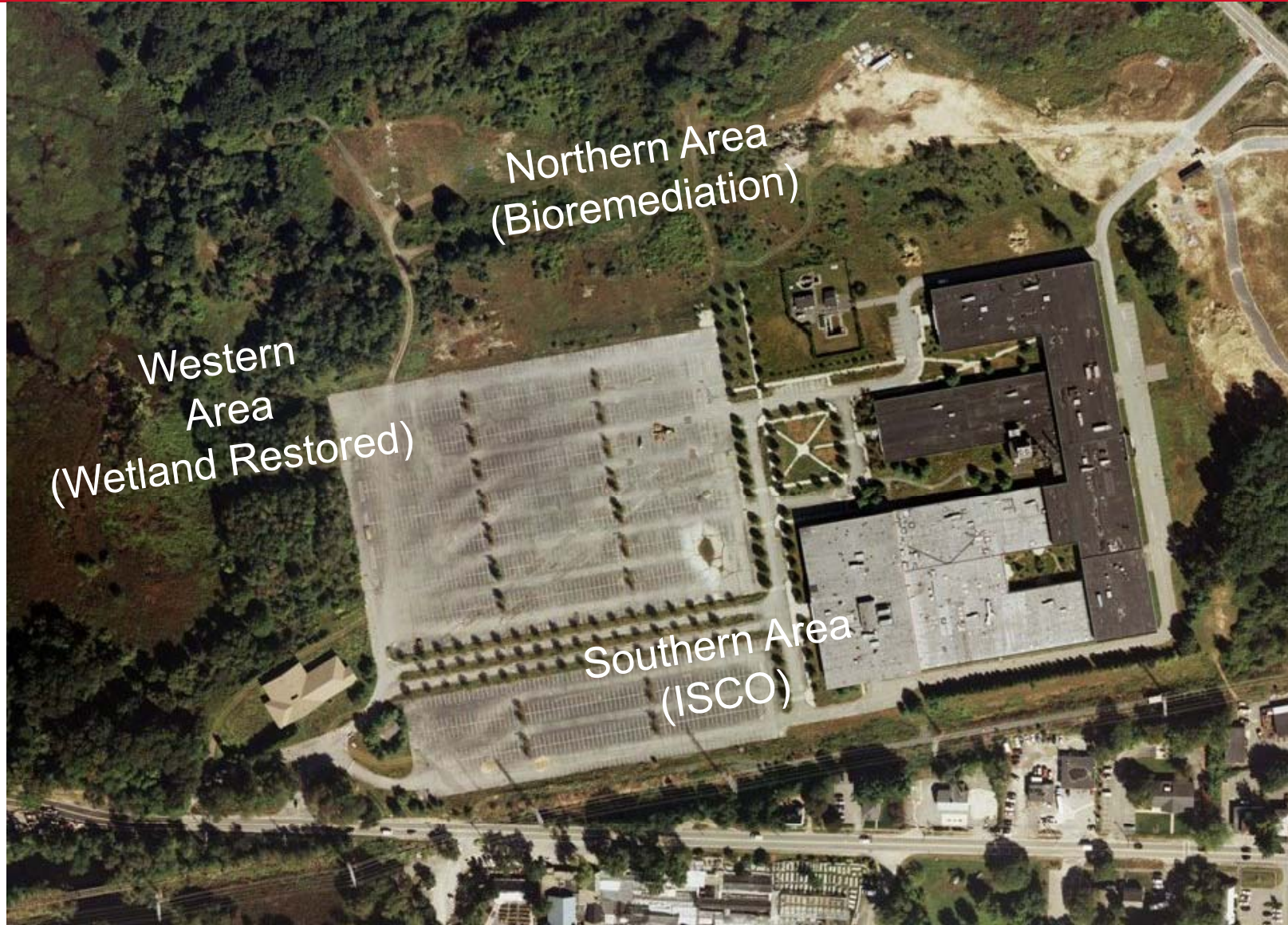
- General Site Overview

- Site Activities Update
 - Site-wide groundwater gauging and monitoring
 - Southern Area
 - Northern Area
 - Wetland Restoration
 - SEP - Sentinel Wells

- Question and Answer Period



Site Overview



Closed Items

- Western Area
 - Arsenic in Groundwater
 - Class B-1 RAO-P filed November 2007
 - PCBs, PAHs, metals in wetland soil/sediment
 - Certificate of Compliance issued by Conservation Commission

- Southern Area
 - MTBE in Groundwater – DPS filed November 2007
 - MassDEP created a new RTN: 3-27651
 - Technical Screening Audit performed by MassDEP April 2008

