



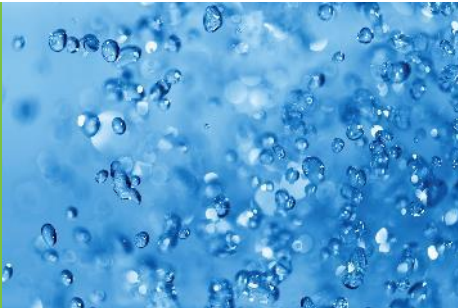
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Lake Preservation - Lessons Learned in Hydraulic Dredging

2015 SESWA Annual Conference – Chattanooga, TN

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**CDM
Smith**

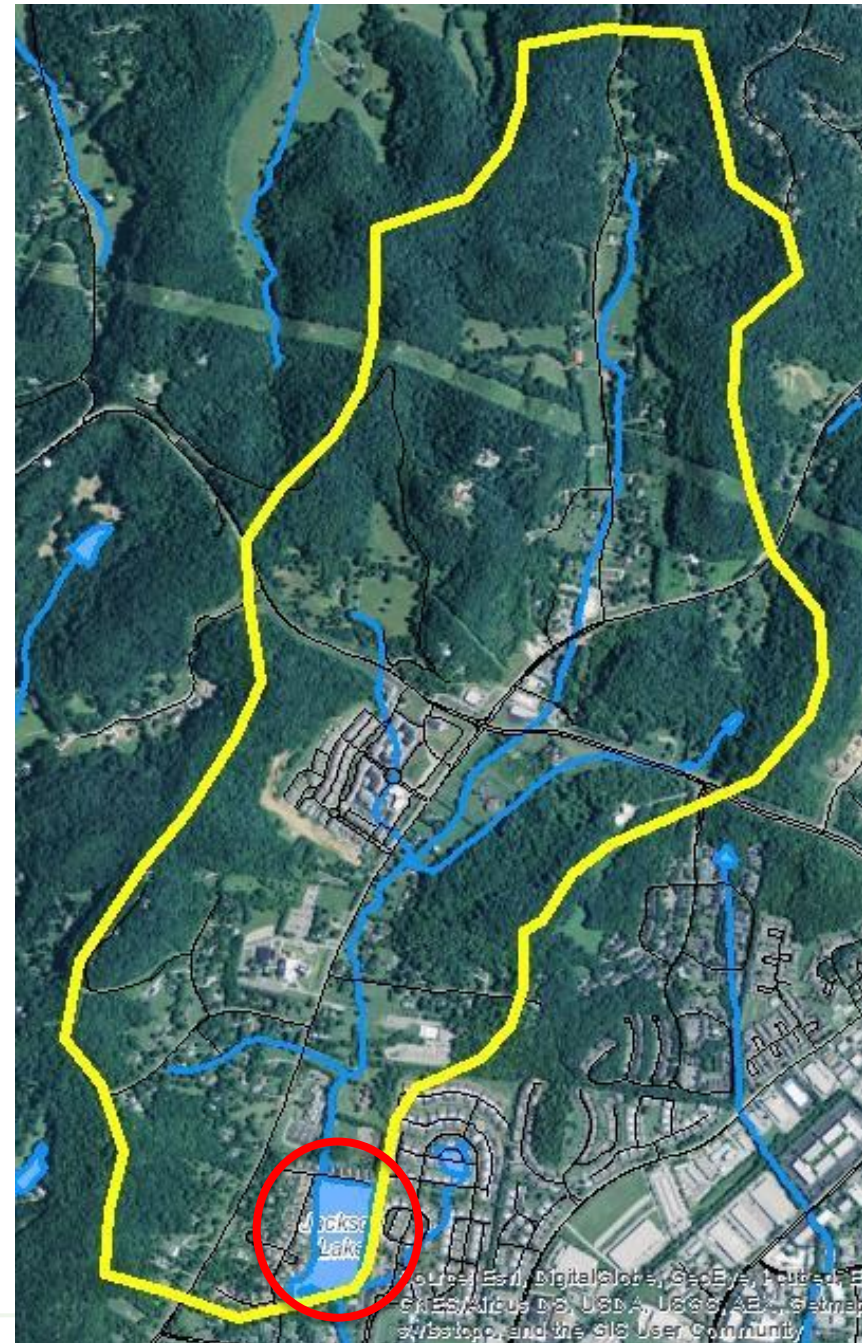
WATER + ENVIRONMENT + TRANSPORTATION + ENERGY + FACILITIES

Agenda

- Background & Site Conditions
- Elements of Design and Specifications
- Construction Challenges
- Out with the Old, In with the New
- Lessons Learned

