

Field and Laboratory Verification Techniques for an Interim Sand and Organoclay In-Situ Cap to Address PCB Contamination in the River Raisin

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Team

- **U.S. Environmental Protection Agency Great Lakes National Program Office** – Project Partner, 64% Funding of \$18.9 Million Project Agreement Under Great Lakes Legacy Act (GLLA)
- **Michigan Department of Environmental Quality** – GLLA Non-Federal Project Partner
- **Ford Motor Company** – GLLA Non-Federal Project Partner
- **U.S. Army Corps of Engineers, Detroit District** – GLLA Project Partner, Provided Confined Disposal Facility (CDF) for Placement of Non-TSCA Dredged Sediments and assisted GLNPO with Construction Quality Assurance
- **Environmental Restoration** – GLLA Project General Contractor and Upland Operations
- **J.F. Brennan Company** – GLLA Project Marine Subcontractor for Dredging and Capping Operations
- **Natural Resource Technology** – GLLA Project Construction Quality Control and Environmental Monitoring
- **Anchor QEA** – Consultant to Ford Motor Company
- **CH2M Hill** – Design Engineer for USEPA GLNPO

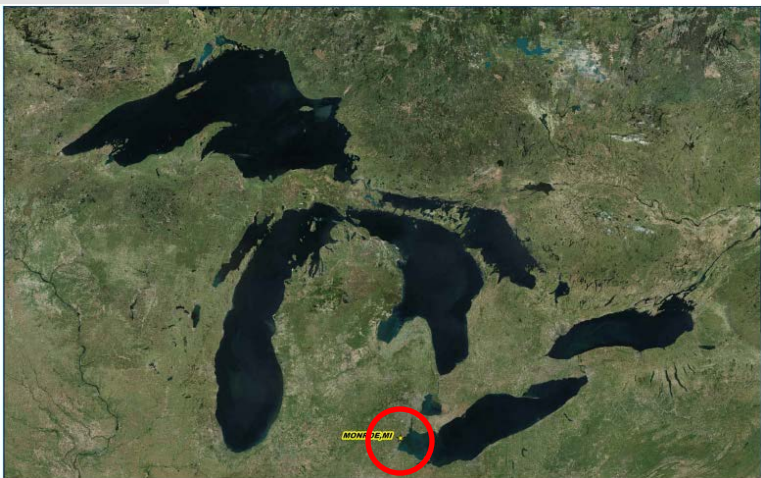


Great Lakes Legacy Act (GLLA)

- Sediment Remediation Program Administered by U.S. EPA's Great Lakes National Program Office (GLNPO)
- Provides Cost-Sharing for Sediment Remediation Projects in Great Lakes Areas of Concern (AOC)
 - Up to 65% Federal Cost-Share
- 21 Sediment Remediation Projects Completed or Underway Since 2004
 - Over \$500 Million in Total Remediation Costs
 - Over 4,000,000 Cubic Yards (cy) of Sediments Remediated
- More Information at: www.epa.gov/glla



