Citizens Coordinating Council Meeting
Silver Lake Bench-Scale Study Results

March 30, 2006
Pittsfield, Massachusetts

Silver Lake Presentation

- Background
- Bench-Scale Study Results
- Questions

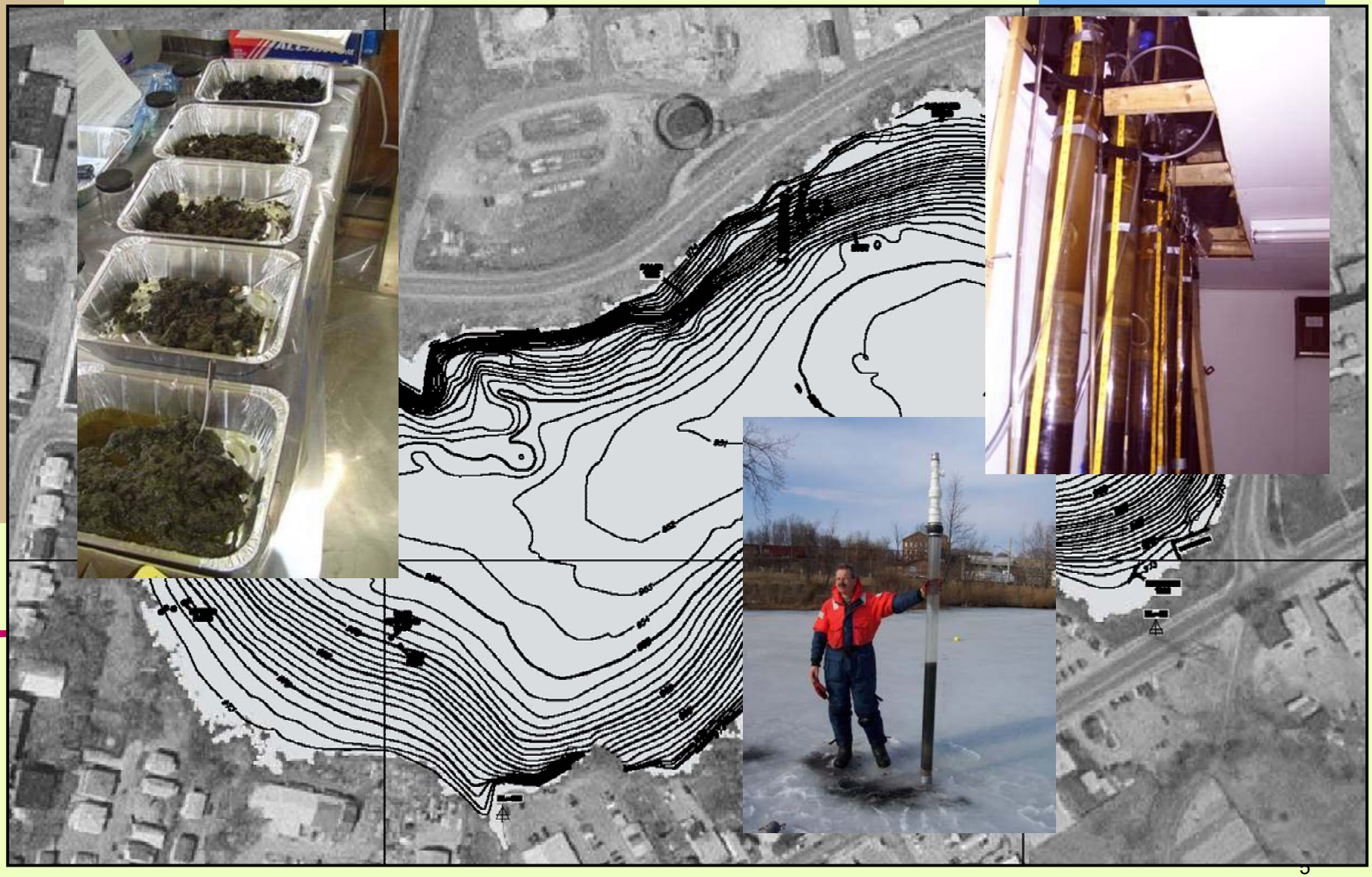
Background

- Consent Decree (CD) and accompanying Statement of Work (SOW) established Performance Standards and provided initial conceptual design for Silver Lake cap.
- Install a cap over the entire bottom of the lake including:
  - Isolation layer with presumptive thickness of 6 inches and total organic carbon (TOC) of 0.5%.
  - Additional 4-6 inches of isolation layer material to account for potential bioturbation and mixing.
  - Armoring layer along shoreline.

Background

- **Series of Pre-Design Investigation (PDI) studies performed from 2003-2005:**
  - ***Pre-Design Investigations Report for Silver Lake Sediments (BBL, December 2004)***
  - ***Supplemental Pre-Design Investigations for Silver Lake Sediments (BBL, April 2005)***
- **PDI activities provided confirmation of initial cap design parameters.**
- **A series of Bench-Scale studies were proposed to gain additional information related to the design and construction of the Silver Lake cap.**

