Occidental Chemical Montague, Michigan Amended Proposed Remedy

Updated Remedial Strategy to Address Contaminated Groundwater and Source Areas

Remedial Actions Taken

- 1979 Michigan Consent Judgment
  - Clean up contaminated soils down to water table
  - Construct waste containment vault (landfill)

Remedial Actions Taken

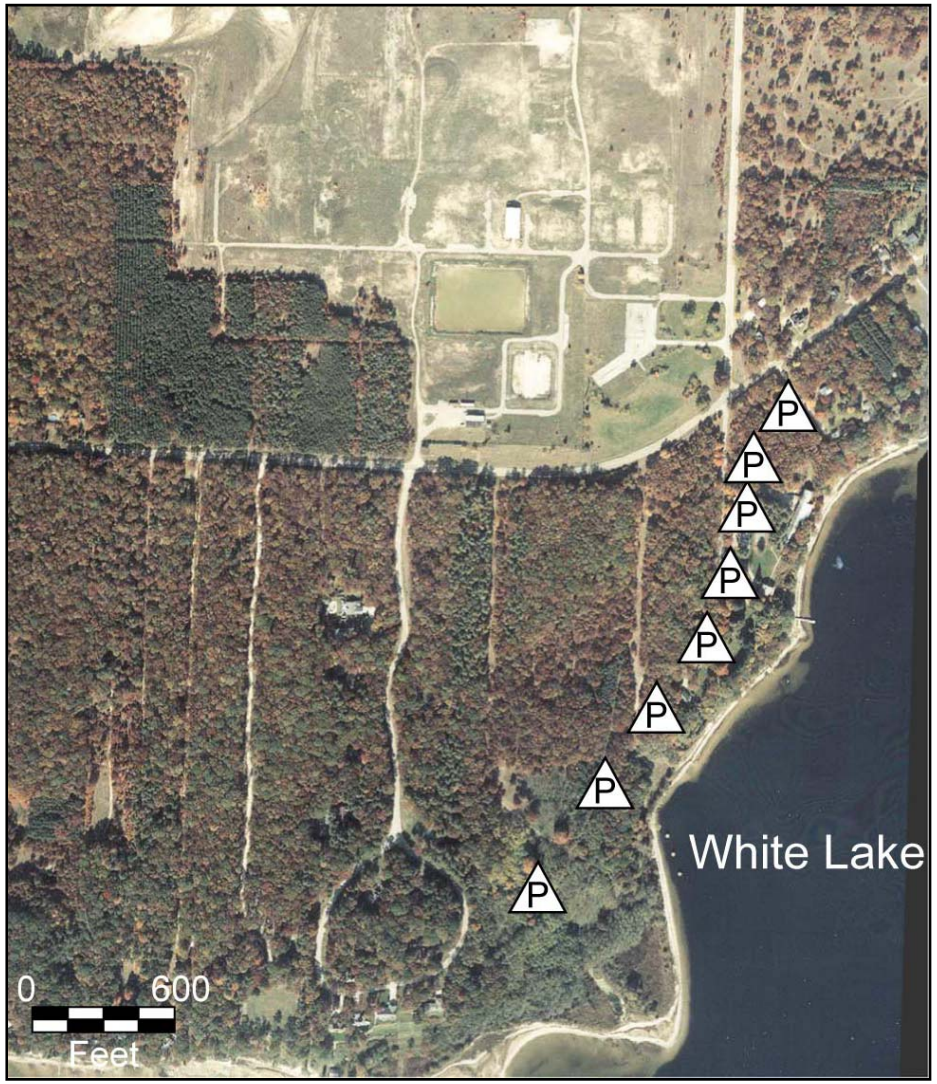
- 1979 Michigan Consent Judgment
  - Install purge wells to eliminate discharge to White Lake
  - Groundwater from purge wells treated with carbon and discharged to Lake
  - Provide potable water to residential area

Remedial Actions Taken

- 2001 RCRA Final Decision
  - Continue to operate purge wells at White Lake
  - Excavate 525 tons of contaminated soil and cap six small areas
  - Dredge contaminated sediment from White Lake
  - Control property use
  - Conduct bench and pilot tests to evaluate technologies to treat source areas and expedite the time to clean up groundwater