- Northern Area
 - CVOCs in soil – Completed source area removal in 2007
 - Certificate of Compliance issued by Conservation Commission

Open Items

- Northern Area
 - CVOCs in Groundwater
 - Remediation via enhanced reductive dechlorination ongoing

- Southern Area
 - CVOCs in Groundwater
 - Remediation via in situ chemical oxidation (ISCO) ongoing

Update on Site Activities

Groundwater Gauging & Monitoring

Site-Wide Groundwater Monitoring

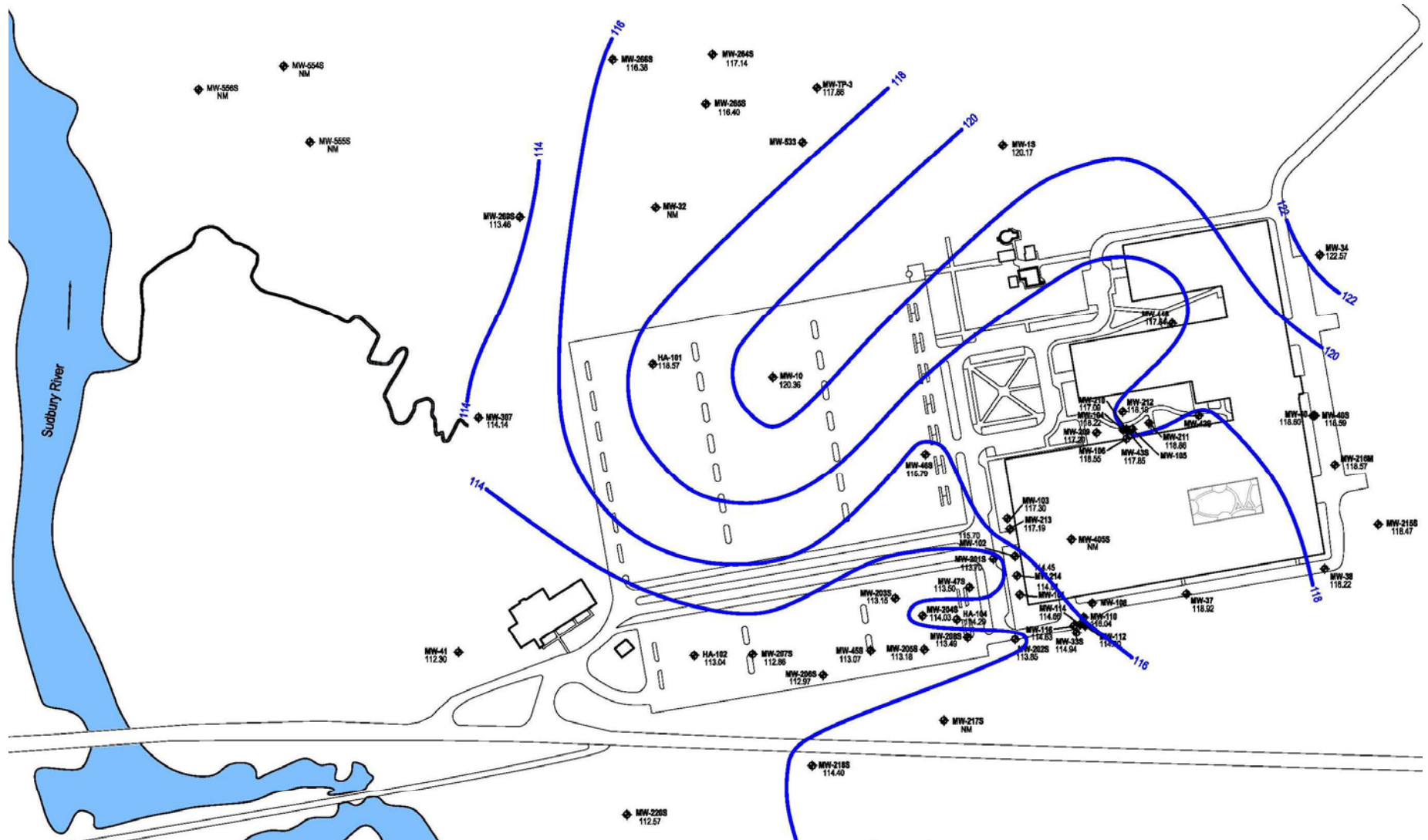
Groundwater Gauging

- Site-wide gauging round conducted on October 5, 2010
 - Water levels measured in 90+ monitoring wells