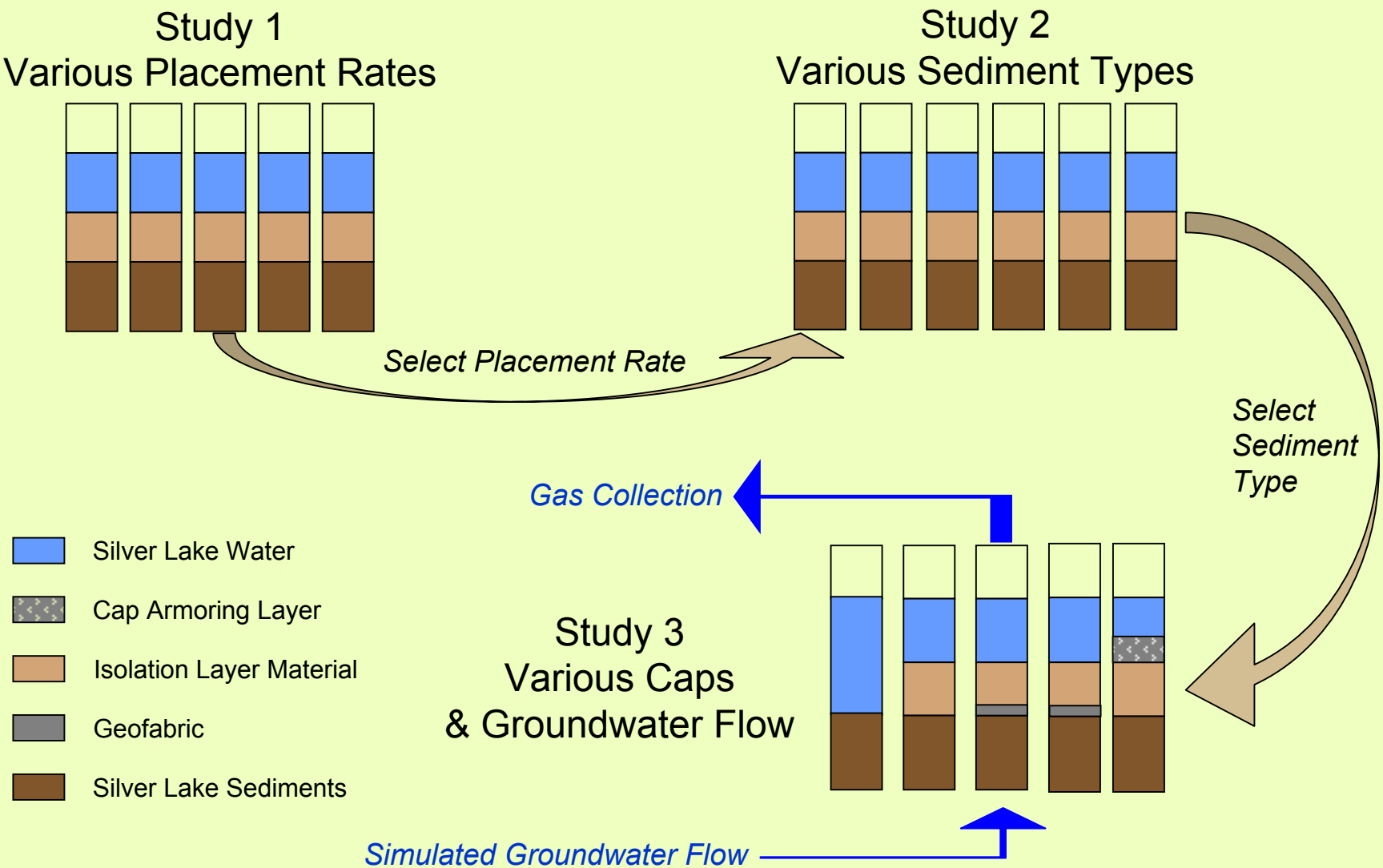
Bench-Scale Study



Bench-Scale Studies

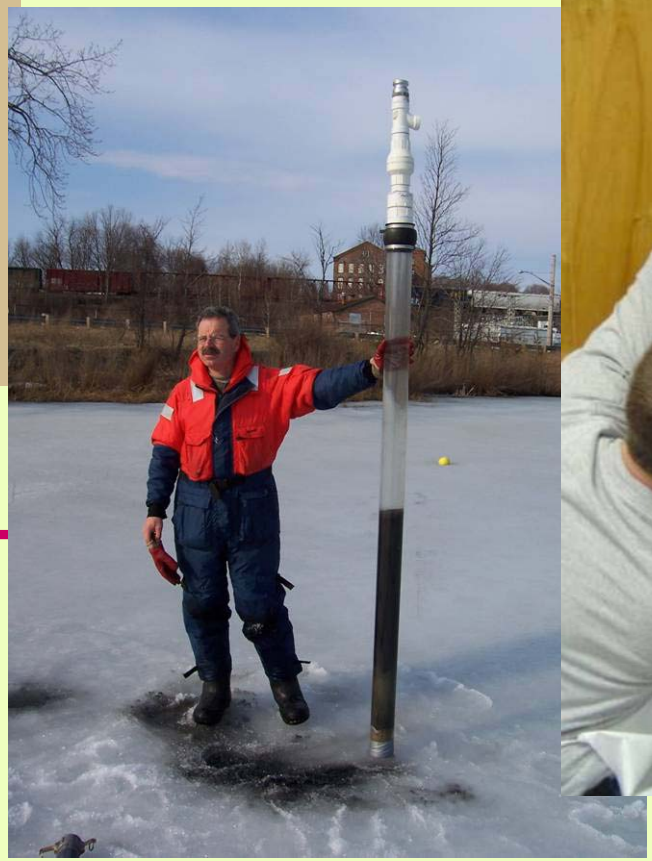
- **Study 1**
  - Evaluate the extent of mixing and consolidation caused by placement of isolation layer materials at varying rates.
- **Study 2**
  - Evaluate the extent of mixing, consolidation, and potential PCB migration caused by placement of isolation layer materials at a fixed rate over sediment types with varying physical and chemical characteristics.
- **Study 3**
  - A longer duration mixing/consolidation and PCB transport study performed with various cap configurations, groundwater flow, and gas collection.

Bench-Scale Studies



Study 1 - Objective

- ***Evaluate the extent of mixing and consolidation caused by placement of isolation layer materials at varying rates.***

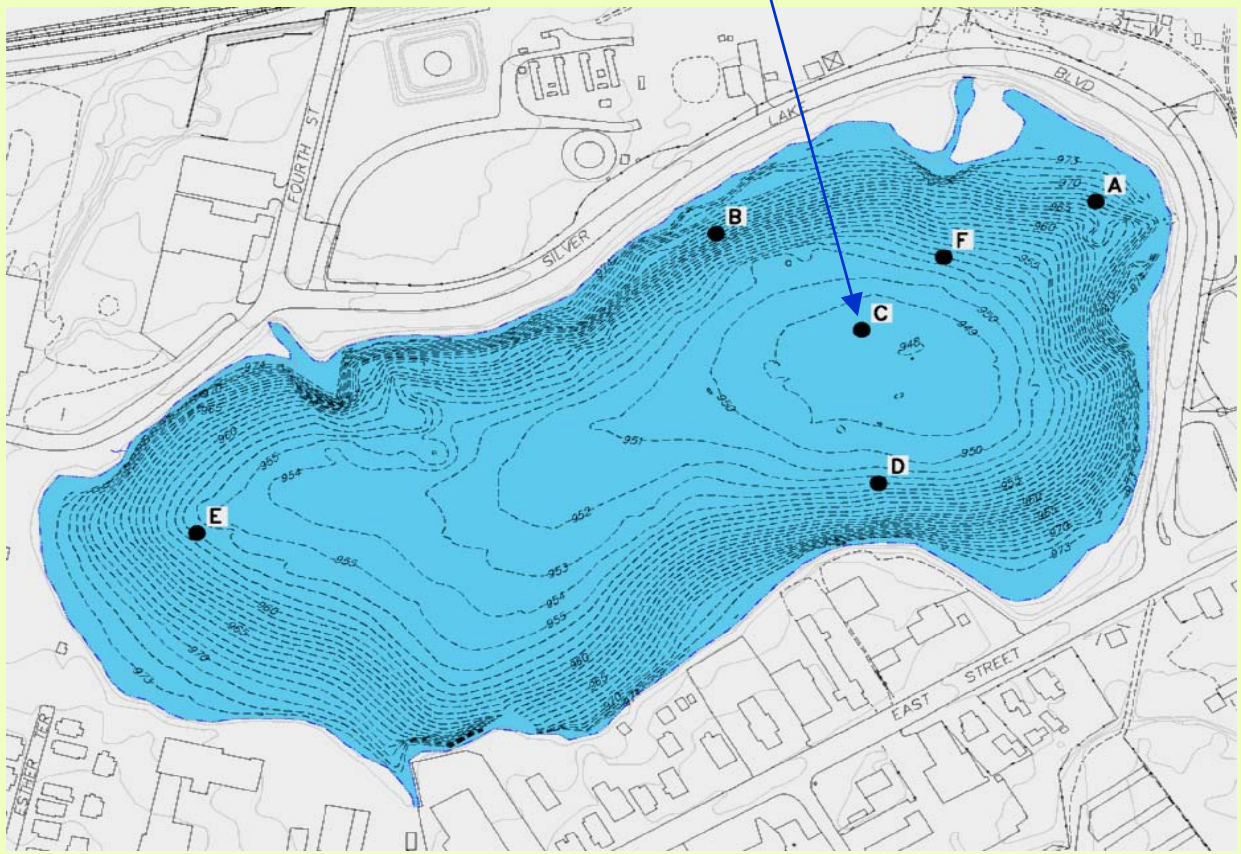


Study 1 – Sediment Core Collection

- **Five sediment cores collected from center of lake using 4-inch diameter Lexan cores.**

  - **Each core contained 3-4 feet of sediment and 2-3 feet of lake water.**

  - **Cores transported to GE facility for testing.**



Study 1 - Procedures

- Isolation layer materials comprised of soil/sand mixture with average total organic carbon (TOC) of 1.2%.
- 12 inches of isolation layer materials placed through water column at varying rates:
  - Three one-inch lifts placed each day for four consecutive days.
  - Three inches placed on day one and nine inches placed on day two at a rate of one inch per minute.
  - Twelve inches placed over 12 minutes.
  - Twelve inches placed over one minute.