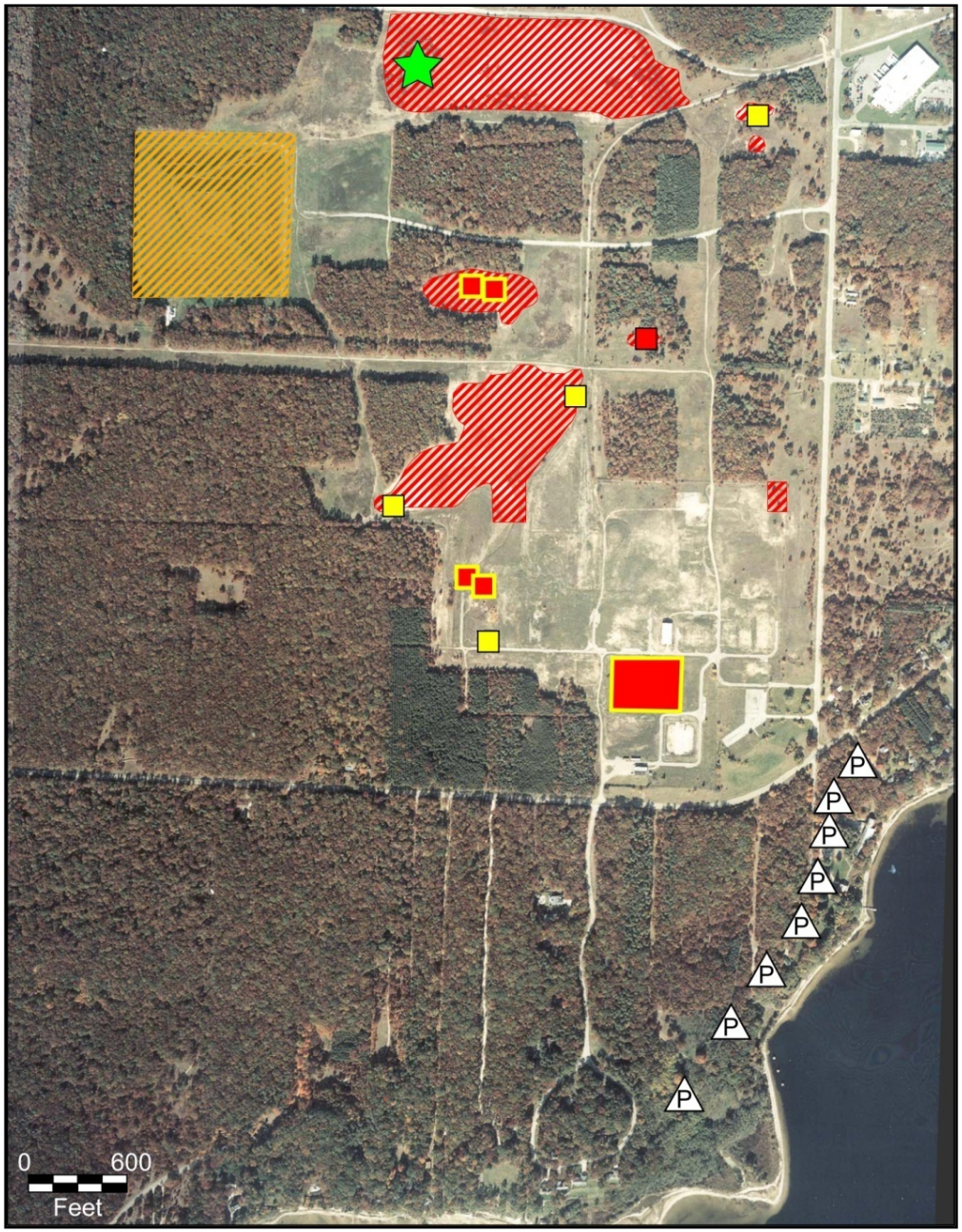
Purge Wells

- 8 wells installed down gradient of site at White Lake
- Capture chemicals dissolved in groundwater
- Prevents groundwater from entering Lake



Remedial Actions Taken

- Pilot Tests
- Purge Wells
- Soil Cap
- Excavation
- Excavation and Cap
- Excavated Areas
- Storage Vault