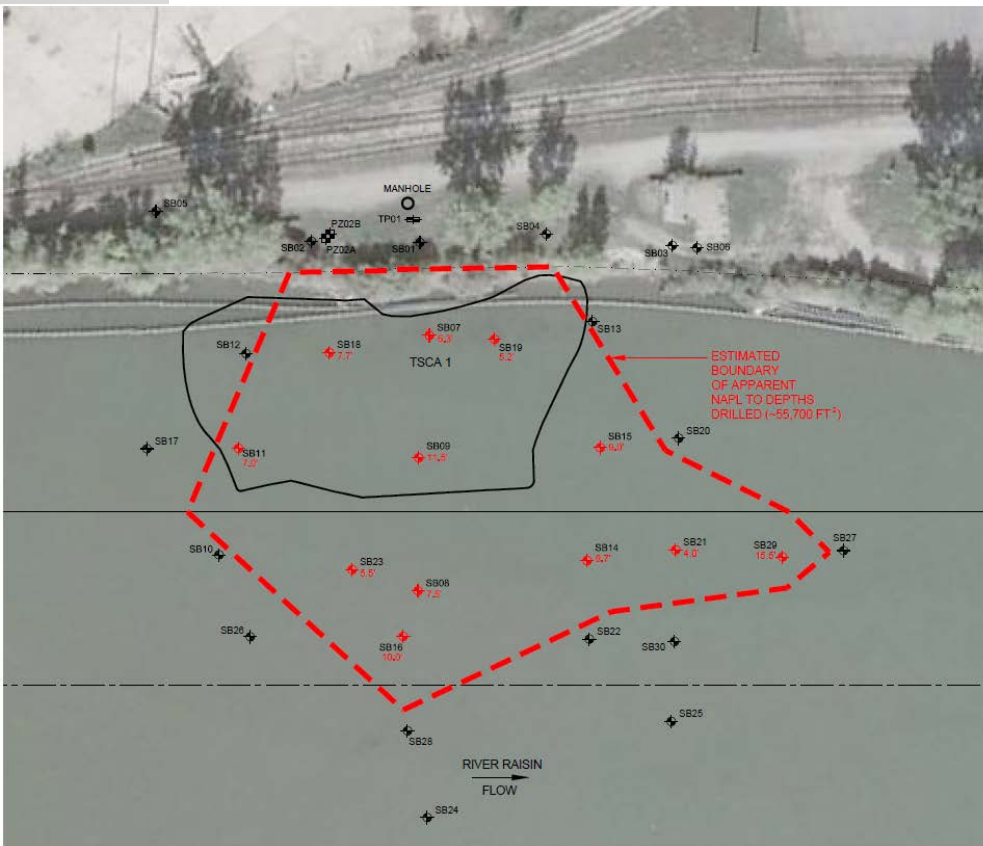
GLLA Project Summary



- 1.1 River Miles; Dredging of PCBs Between Shorelines and USACE Navigation Channel; Goal to Address Beneficial Use Impairments Including Removing Fish Consumption Advisory
- Field Construction Schedule: May–November 2012
- Mechanical Dredging Volume of TSCA Sediment: 2,500 cy
- Hydraulic Dredging Volume of Non-TSCA Sediment Using 8- and 10-in. Swinging Ladder Dredges: 71,457 cy
- Non-TSCA Sediment Placement Site: USACE CDF at Sterling State Park; Existing Sediment Removed from CDF and Beneficially Re-used at Ford Motor Facility to Maintain CDF Capacity
- Area of 6-inch Residual Sand Cover to Achieve SWAC goal: 7.7 acres
- Area of Interim 4 to 6-inch Sand/Organoclay[®] Reactive Cap over Elevated PCBs: 1.6 acres