Study 1- Results

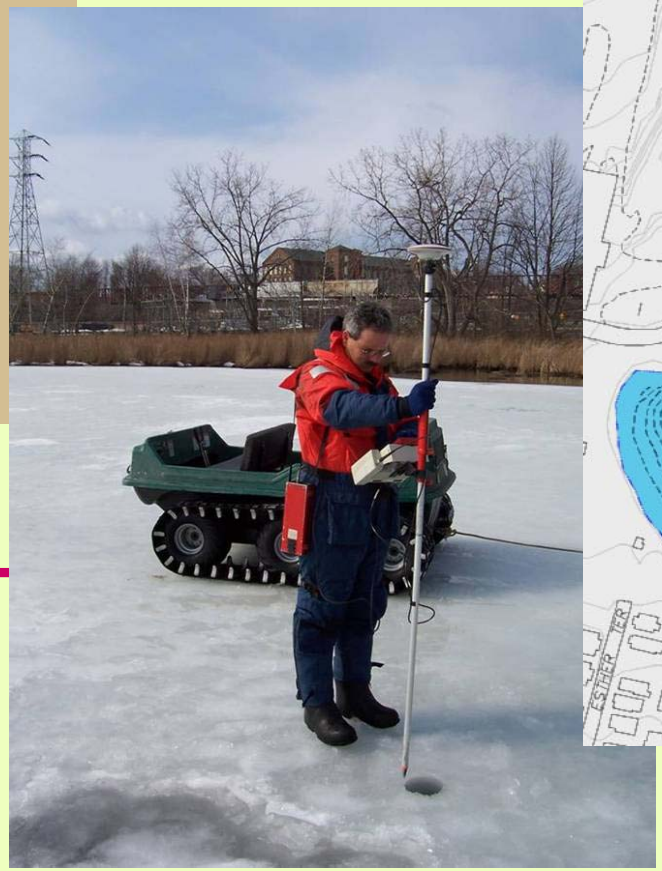
- Sediment bearing capacity sufficient to support cap.
- Minimal mixing of sediment and isolation layer material observed only with highest placement rate.
- Some stratification of fines and sands noted in cap material.
- Placement rate of 3 one-inch lifts/day for four days selected for Studies 2 and 3.

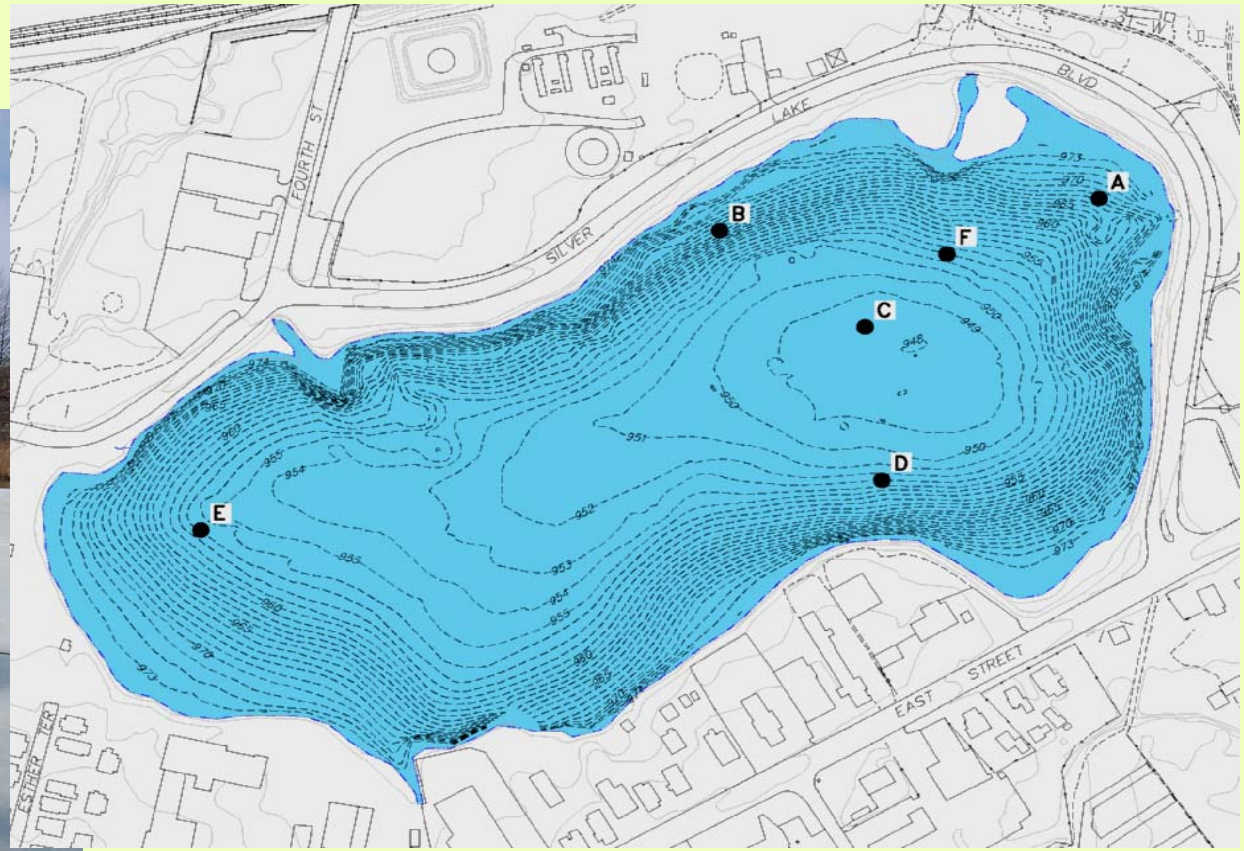
Study 2 - Objective

- ***Evaluate the extent of mixing, consolidation, and potential PCB migration related to placement of isolation layer materials at a fixed rate over sediment types with varying physical and chemical characteristics.***

Study 2 – Sediment Core Collection

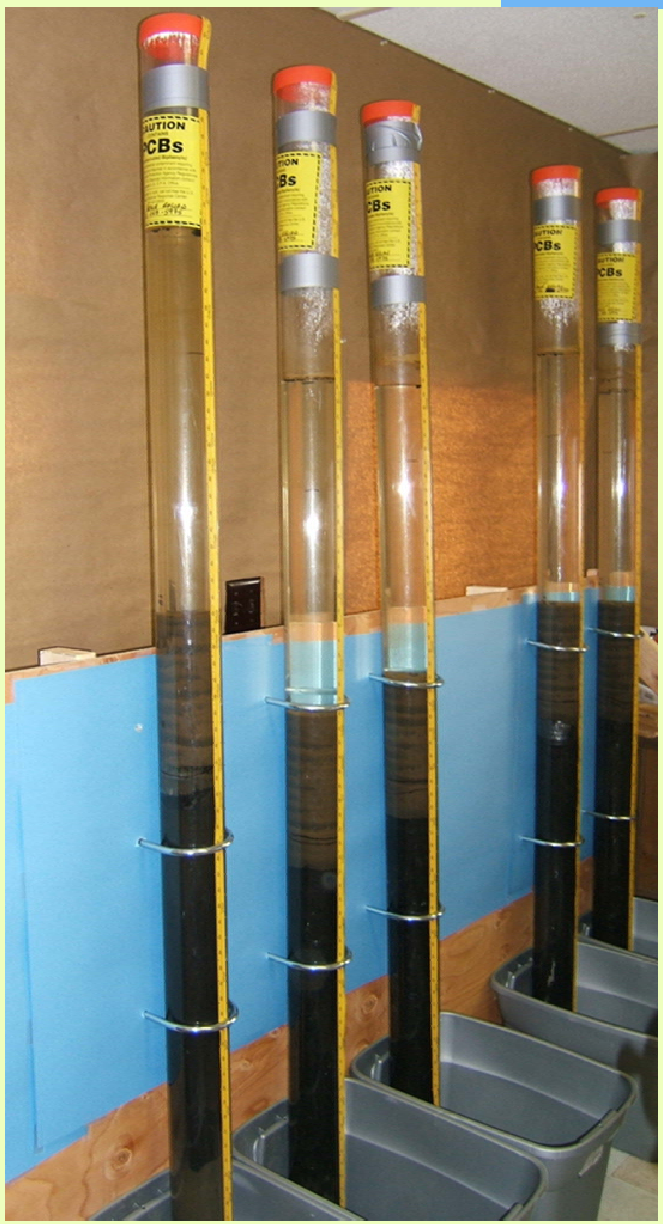
- **Sediment cores collected from six locations with varying physical and chemical characteristics.**