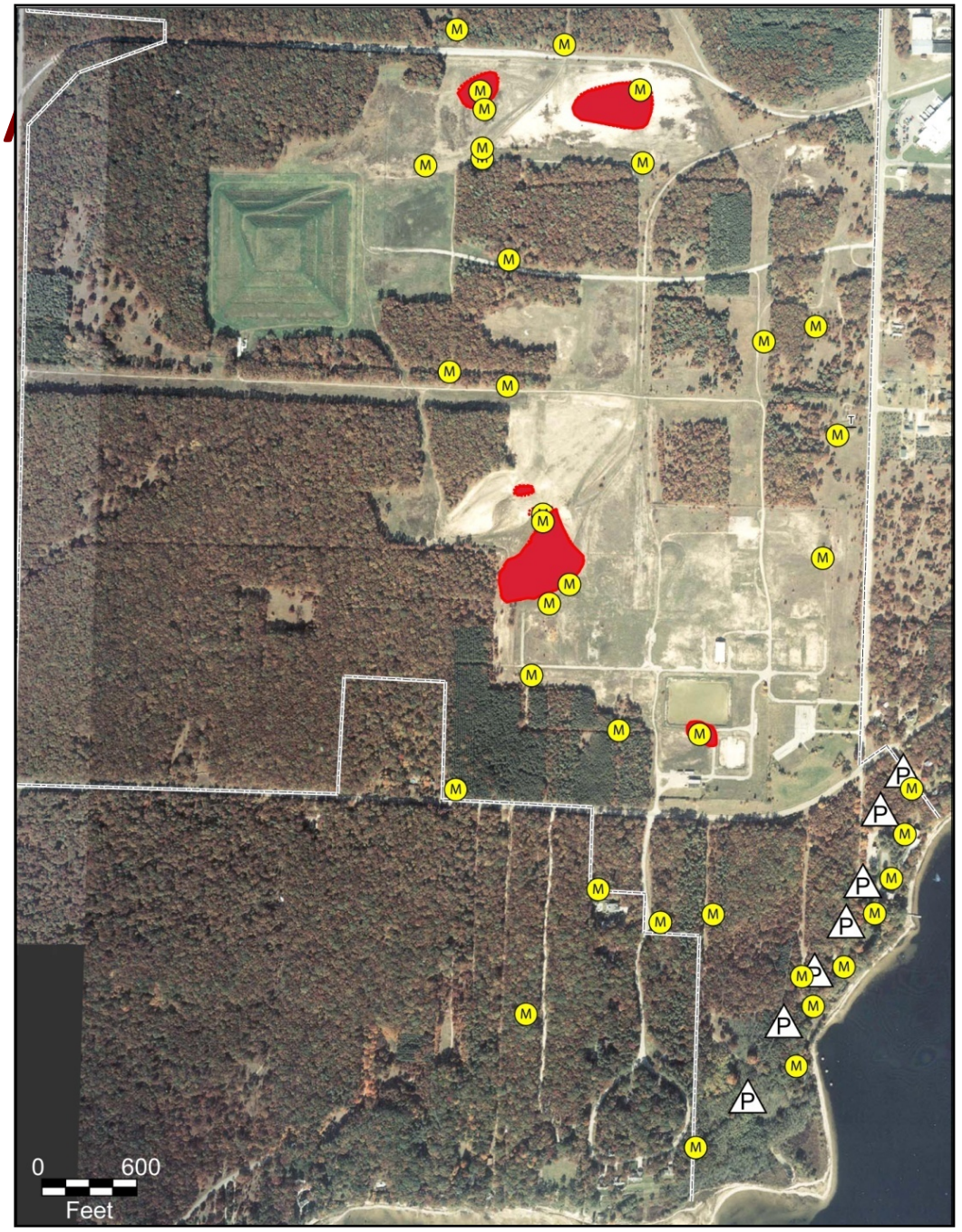


White Lake

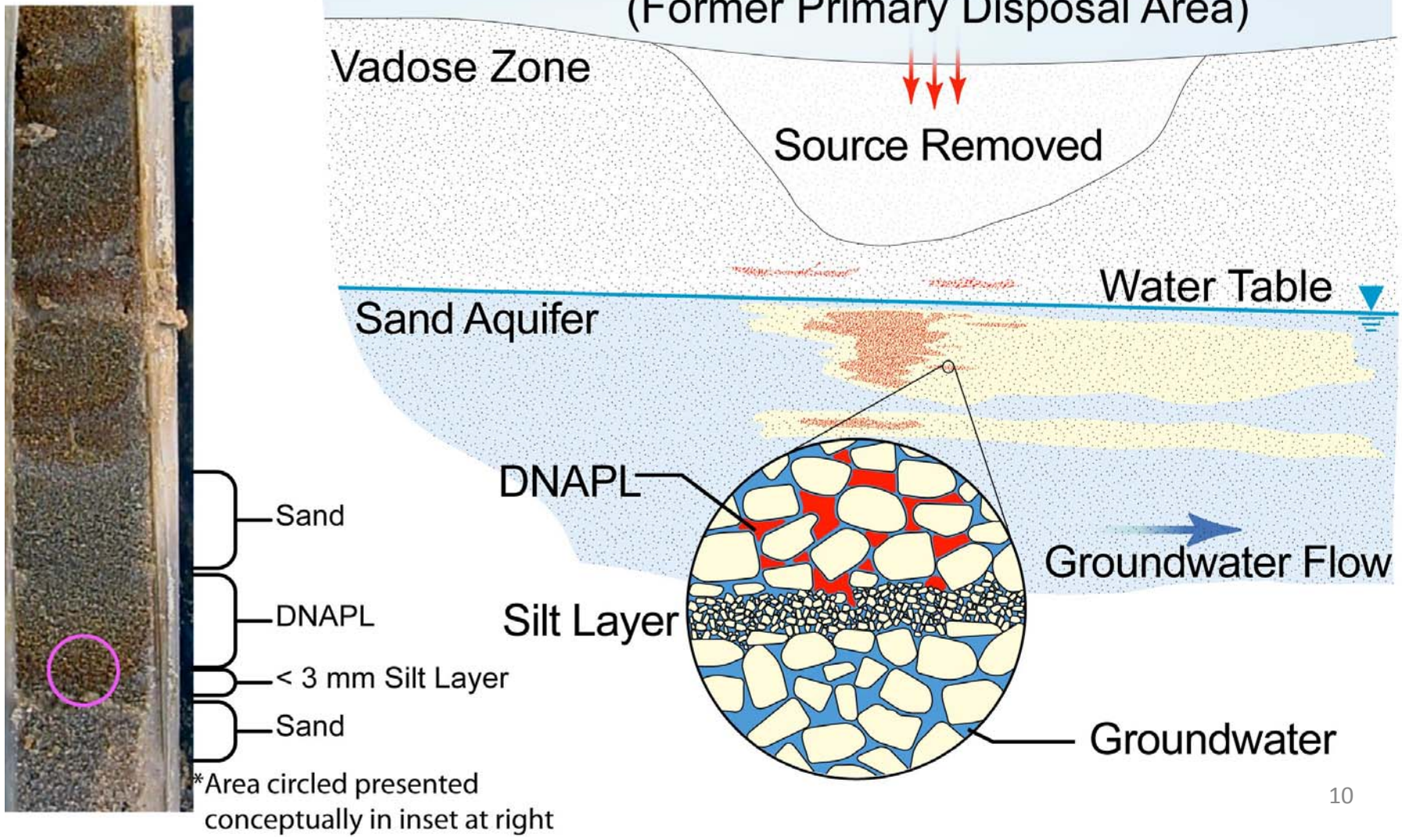
- Dredge 10,500 cubic yards of sediment from July to September 2003
- Removed PCB and HCB from Lake environment

Dredge Area (off Dowie's Point)