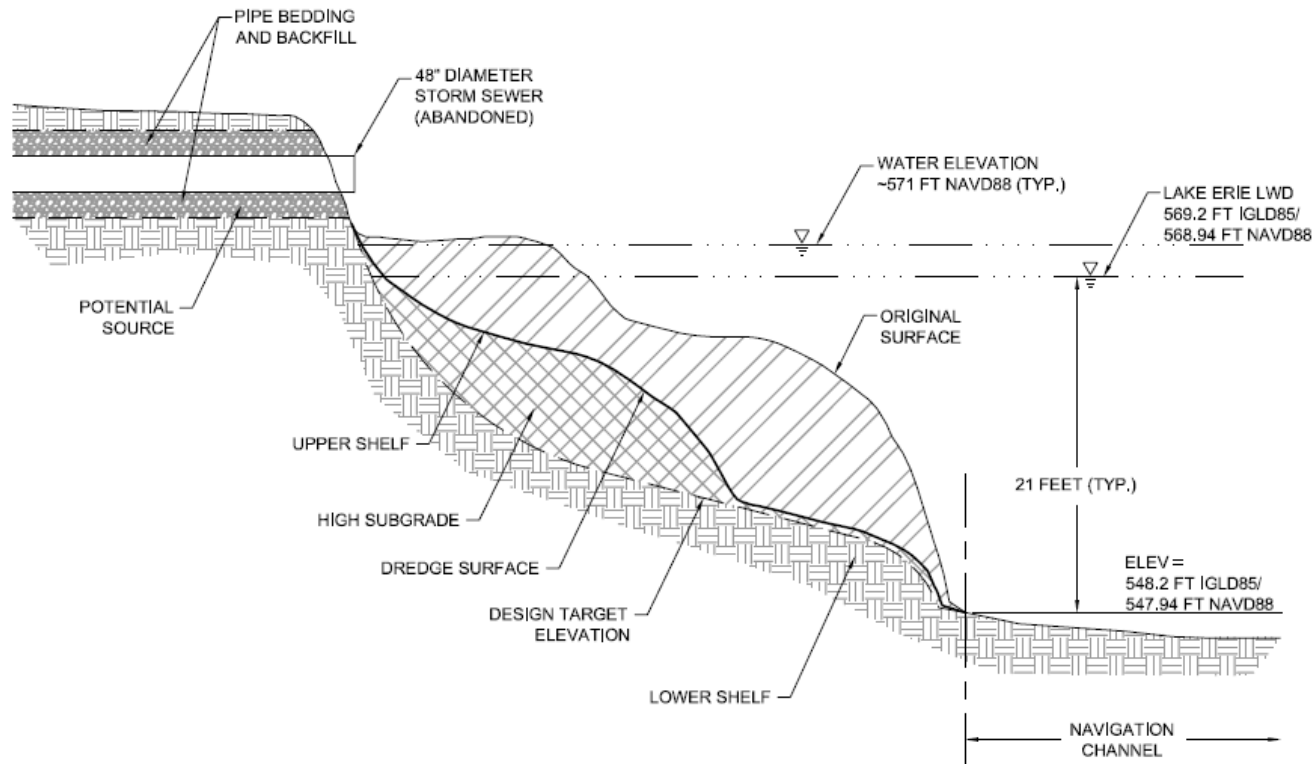
The Dredge Residuals Surprise



- Dredge cuts designed to remove PCBs > 1 mg/kg and achieve 0.25 mg/kg surface-weighted average concentration (SWAC)
- After achieving design grades, post-dredge push core samples of top 6 in. in Dredge Area N1T1 found PCBs as high as 1,900 mg/kg and traces of visual non-aqueous phase liquid (NAPL)
- Subsequent manual split-spoon samples to 24 in. found PCBs as high as 5,500 mg/kg and visual NAPL in in undisturbed residuals substrate of glacial till and weathered bedrock
- Subsequent onshore exploration borings and test pits found no PCBs/NAPL, but river borings with split-spoon samples found PCBs as high as 24,000 mg/kg at a depth of 11.5 ft below mudline and visual NAPL as deep as 15.5 ft below mudline
- Area of “hotspot” estimated to be 1.3 acres