Project Background

- Residential lake located in-line on Dry Branch Creek
- 11 acre surface area
- Drains approximately 1,000 acres

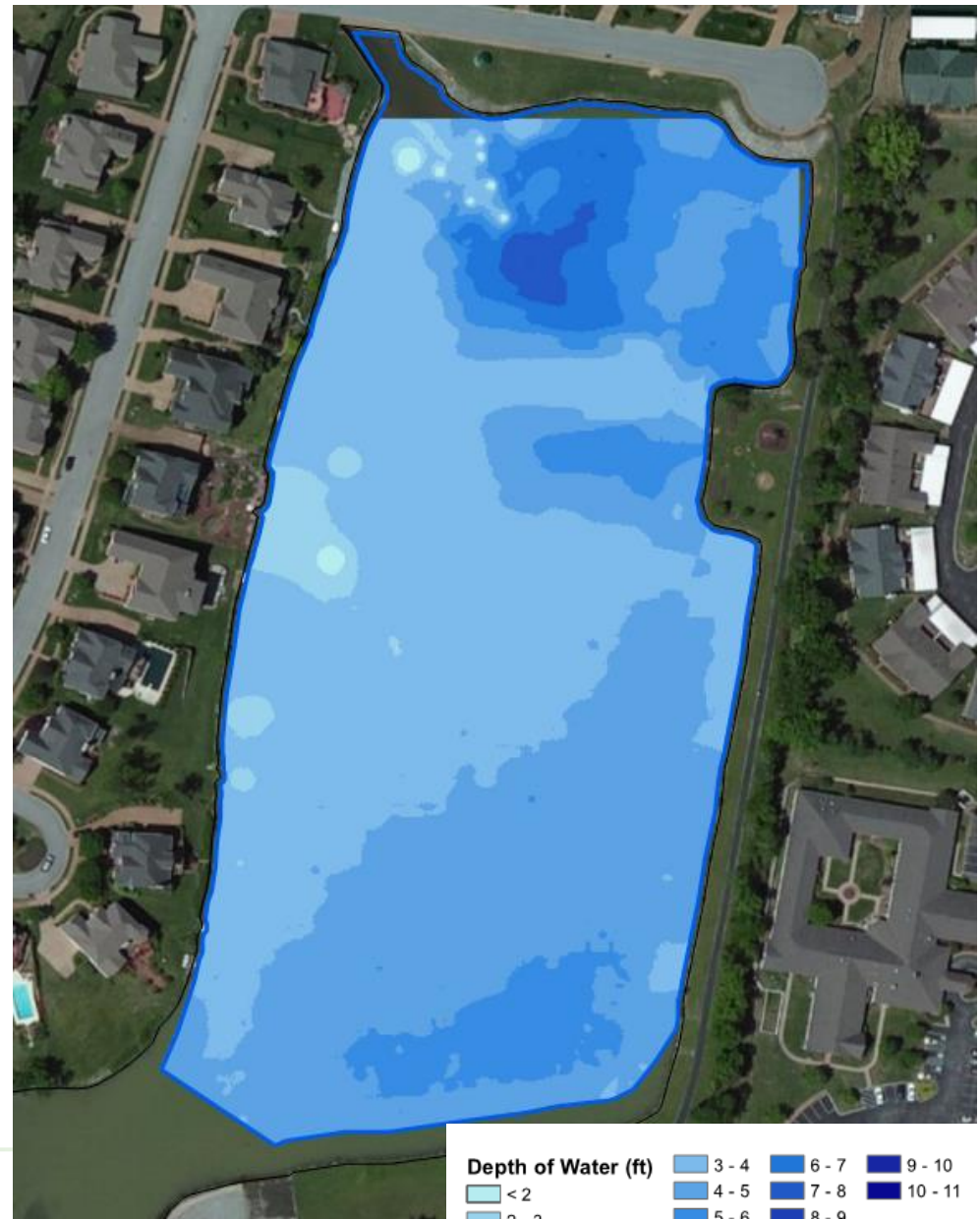


Site Conditions

- Well established neighborhood
- Continual sediment accumulation from upstream development and streambank erosion
- Original estimate: 36,000 cubic yards of material in lake