Extent of Source A



DNAPL Distribution in Sandy Soils



Groundwater Plume Captured

Extent of Dissolved VOC Plume

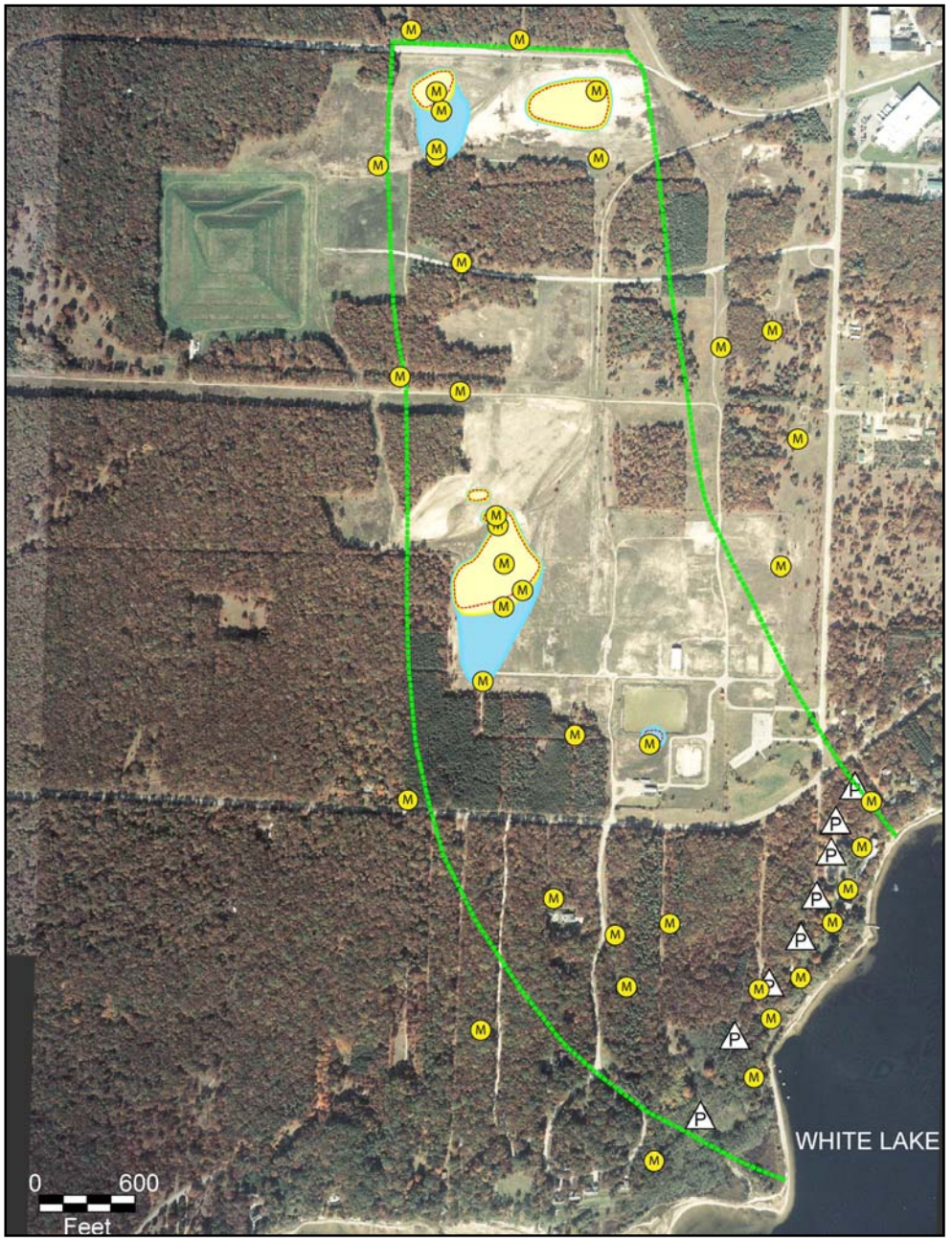
Purge Wells

Monitoring Wells

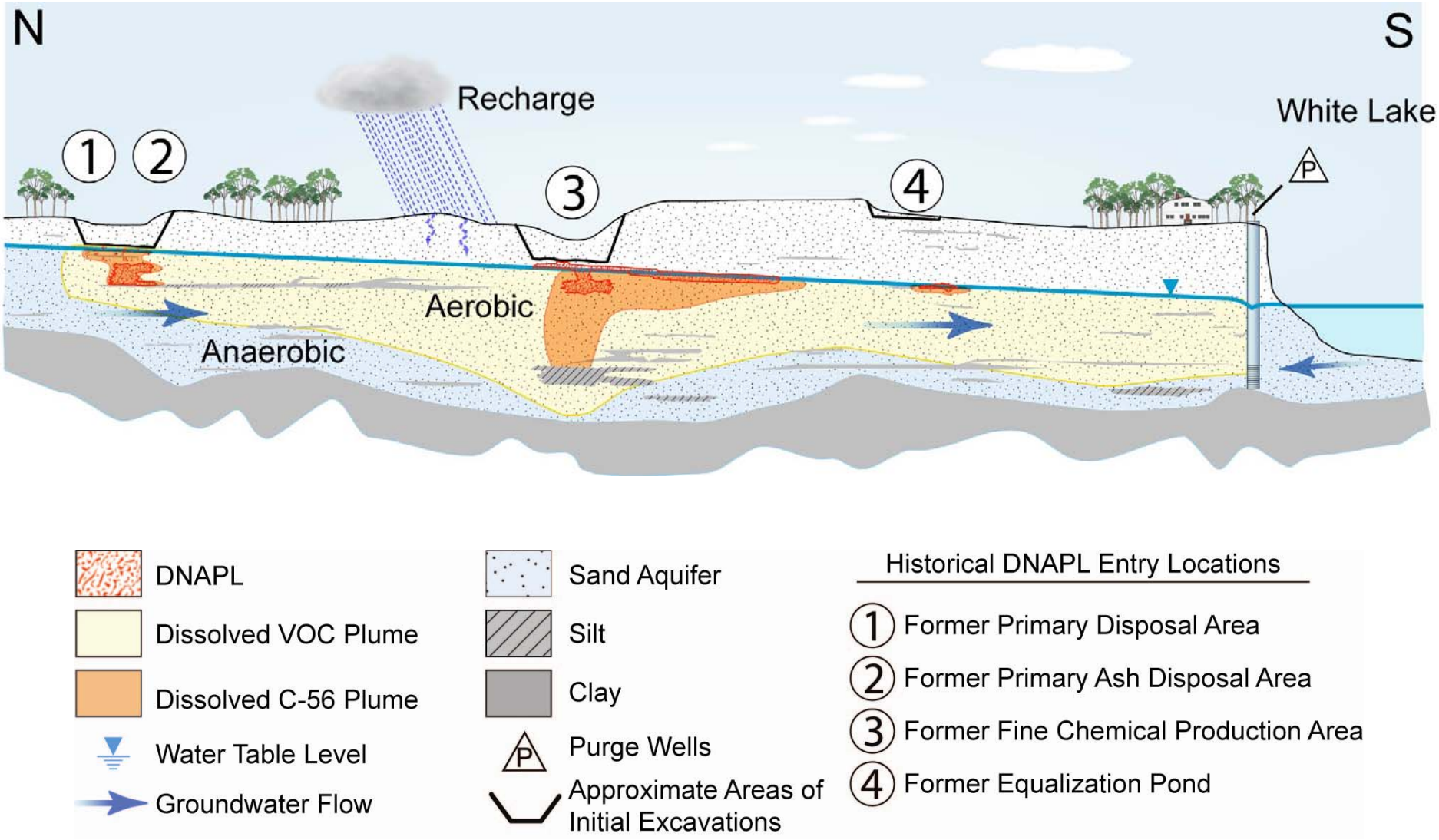
DNAPL Extent

C-66 and C-58 > Criteria

C-56 > Criteria



Conceptualized Cross Section



Innovative Technologies Evaluated

- Chemical
  - In Situ Chemical Oxidation (ISCO)
  - Zero Valent Iron (ZVI)
- Biological
  - Enhanced Reductive Dechlorination (ERD)
- Physical
  - Surfactant Enhanced Aquifer Remediation (SEAR)
  - In-Situ Thermal Desorption (ISTD)
  - DNAPL Extraction/Pump and Treat

In Situ Chemical Oxidation

- Extensive laboratory bench tests
- Full pilot study in the field
  - Hydrogen peroxide with iron catalyst
  - Ozone with hydrogen peroxide

Enhanced Reductive Dechlorination

- Laboratory bench studies
- Full 9-month field pilot study

Other Technologies Evaluated

- Physical Containment
  - Barrier walls keyed into clay at 100 to 130 feet
- Excavation and Disposal
  - Assumes removal of 90% or over 500 tons of contaminant mass
  - Cost $145 M
- In-Situ Solidification (ISS)
  - Mix soil with reagent to reduce permeability
  - Cost $88 M