Groundwater Quality Monitoring

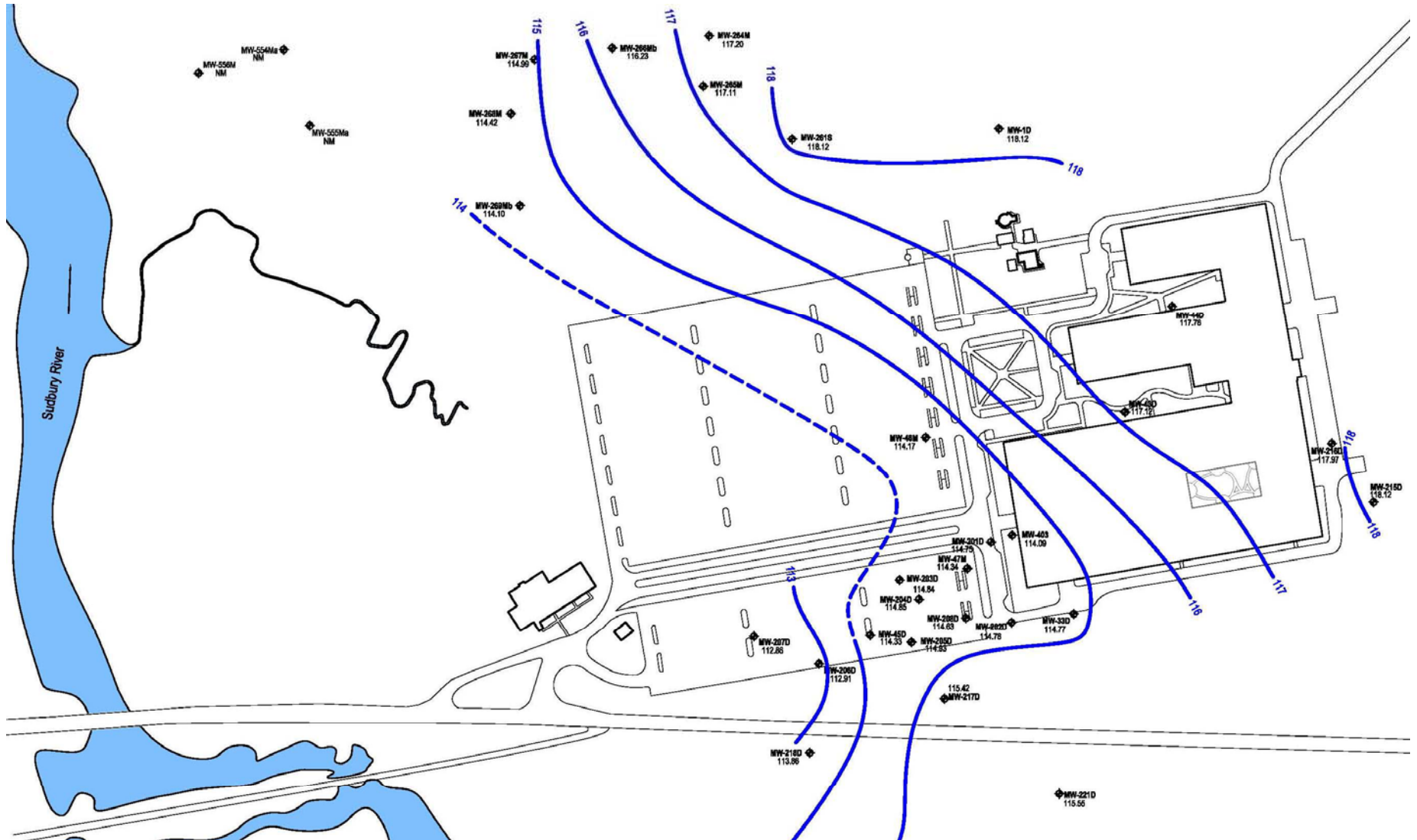
- Monitoring data summarized in Remedy Operation Status Submittal
 - Quarterly monitoring rounds conducted in July and October 2010

Site-Wide Groundwater Monitoring



Shallow Aquifer Elevation Contours

Site-Wide Groundwater Monitoring



Deep Aquifer Elevation Contours

Southern Area

Southern Area ISCO



Southern Area

Injection Point Decommissioning

- Injection Points (IPs) Installed in 2004 for Use in Full-Scale ISCO Implementation
 - Some used for subsequent permanganate injections through early 2008
 - 3 locations maintained for long term monitoring (IP-16S/D, IP-17D)
 - Indoor monitoring wells excluded from decommissioning

- 75 IPs Decommissioned in Accordance with MassDEP *Standard References for Monitoring Wells*, Section 4.6
 - 57 indoors in Main Building Area
 - 18 outdoors in MW-33 and MW-43 Areas