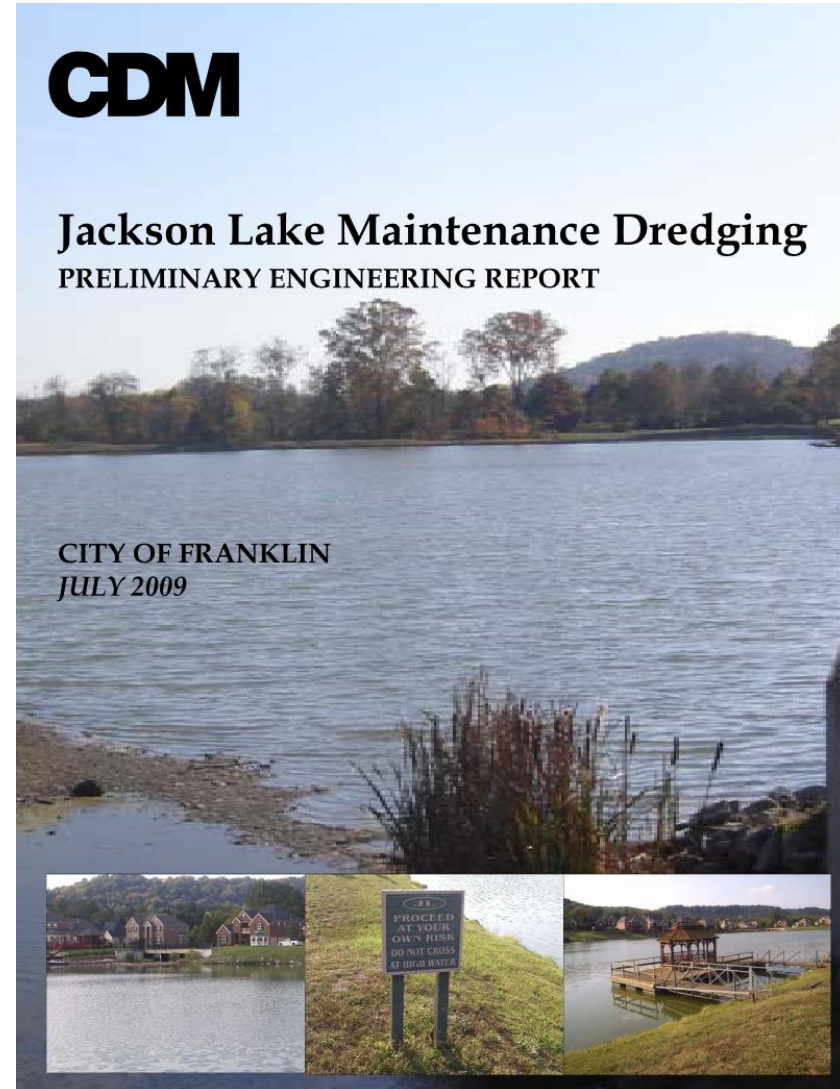


Preliminary Bathymetric Survey Results



Preliminary Engineering & Permitting

- Sediment sampling
 - Chemical
 - Physical
- Dam stability analysis
- Regulatory Coordination
 - TN Dept. of Environment
 - Aquatic Resource Alteration Permit (ARAP) (i.e. 401 permit)
 - SWPPP
 - US Army Corps of Engineers
 - Nationwide #16 for return water from a disposal area



Dredging Method: Mechanical or Hydraulic

- Limited construction access
- Water control through in-line lake
- Potential impacts to established residential neighborhood



Hydraulic Dredging

- Limited disturbance along shoreline of lake
- Nearby dewatering area with adequate construction access
- Reduced impact to the environment
- Support from the homeowners and church



Sediment Dewatering Options

- Conventional sediment dewatering
 - Sedimentation basins
- Mechanical dewatering
 - Belt presses, centrifuges, etc.
- Passive dewatering
 - Geotextile containers