Estimated Cleanup Time

Baseline Conditions vs. 90% Removal by Excavation and Disposal

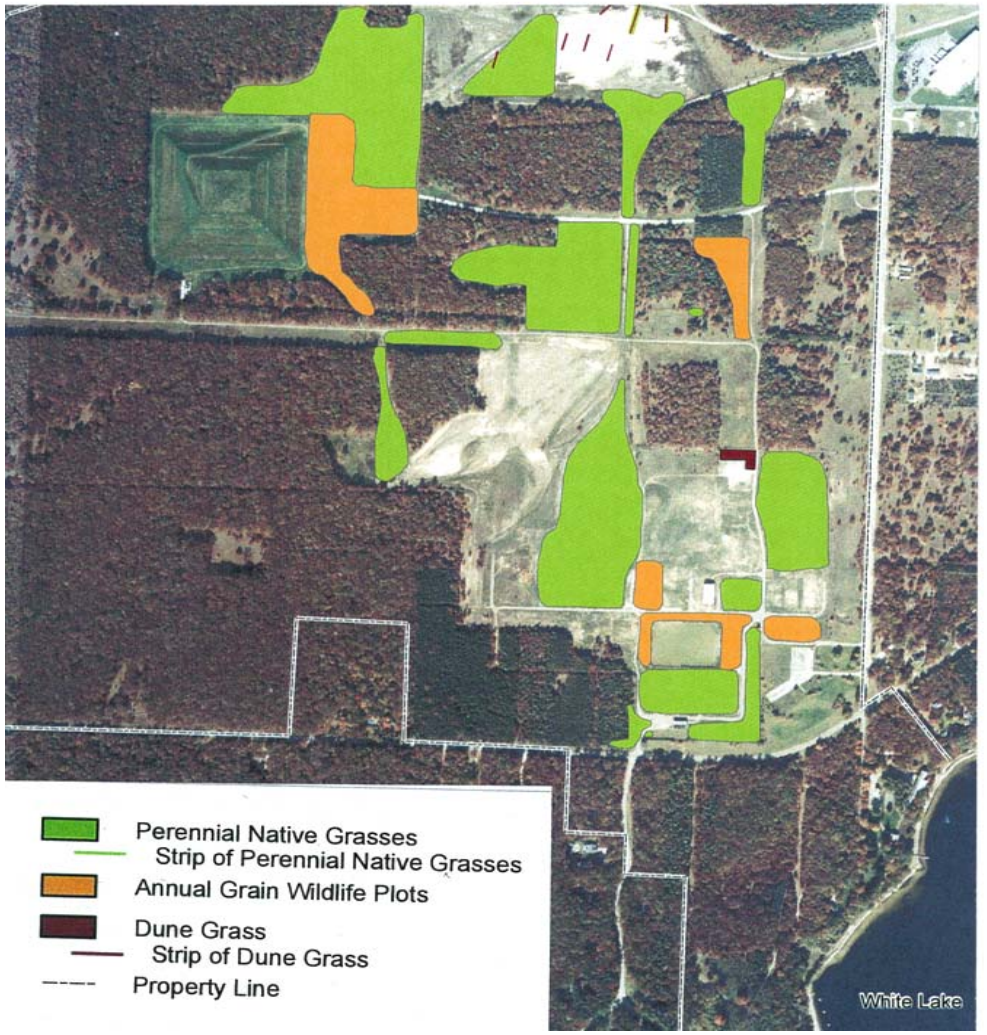
	Former Primary Disposal Area		Former Primary Ash Disposal Area		Former Fine Chemical Production Area		Former Equalization Pond Area	
Constituent	Baseline	90% Removal	Baseline	90% Removal	Baseline	90% Removal	Baseline	90% Removal
C-56	> 10,000 yr	4,900 yr	1,365 yr	12 yr	6,900 yr	1,980 yr	1,220 yr	280 yr
C-58	> 10,000 yr	79 yr	1,480 yr	45 yr	2,090 yr	36 yr	ne	ne
PCE	1,540 yr	890 yr	na	na	174 yr	138 yr	440 yr	40 yr
CT	308 yr	210 yr	na	na	na	na	na	na
C-26	355 yr	160 yr	na	na	810 yr	445 yr	na	na

na - not applicable, constituent has zero mass
ne – not evaluated, baseline concentration is below criteria

Other Technologies and Controls Evaluated

- Groundwater Extraction and Treatment
  - Add a new line of 6 purge wells
  - 18 year cleanup time frame
- Technical Impracticability (TI Zone)
  - Waiver to clean up groundwater in a reasonable time frame
  - Re-evaluate technologies every 5 years

Proposed Remedy

- Additional line of six purge wells
- TI zone to north
- Reduce footprint to south (about 90 acres)

Voluntary Habitat Restoration