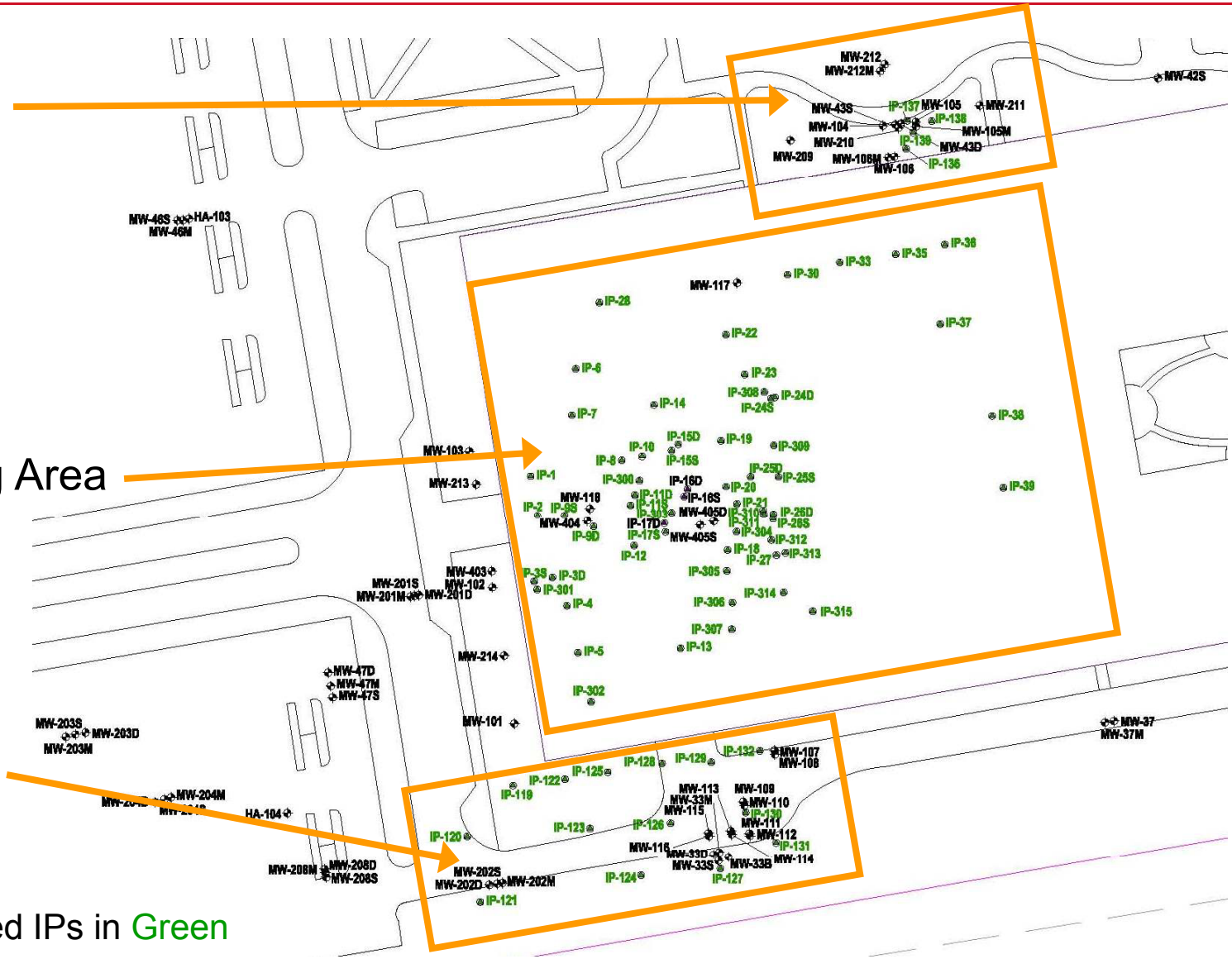
Southern Area ISCO

MW-43 Area

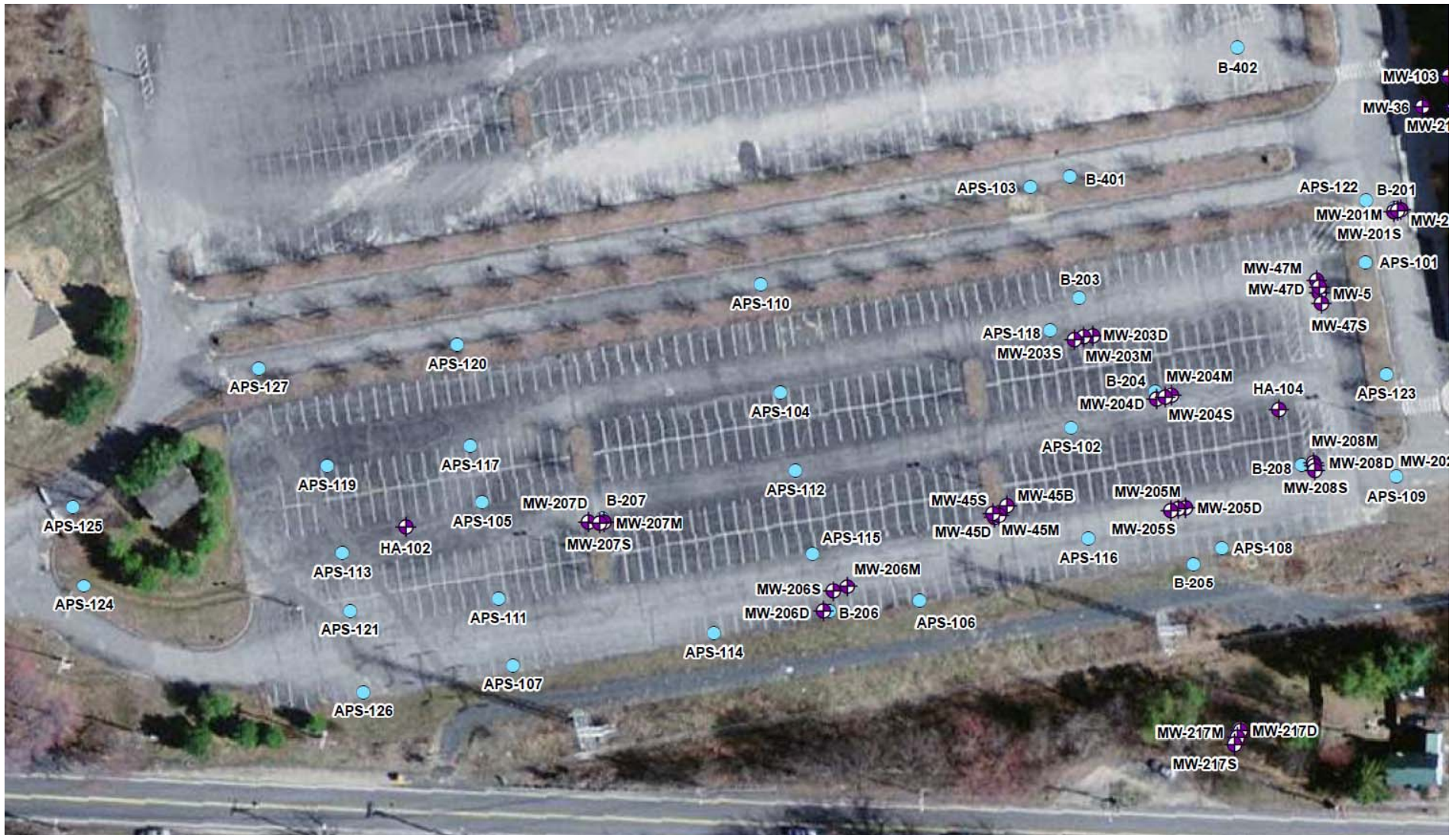
Main Building Area

MW-33 Area

Decommissioned IPs in Green



Southern Area Investigation



Northern Area

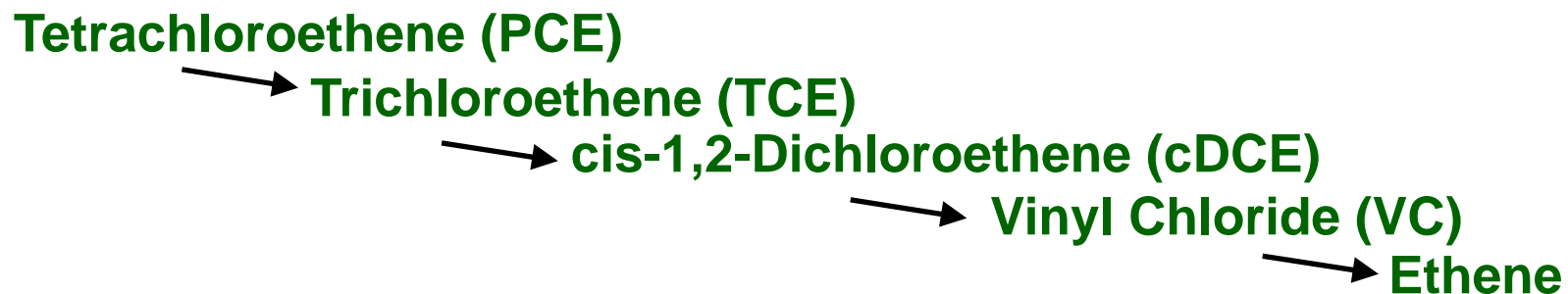
Northern Area



Northern Area Bioremediation

Bioremediation Progress Review

- A carbon source (e.g. lactate or vegetable oil) was introduced to naturally occurring microbes via injection wells to jump-start metabolic processes
 - Reductive Dechlorination: Process by which a consortia of microbes remove chlorine atoms from chlorinated solvents until all that is left is harmless ethene gas