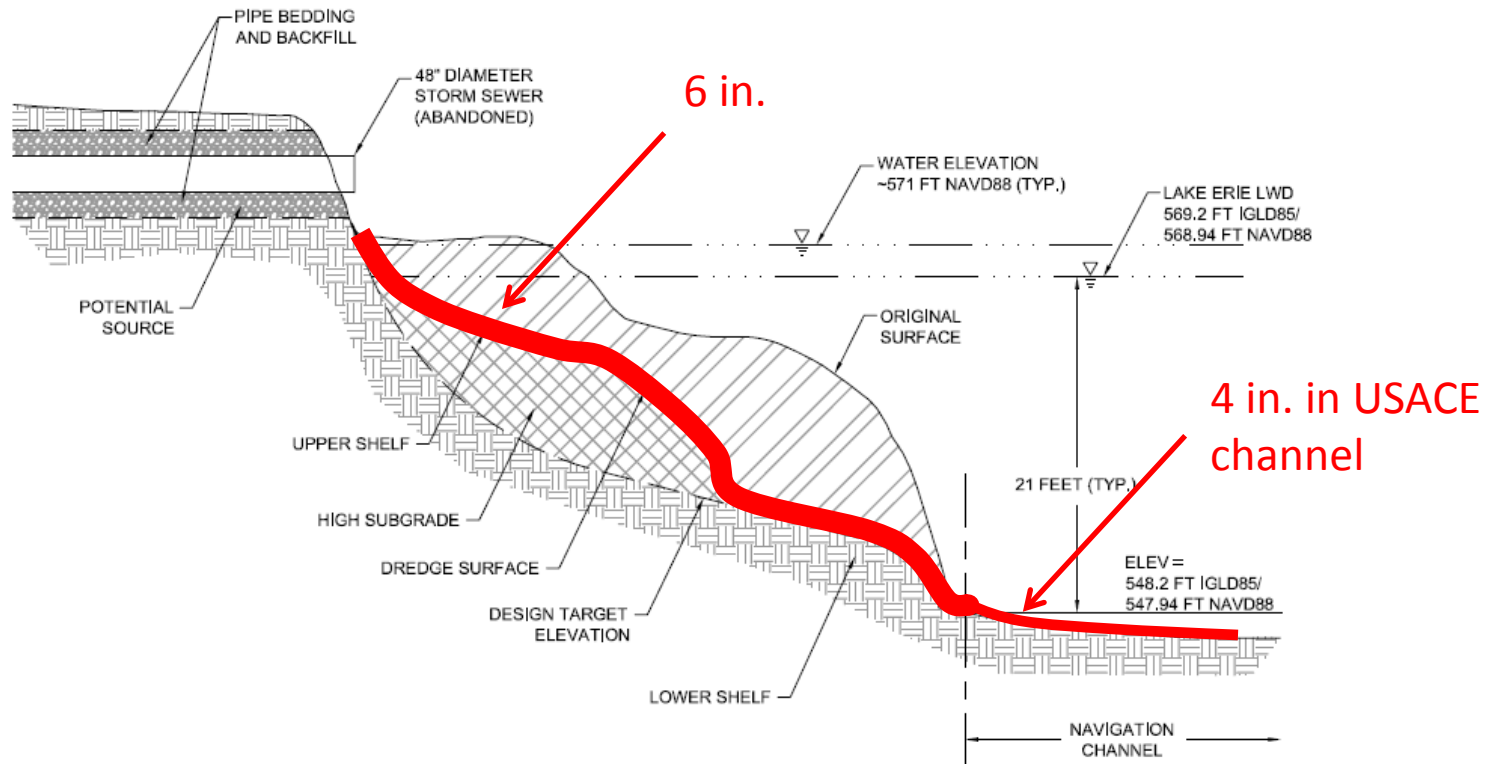


Site Conceptual Model



NOT TO SCALE

Interim Remedy – Sand/Organoclay Cover



5% Organoclay by Volume (CETCO PM-199)