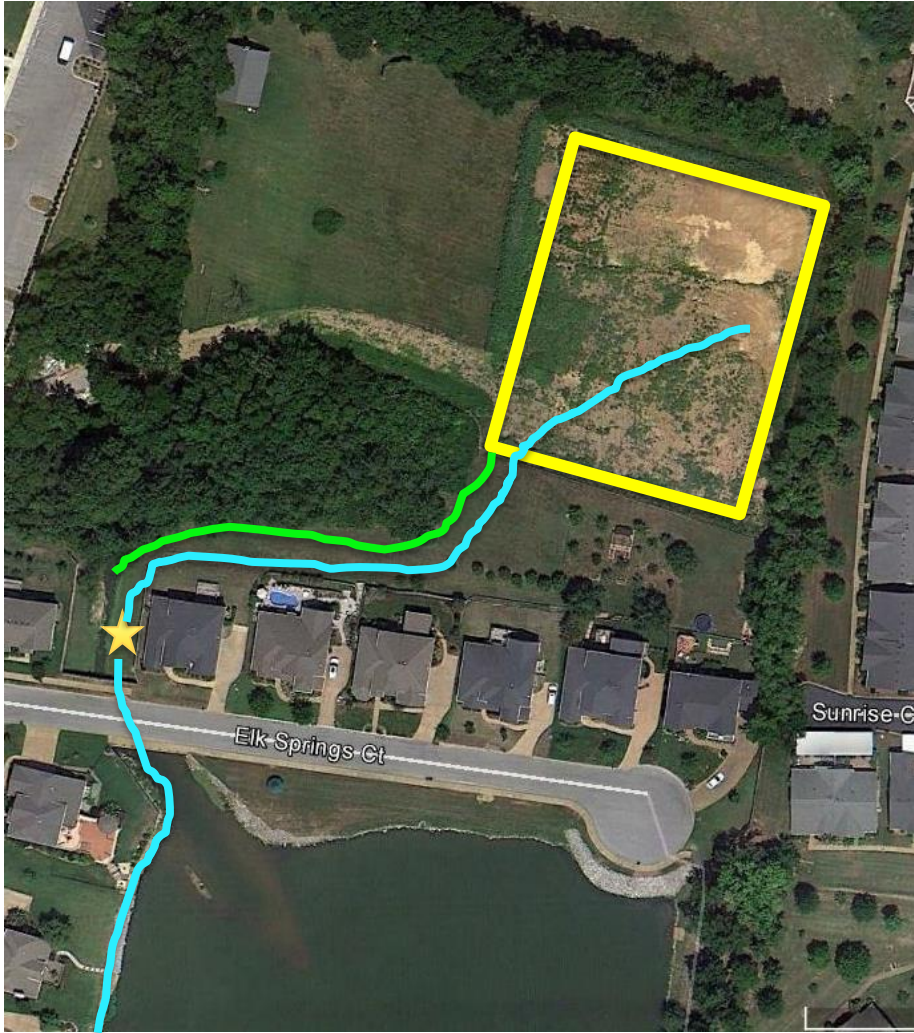


Contractor Bidding and Selection Process

- Traditional bidding process
 - Significant interest from numerous dredging firms
 - 3 bids received, ranging from \$1.5M to \$1.7M
- Winning bidder
 - Local site development & construction contractor w/ dredging “specialist”
 - Dredging company appeared to be qualified



Site Layout and Dewatering Plan



Adequate Pump & Dredge Equipment?

- Proposed Dredging Production Rate
 - Initial Volume – 37,000 cubic yds
 - Initial Duration – 60 days
 - Available Dredging Days – 43 days
 - Dredging Rate – 863 cubic yds/day
 - Dredging Rate – 2 dredges – 432 cubic yards/day each

DINO Six
Sediment Removal System



**Actual Production Observed
~ 170 cy/day**



Dewatering Area Set-up

- Configuration of bags not ideal
- First bag “rolled”
- Only pumping to one bag at a time rather than multiple bags



Equipment Failures and Debris Clogs

- Insufficient equipment
 - One dredge vs two dredges
 - Inadequate pumping capacity
- Frequent clogs due to mussel shells
- Dealing with debris in the lake