Northern Area Bioremediation

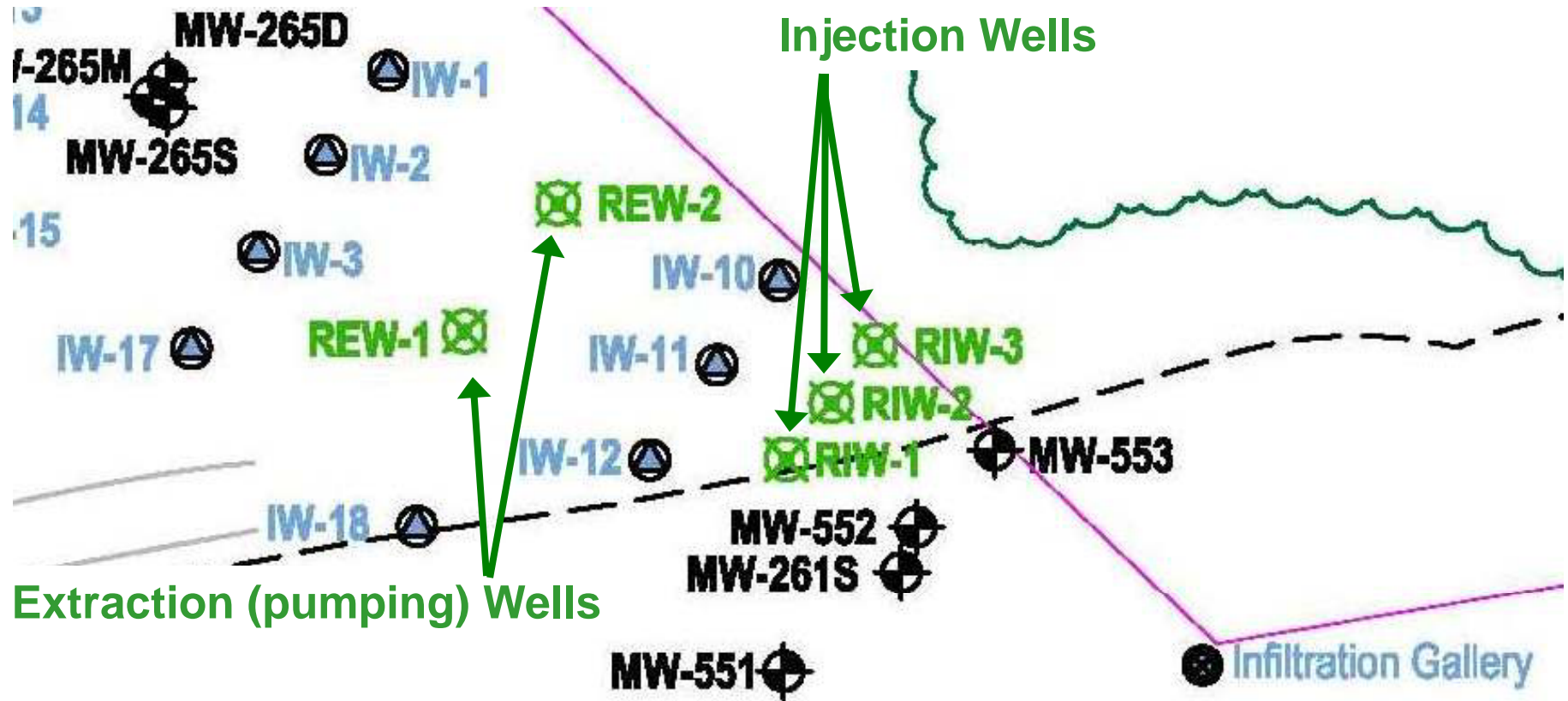
- Distribution of substrate (carbon) in subsurface is challenging due to low permeability of soils at the Site

- Pumping Tests
 - Conducted using existing monitoring and injection wells at the site.
 - Indicated that specially designed extraction wells may provide higher flow rates and further increase distribution of injected carbon source

- Recirculation System
 - Increases subsurface mixing by inducing a greater hydraulic gradient by mechanical pumping
 - Adds nutrients to the extracted groundwater prior to re-Injection
 - Vegetable oil, isopropyl alcohol, and potassium hydroxide