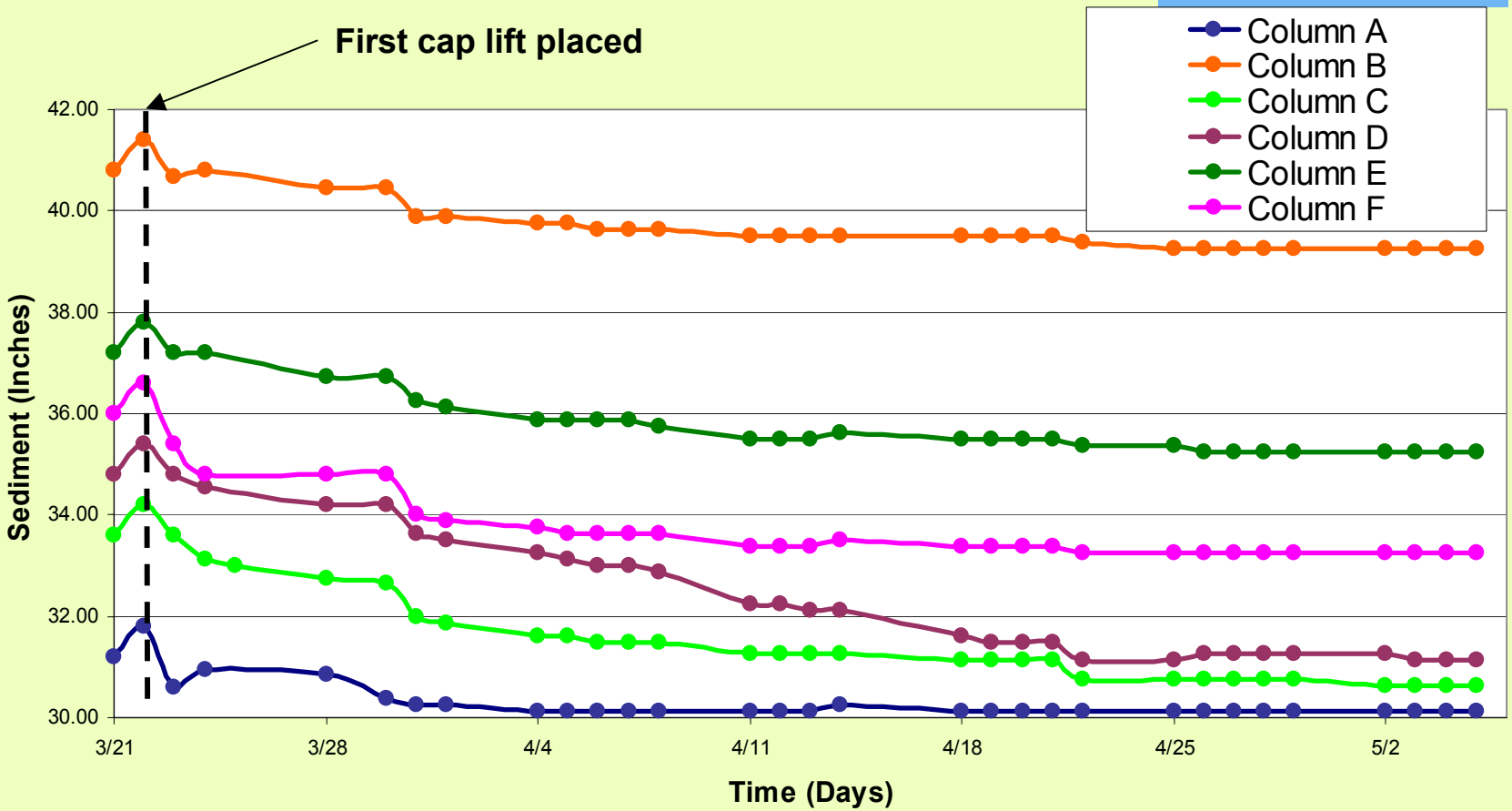


Study 2 - Procedures

- Each core contained approximately 3 feet of sediment and 2 feet of lake water.
- 12 inches of cap material added to each core in 3 one-inch lifts/day.
- Cores allowed to consolidate for 45 days.
- Sediment analyzed for PCBs. Cap material analyzed for TOC and PCBs.