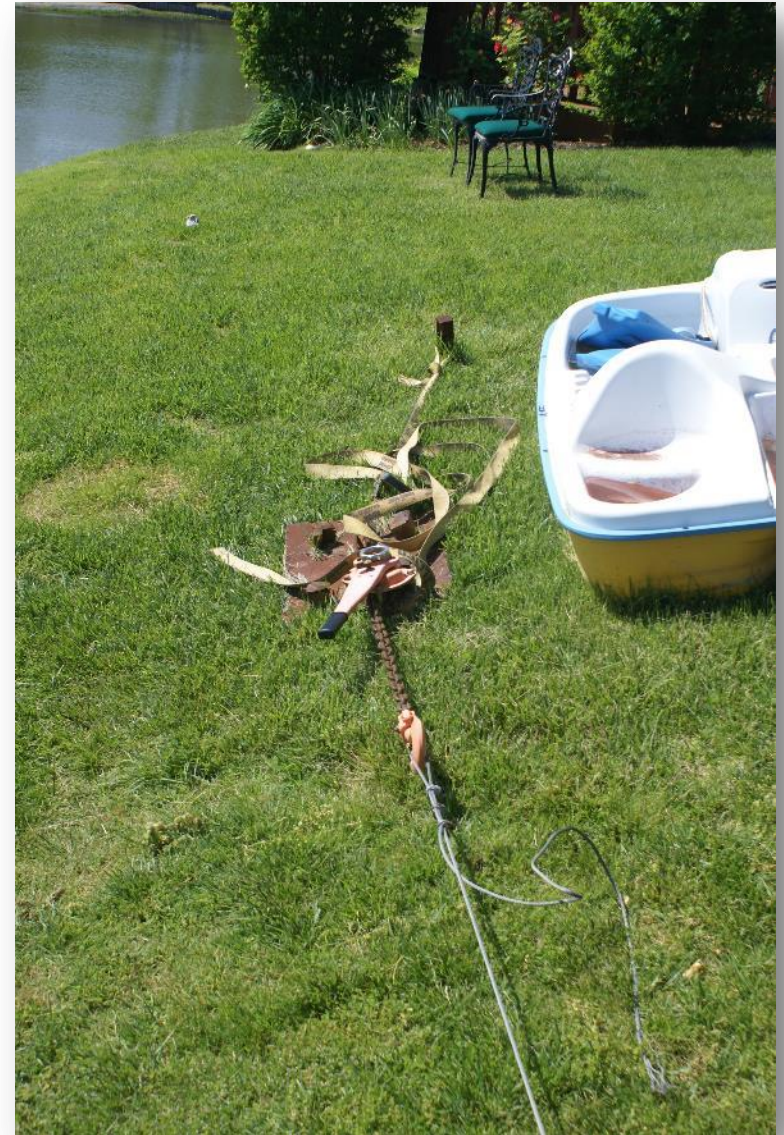


Contractual Review of Debris Issue

- Specification language addressing debris:
 - *“The Project generally consists of the furnishing and installation of all materials, equipment, and labor for the dredging and disposal of removed materials from Jackson Lake.”*
 - *“Each Bidder must(b) familiarize himself with local conditions that may in any manner affect performance of the work....)”*
 - *“Dredging shall consist of the removal of sediment (silt and mud) from the Jackson Lake.....”*
- Addendum addressed trash/debris:
 - Question: *What is to be done with trash found from dredging activities?*
 - Answer: *Contractor will be responsible for the proper disposal of all trash found during lake dredging activities.*

Dredge Anchoring System

- Dredges anchored to shore by cable and plate system
- Frequent dislodging of plates in moderate wind