Northern Area Bioremediation

5 New Recirculation System Wells



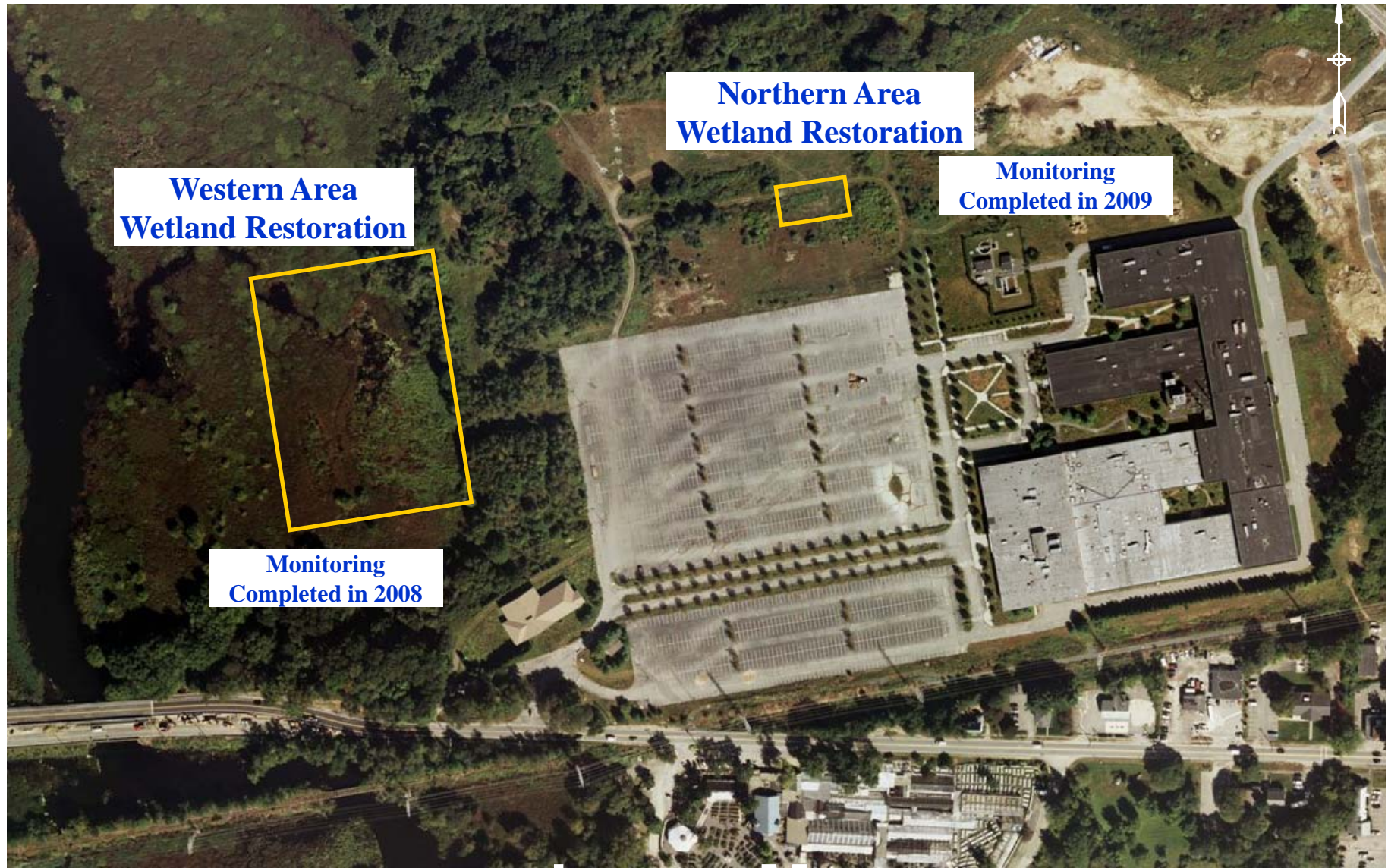
Northern Area Bioremediation

- Solar powered pumps and controls extract groundwater continuously at approximately 3 gallons per minute
 - Has operated for 45 days to date
- Initial “feeding” conducted on October 20, 2010
- Next “feeding” scheduled for December 2010