NOT TO SCALE

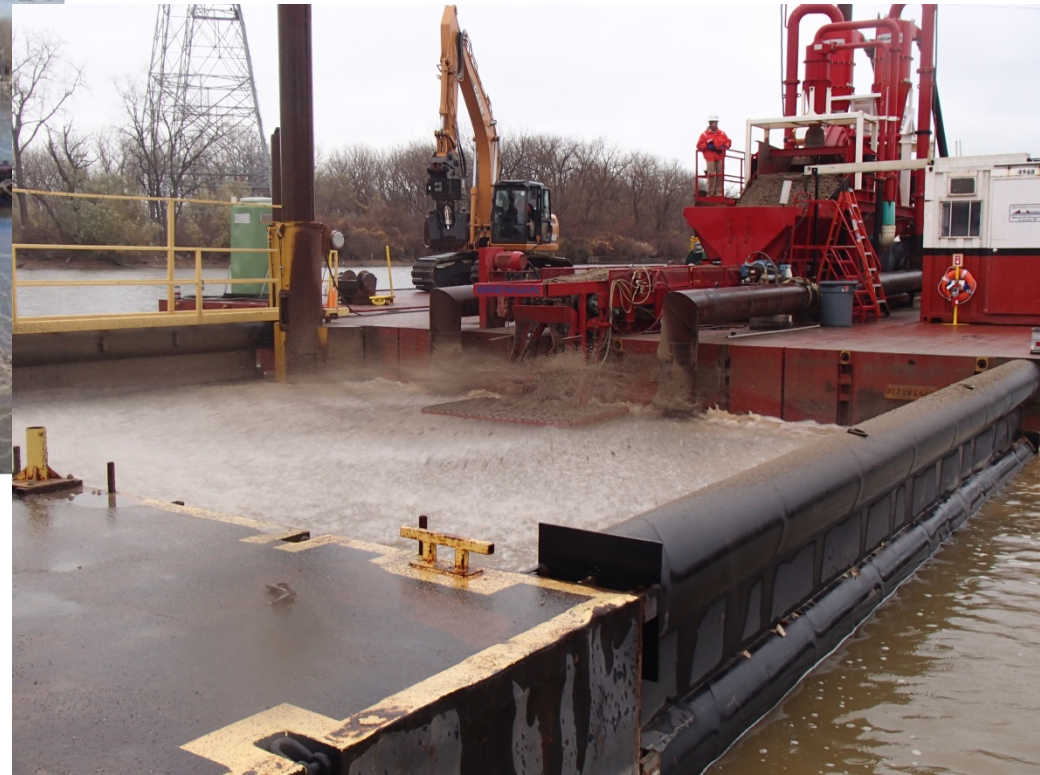
Onshore Blending of Sand and Organoclay



Broadcast Spreader System

For more information:

<http://www.jfbrennan.com/>

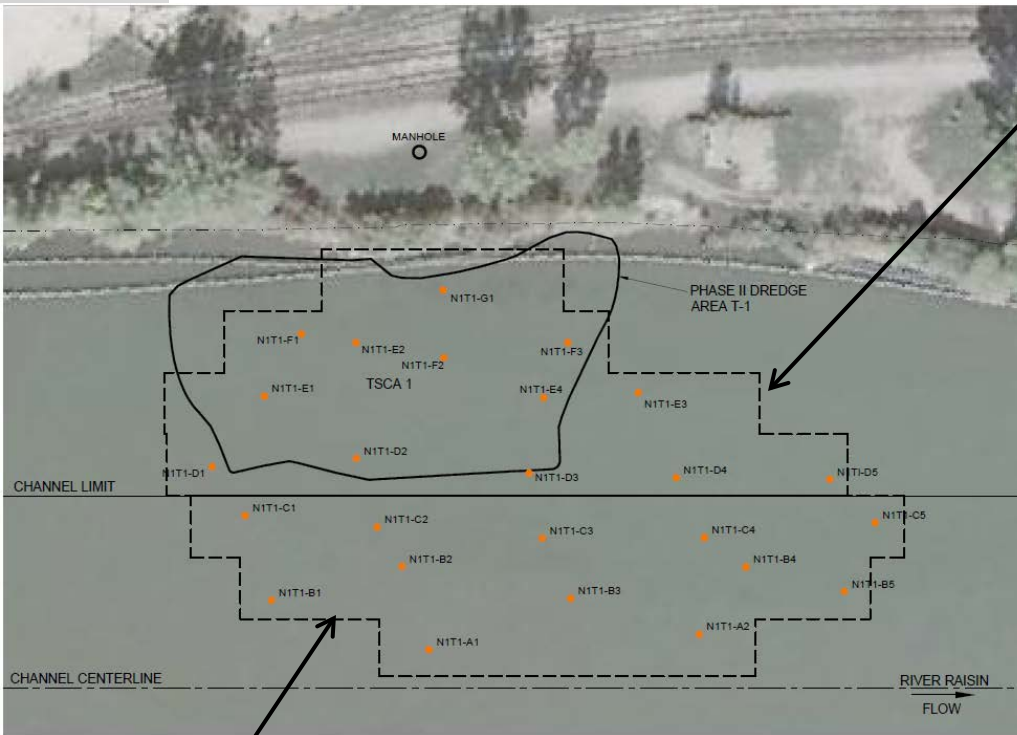


1.6-acre area covered in <2 days



Cores to Document Uniformity & Thickness

7 spreader lanes, 25 cores over 1.6 acres



Specified Min. 6 in.