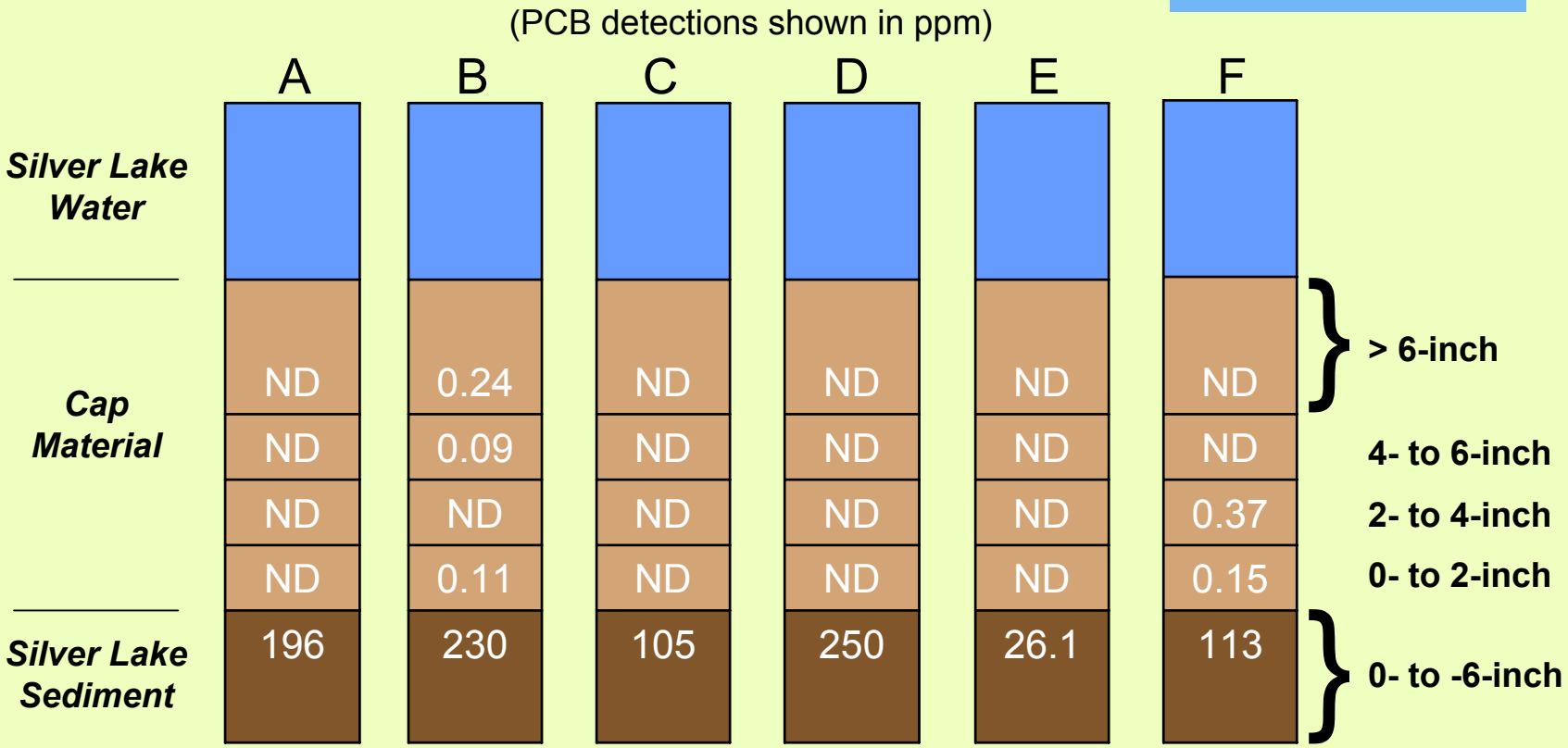


Study 2 - Consolidation Results



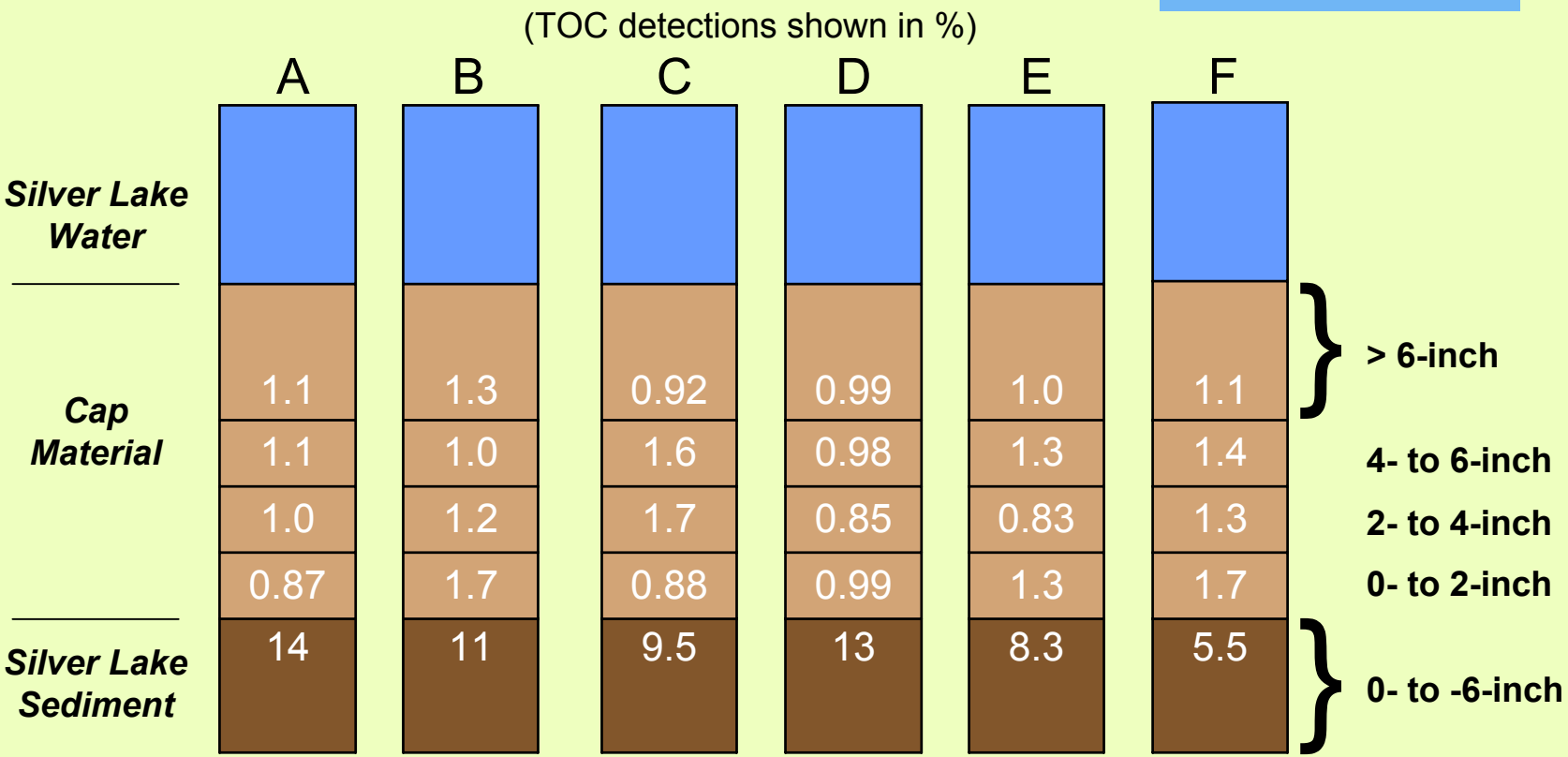
- Majority of consolidation complete in first two weeks.
- Consolidation ranged from 1.1 to 3.7 inches.
- Maximum consolidation observed at location D.

Study 2 - PCB Analytical Results



- PCBs detected in 5 of 24 cap samples (maximum 0.37 ppm).
- PCB detections in 0-2 inch cap increment likely due to mixing observed during cap placement.
- No gradient indicative of PCB migration observed.

Study 2 - TOC Analytical Results



- **All cap sand sample TOC results are greater than the 0.5% specified in the SOW.**