Update on Site Activities Wetland Restoration

Wetland Monitoring



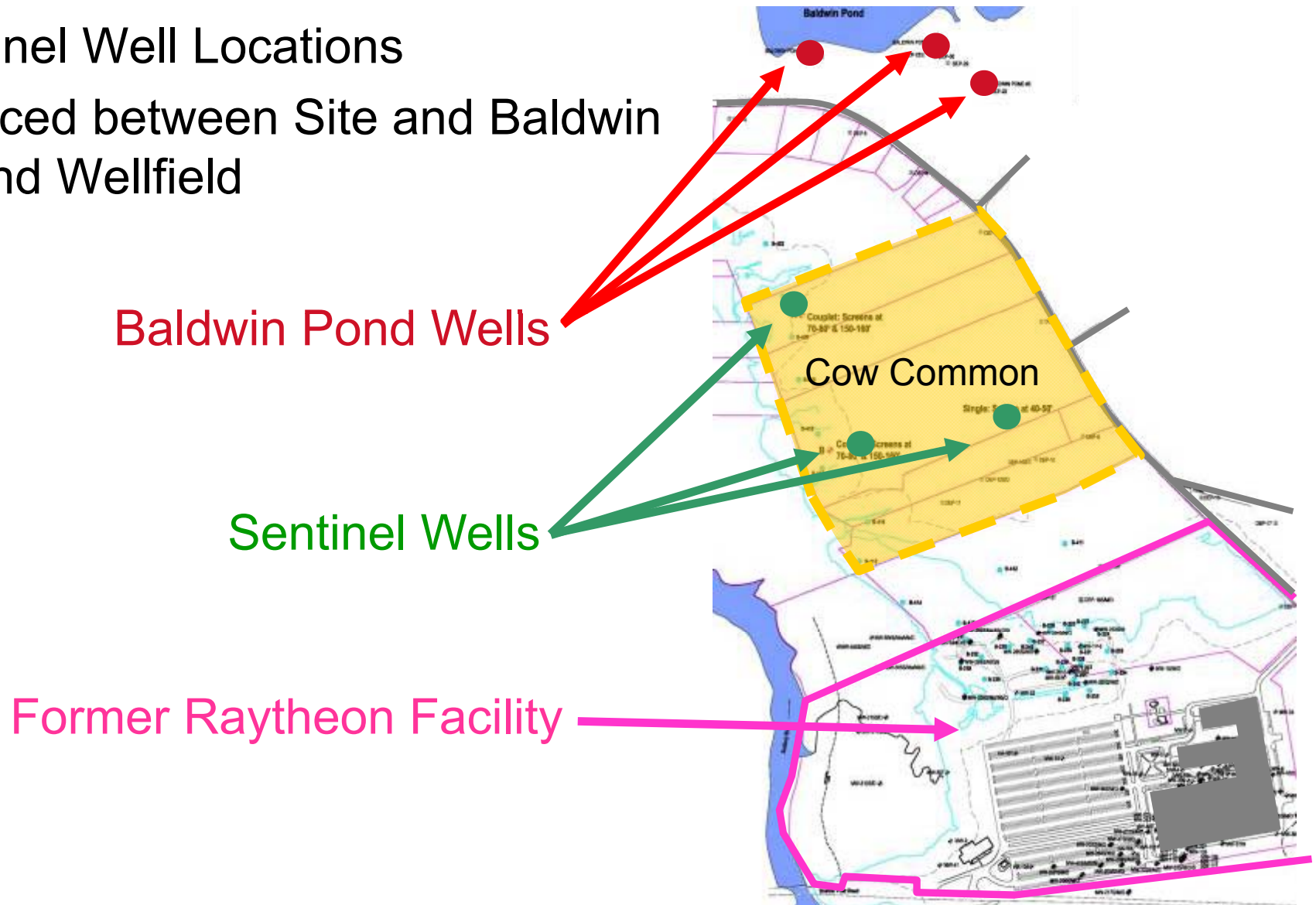
Wetland Restoration

- Certificates of Completion received from Conservation Commission for MassDEP File Nos. 322-553, 322-564, and 322-647
- No open Orders of Conditions remaining on Site
- Wetlands restoration activities completed in both Northern and Western Areas

SEP – Sentinel Wells

Sentinel Well Locations

- Placed between Site and Baldwin Pond Wellfield



SEP – Sentinel Wells

- Groundwater samples collected from wells in October 2010
 - Pursuant to agreement with Conservation Commission
 - Analyzed for VOCs by Method 8260B
- Compounds detected in October (maximum concentration)
 - Chloroform (4.2 µg/L)
 - cis-1,2-Dichloroethene (1.0 µg/L)
- Fewer compounds detected than in April 2010
- Lower concentration of chloroform than April 2010
- Below MCP Reportable Concentrations

Q & A

PIP Schedule

- Raytheon will continue to make documents available at the information repositories (Public Library and Board of Health) and extranet web site
www.ermne.com; username – raytheon; password – wayland
- Next PIP meeting: Spring 2011