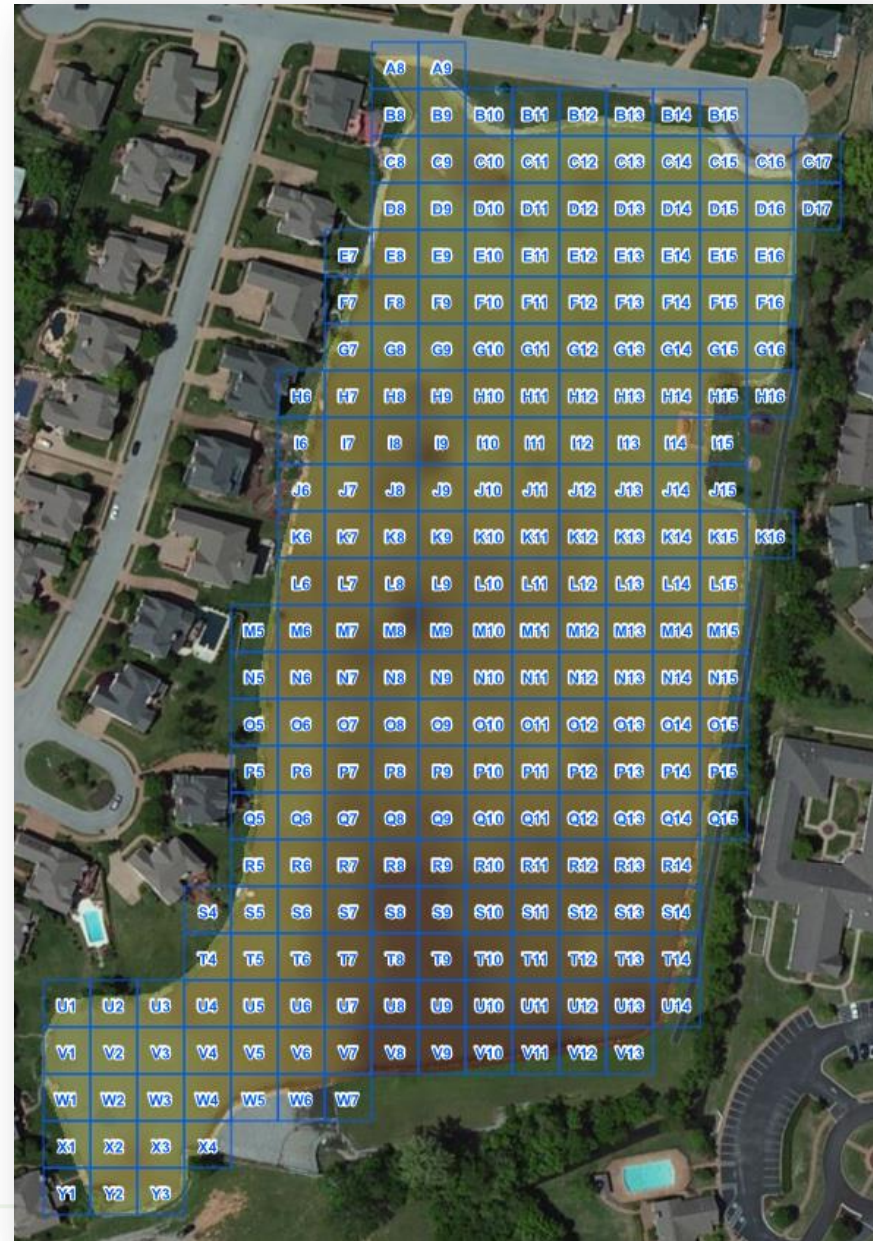
Water Quality Control

- Permit required 25 NTU limit on discharge
- Plans required end of pipe treatment



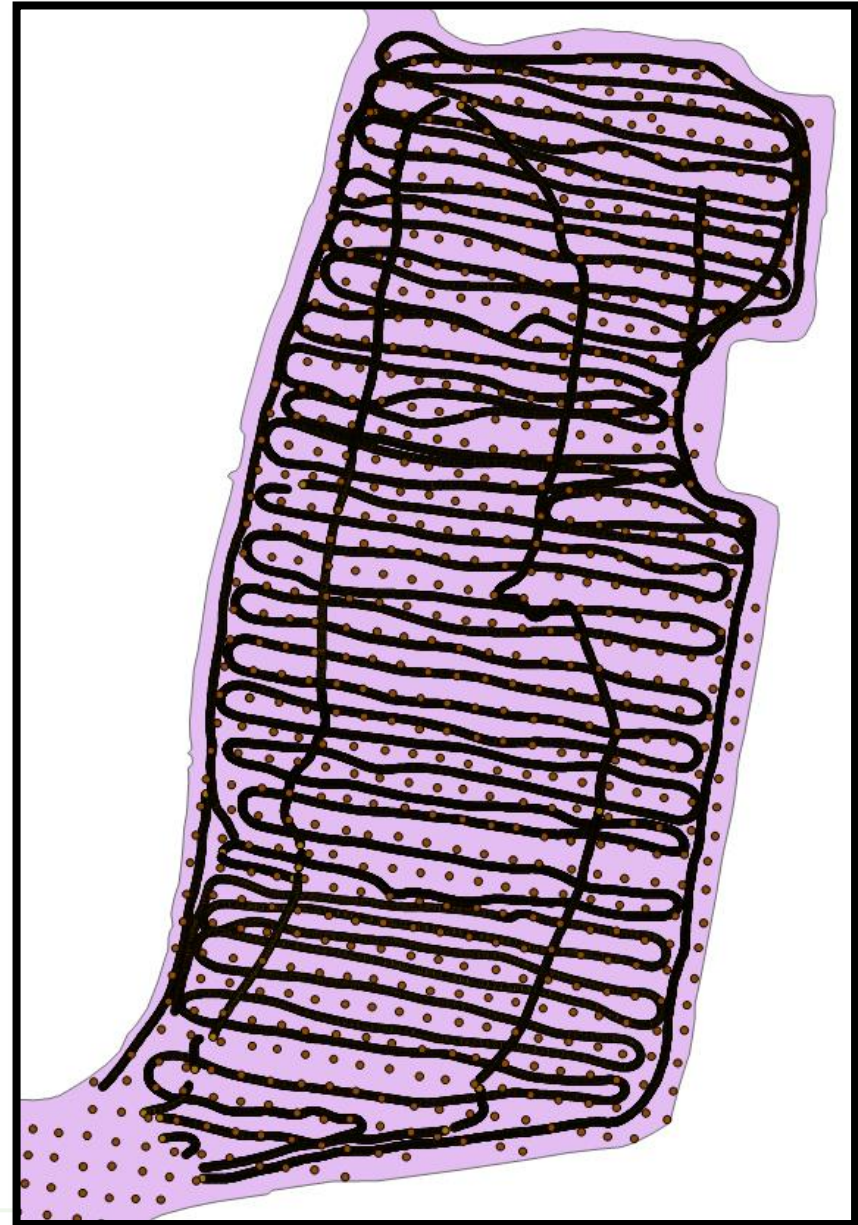
Payment and Confirmation of Material Removed