Range 6.5-11.5 in., Avg. 8.3 in.

No mixing with underlying sediment



Specified Min. 4 in.

Range 4.5-6.5 in., Avg. 5.4 in.

No mixing with underlying sediment

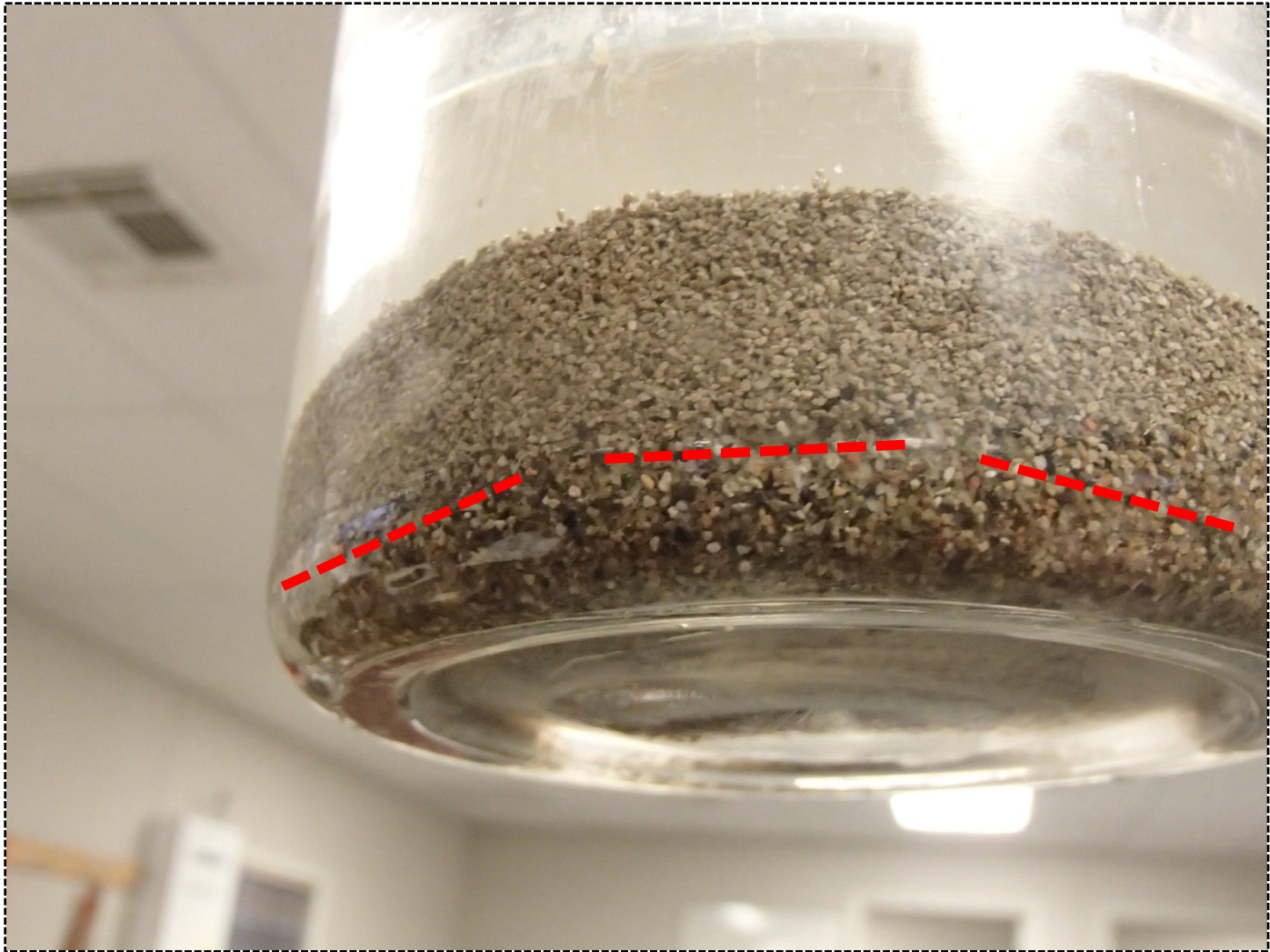


Field Method to Confirm Organoclay Presence

- **Qualitative** method based on differences in grain size and specific gravity (SG) between organoclay and sand:
 - Collect 6 push core samples
 - Dry each in microwave oven
 - Perform dry sieve – keep material passing #30 and retained on #40
 - Hand centrifuge (swirl) in jar of water, allow to settle; sand SG~2.6 vs. organoclay SG~1.7
 - Document with photographs



Typical Results (Side View, Sieved Sample)



Typical Results (Top View, Un-sieved Sample)



Independent Lab Method to Confirm Organoclay Content and Uniformity

- **Quantitative** method based on differences in bulk density (and specific gravity) between organoclay and sand
- Used 6 push core samples from thickness documentation program