Study 2 - Results

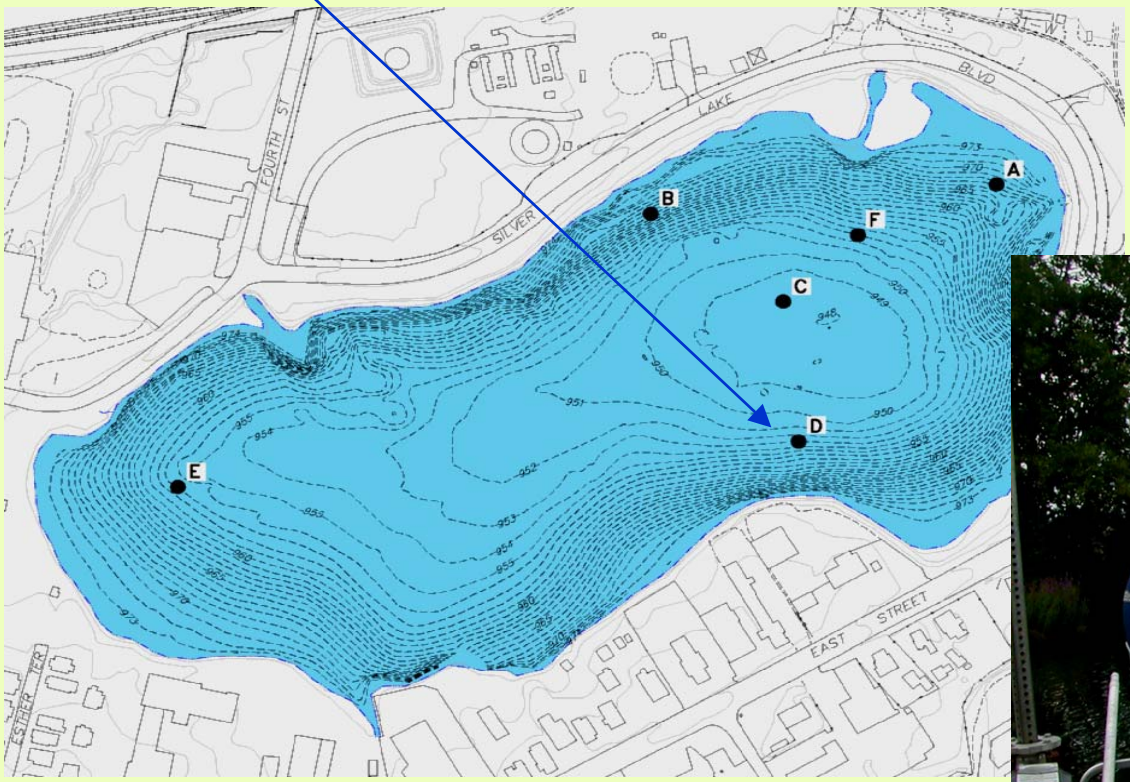
- Cap placement does not result in PCB migration.
- Sediments are able to support weight of cap materials with minimal mixing.
- Location D chosen as Study 3 sediment collection location:
  - Maximum consolidation observed (3.7 inches).
  - Maximum PCB in sediment (250 ppm).

Study 3 - Objective

- Investigate potential PCB transport related to:
  - Groundwater flow.
  - Gas generation.
- Investigate benefits of including geofabric in cap configuration.