- Contract Terms
 - “Final payment based on pre- and post-bathymetric surveys..”
 - “Estimated quantities may be used for monthly progress payments”



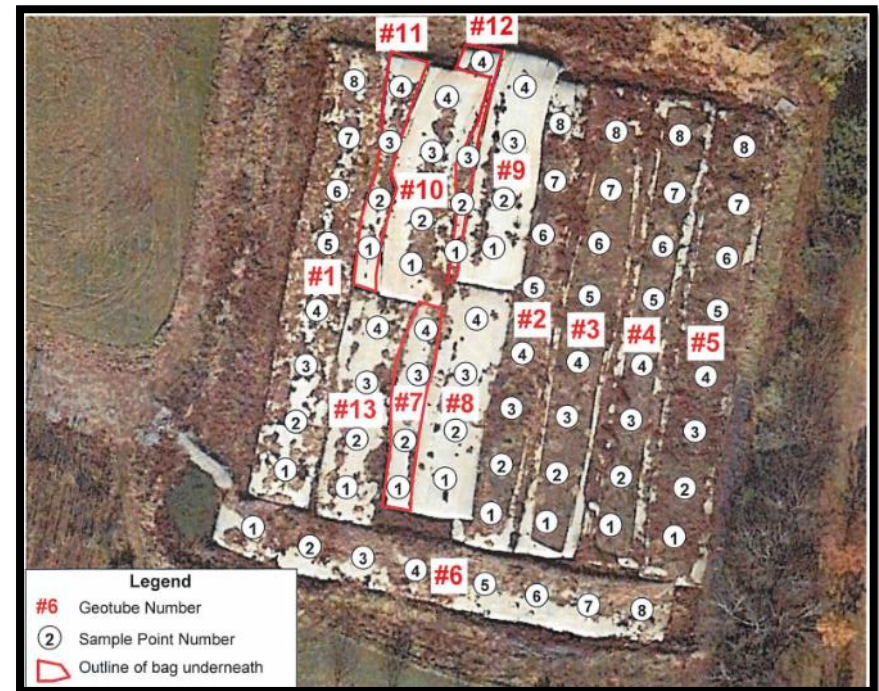
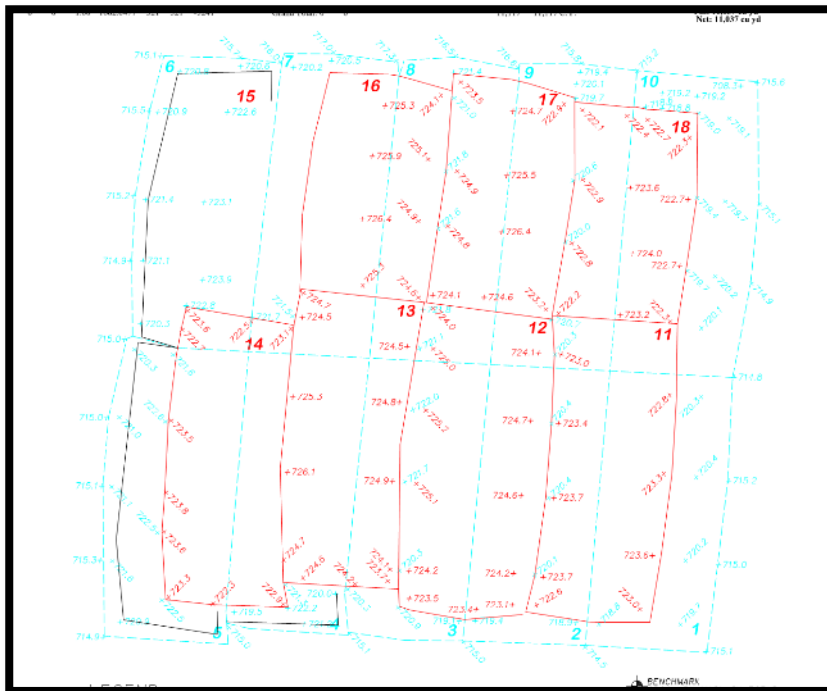
“Muck Probes” vs Sonar