- Laboratory goal: recover the cap material and determine percent weight organoclay



Method Confirmation

- Raw cap materials (organoclay and sand matrix) used to confirm method
- Complete recovery by heavy liquid separation
 - Organoclay bulk density = 0.79 g/cm^3
 - Sand bulk density = 1.75 g/cm^3



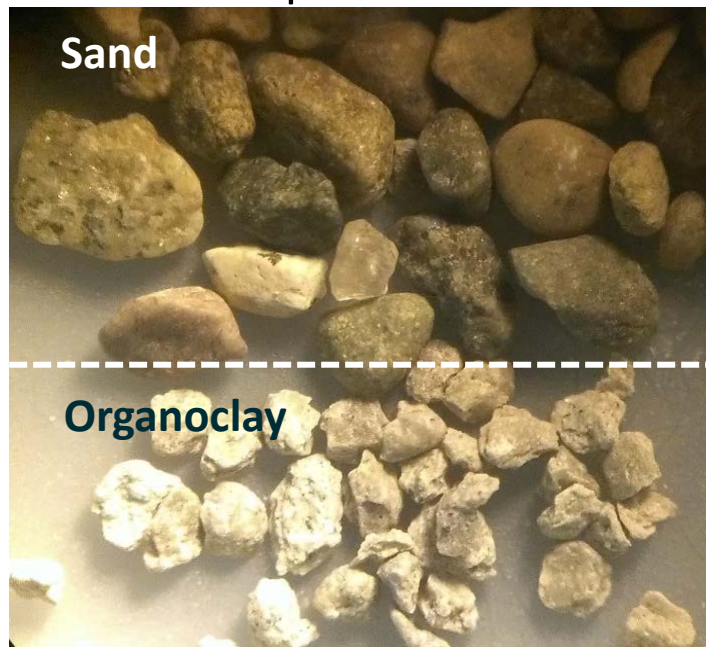
Stereoscope image of the sand matrix



Stereoscope image of the organoclay

Recovery of Cap Materials

- Sub-section cores (1-in. intervals), air dry and weigh interval
- Heavy liquid separation
- Rinse and air dry each fraction, weigh
- Stereoscope confirmation



The organoclay and sand are very distinct with stereoscope magnification



Results of 6 Cores



- Average organoclay content by volume = $5.0 \pm 0.1\%$
- Average organoclay content by mass = 2.2%
- Average thickness of interim cover = 6.9 in.
- Thickness range = 5.5 to 9 in.

Questions?



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