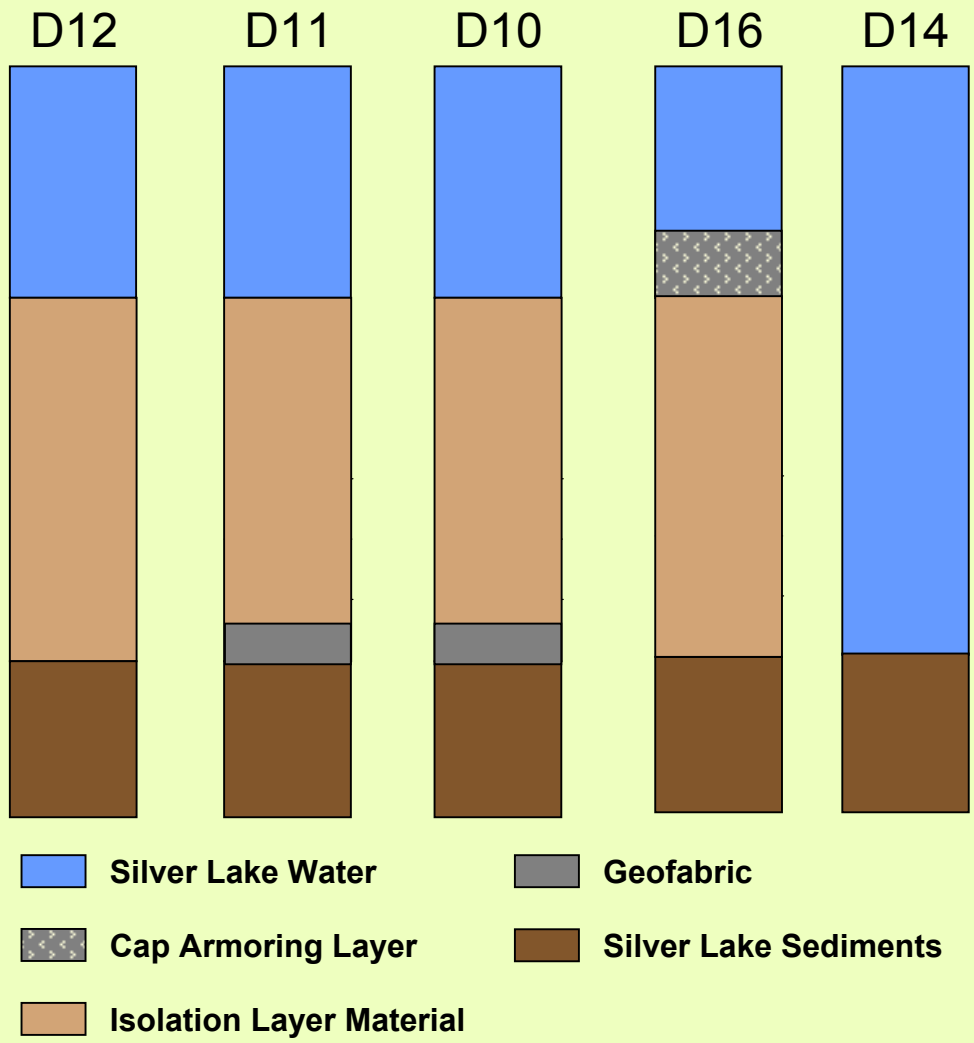
Study 3 – Sediment Core Collection

- **Sediment cores were collected using 4-inch Lexan cores.**



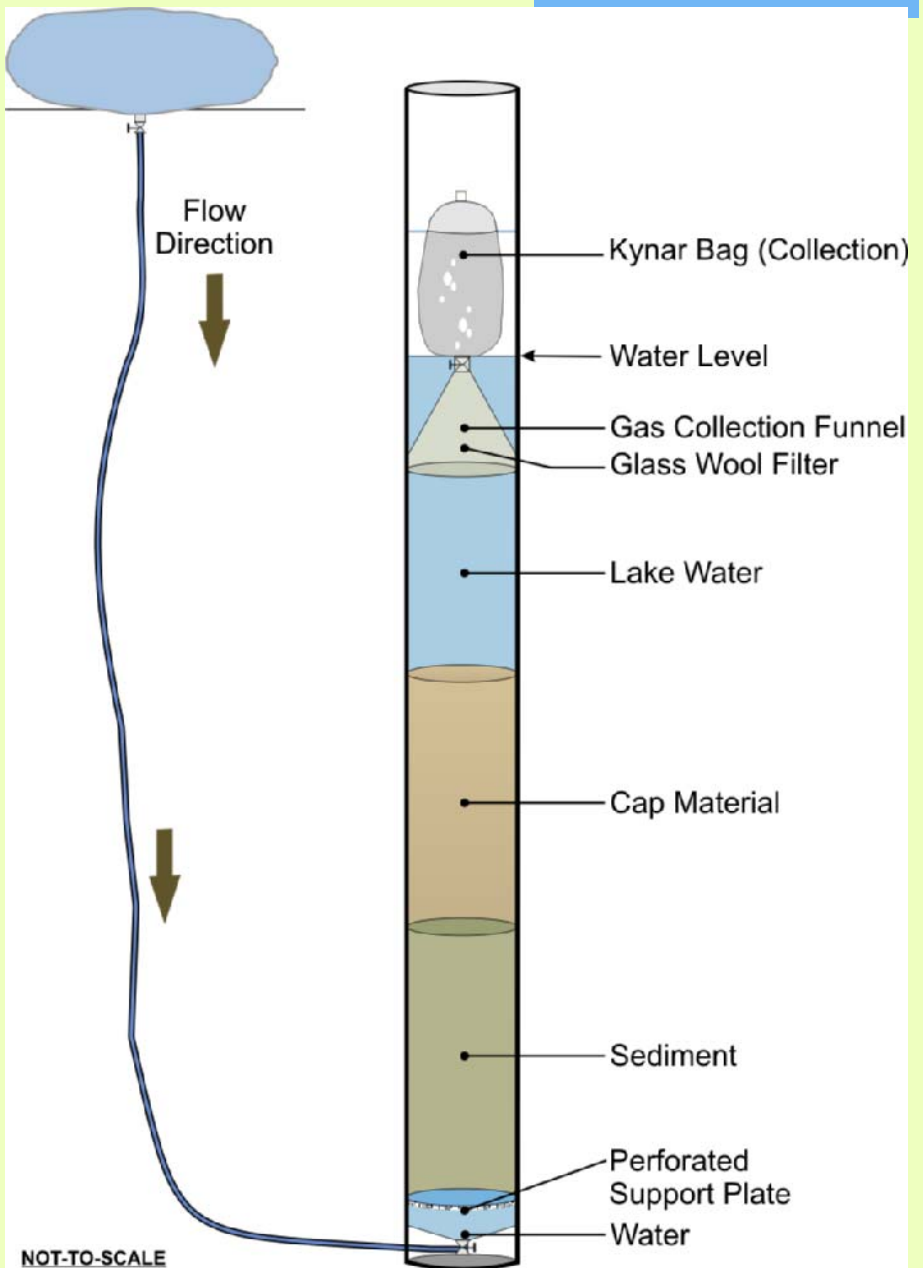
Study 3 – Procedures

- **5 cores with various cap configurations used in study:**
  - **D12 – Isolation layer only**
  - **D11 – Isolation layer and geocomposite**
  - **D10 – Isolation layer and geotextile**
  - **D16 – Isolation layer and armor stone**
  - **D14 – No cap (baseline)**



Study 3 – Procedures

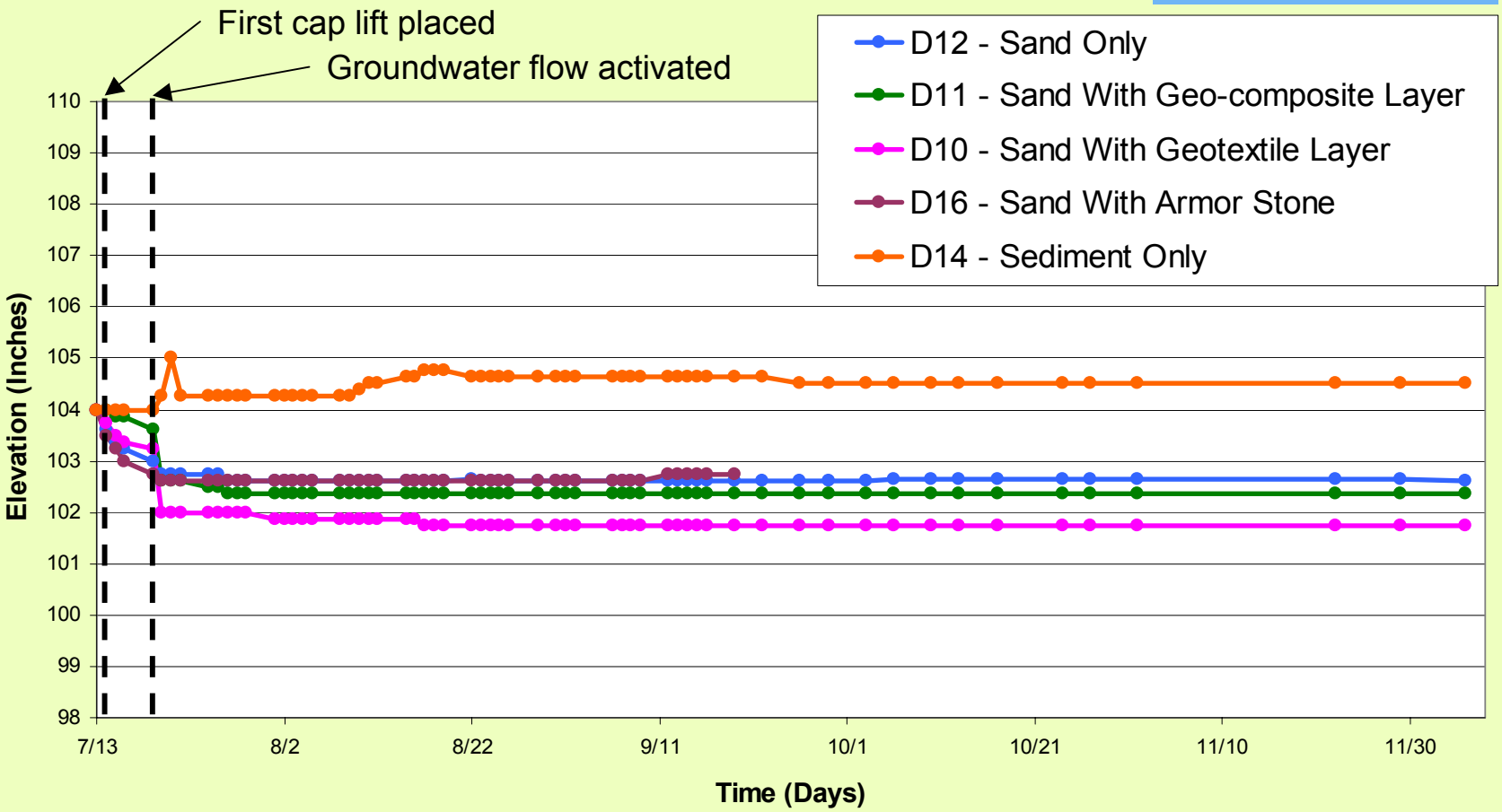
- **Creation of an environment to simulate conditions in lake:**
  - **Groundwater flow (~10X observed lake seepage rates).**
  - **Gas collection.**
- **Longer-term duration (5 months).**



Study 3- Procedures

- Cores allowed to consolidate for five months.
- Groundwater flow and gas collection activated after cap placement complete.
- Sediment and gas filters analyzed for PCBs; Cap material analyzed for TOC and PCBs.