- Muck Probes
 - 200 points of data
 - Manual check
- Sonar Survey
 - 40,000+ points of data
 - Calibrated equipment
 - Approved process by US ACOE for dredging projects



Other “Truth Checks” Performed

- Field survey of geotextile container area
- Geotechnical analysis of bag contents



Phase II of Dredging

- No agreement between parties on amount of material dredged
- Dredging subcontractor leaves the job unfinished
- Prime contractor hires new dredging company to finish the job



Changes to Phase II Dredging Process

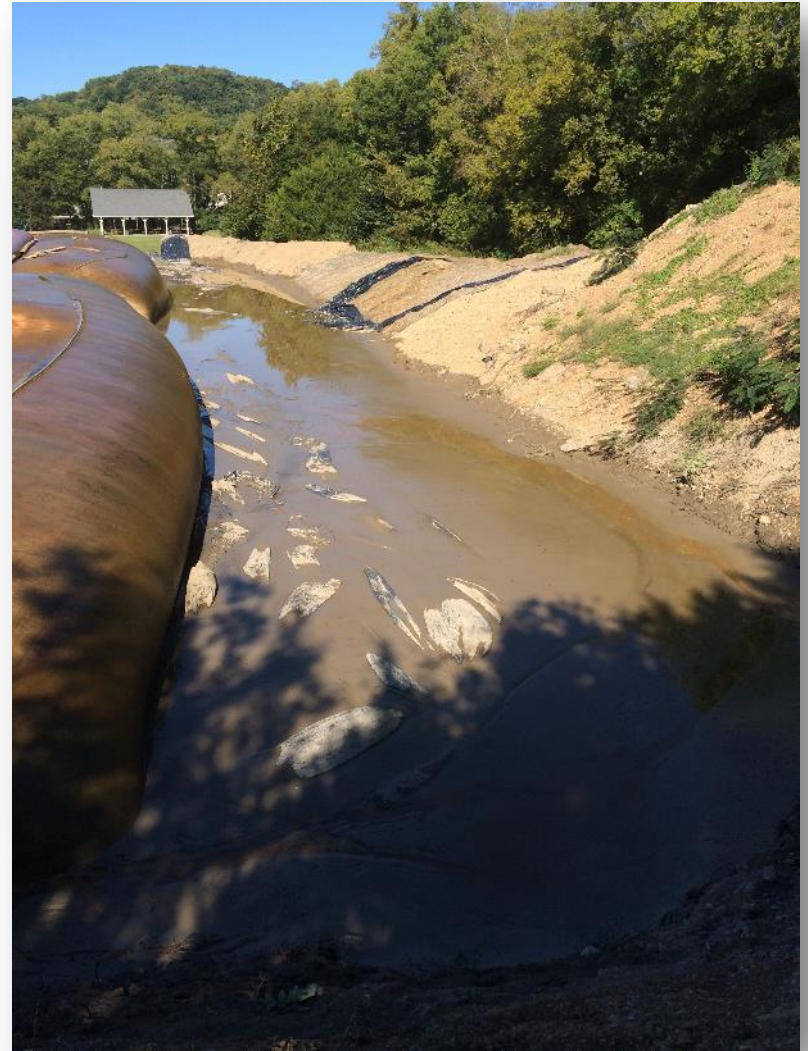
- Adequate, experience staff
- New equipment
 - Ellicott 360 swinging ladder dredge
- Proposed use of polymer injection
- Manifolded pumping for discharge to multiple geotextiles bags
- Agreed upon process for documenting monthly progress



Phase II Dredging Process



One Hiccup – Broken Bag!



Material Removal Process

- Contract specified a required moisture content for removal
- Approved change to paint filter test to speed up process



Current Site Conditions



Points of Emphasis for Hydraulic Dredging Projects

- More rigorous pre-qualification of contractor
- Thorough review of dredge plan by Engineer
- Clear statement in specifications about lake conditions or knowledge of debris, etc.
- Up front agreement on process for in-progress payments
- Frequent communication with all stakeholders (citizens, landowners, etc)





QUESTIONS?

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