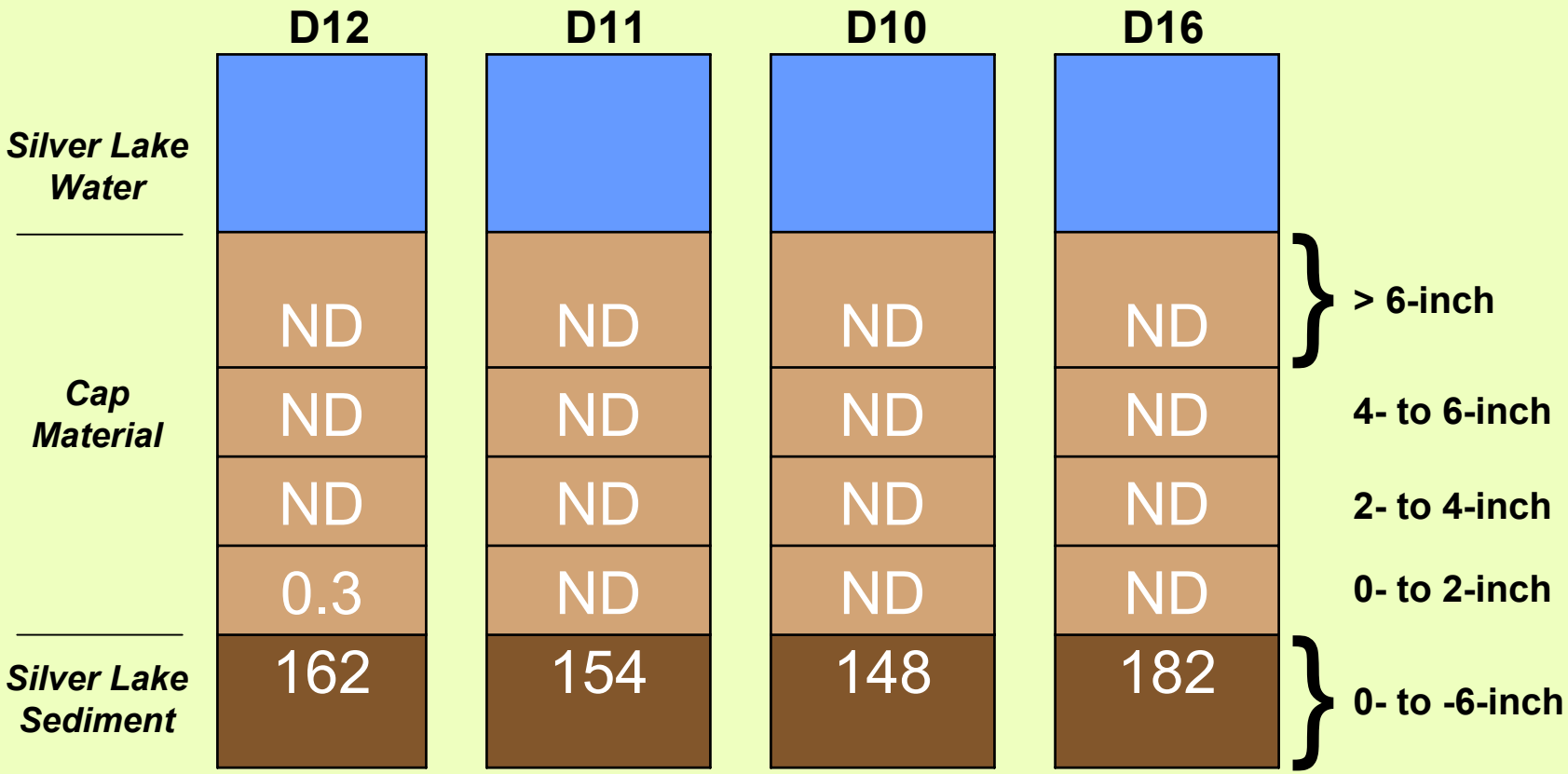
Study 3 - Consolidation Results



- **Majority of consolidation occurred in first two weeks.**
- **Total consolidation ranged from 1.4 to 2.3 inches.**
- **Sediment supported weight of cap materials.**

Study 3 – PCB Analytical Results

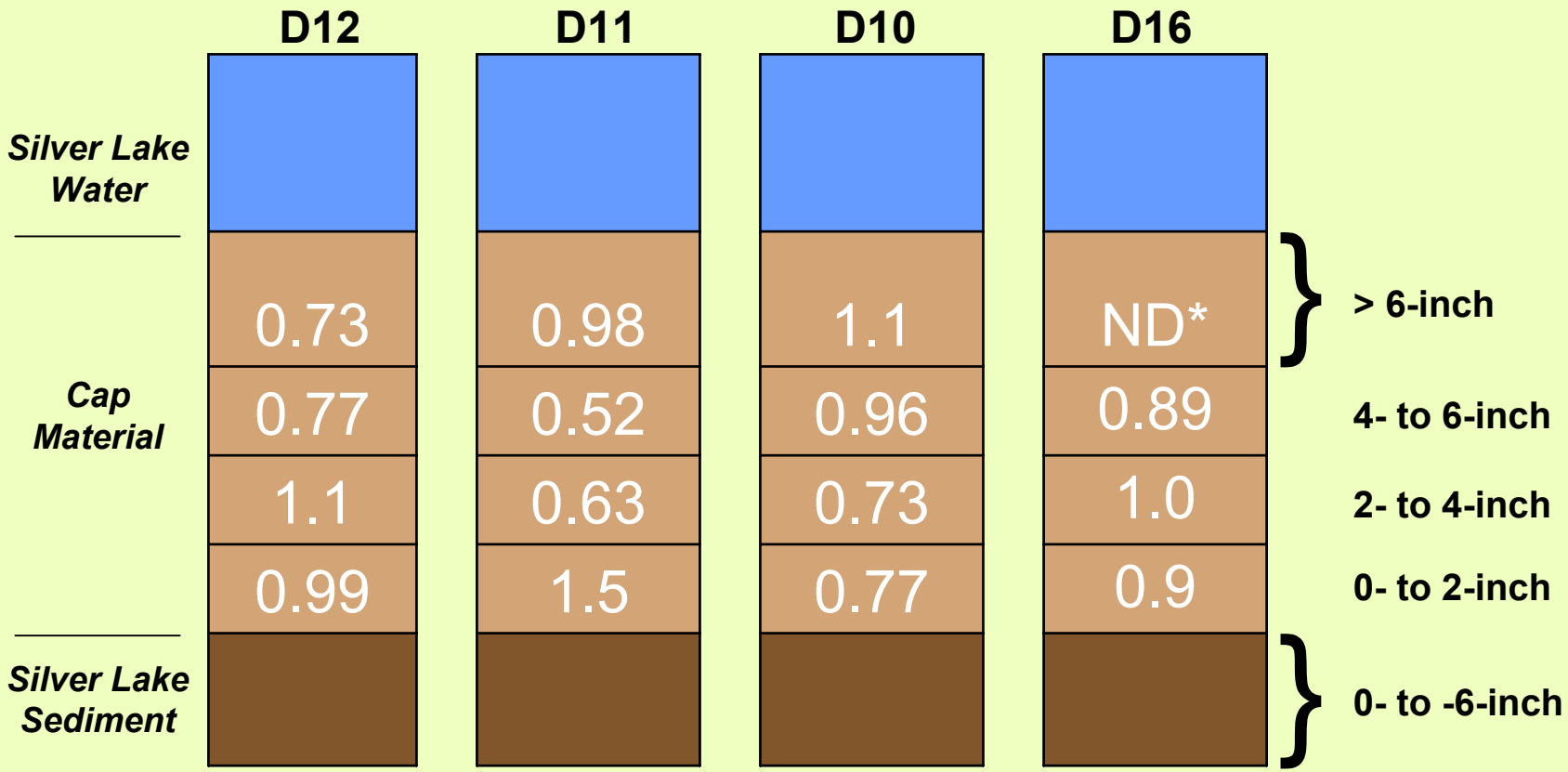
(PCB detections shown in ppm)



- PCBs detected in only 1 of 16 cap samples.
- Only detection in Core D12, 0.3 ppm in 0 to 2 inch layer (mixing observed during cap placement).
- PCBs only detected in gas filter of uncapped core (0.11 ppm).

Study 3 – TOC Analytical Results

(TOC detections shown in %)



- **15 of 16 cap sand sample TOC results exceeded 0.5% specified in the SOW**

Study 3 - Results

- Geofabrics in cap configuration appear to reduce the potential for mixing at sediment/cap interface.
- Sediments are able to support weight of cap materials and armor stone for extended periods.
- Presence of groundwater flow does not diminish the caps ability to provide an effective barrier to PCB migration.
- Generation of gas does not enhance the mobility of PCBs in sediment.

Bench-Scale Conclusions

- Sediments are capable of supporting cap materials.
- Conceptual cap configurations provide effective isolation of PCBs in sediment and mitigation of upward PCB migration.
- Conceptual cap design considerations and initial design assumptions as described in SOW are appropriate and do not require modification.

Questions