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DREDGING, PIPELINE TRANSPORT, AND MATERIAL MANAGEMENT OF ENVIRONMENTAL DREDGING AT ONONDAGA LAKE, NEW YORK STATE

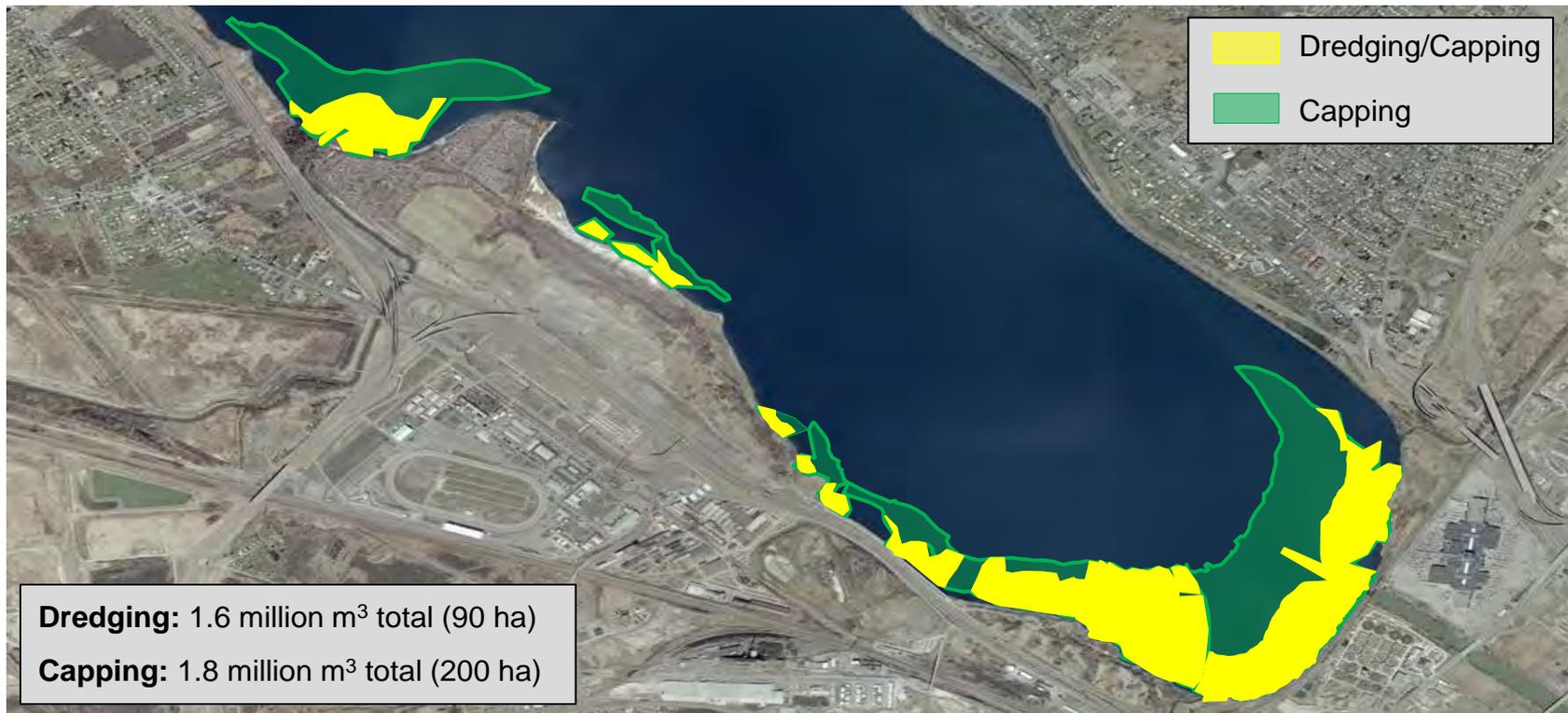
WODCON XXI – June 16, 2016

Presentation Overview

- Dredging Design
- Contractor Procurement / Equipment Selection
- Slurry Pipeline Design & Construction
- Debris Management Planning
- Dredging Operations Overview
- Early Finish Factors / Lessons Learned

Dredge Area Development

- Design considerations
 - Five distinct Remediation Areas
 - Extents driven by PDI data
 - Dredge to fit cap



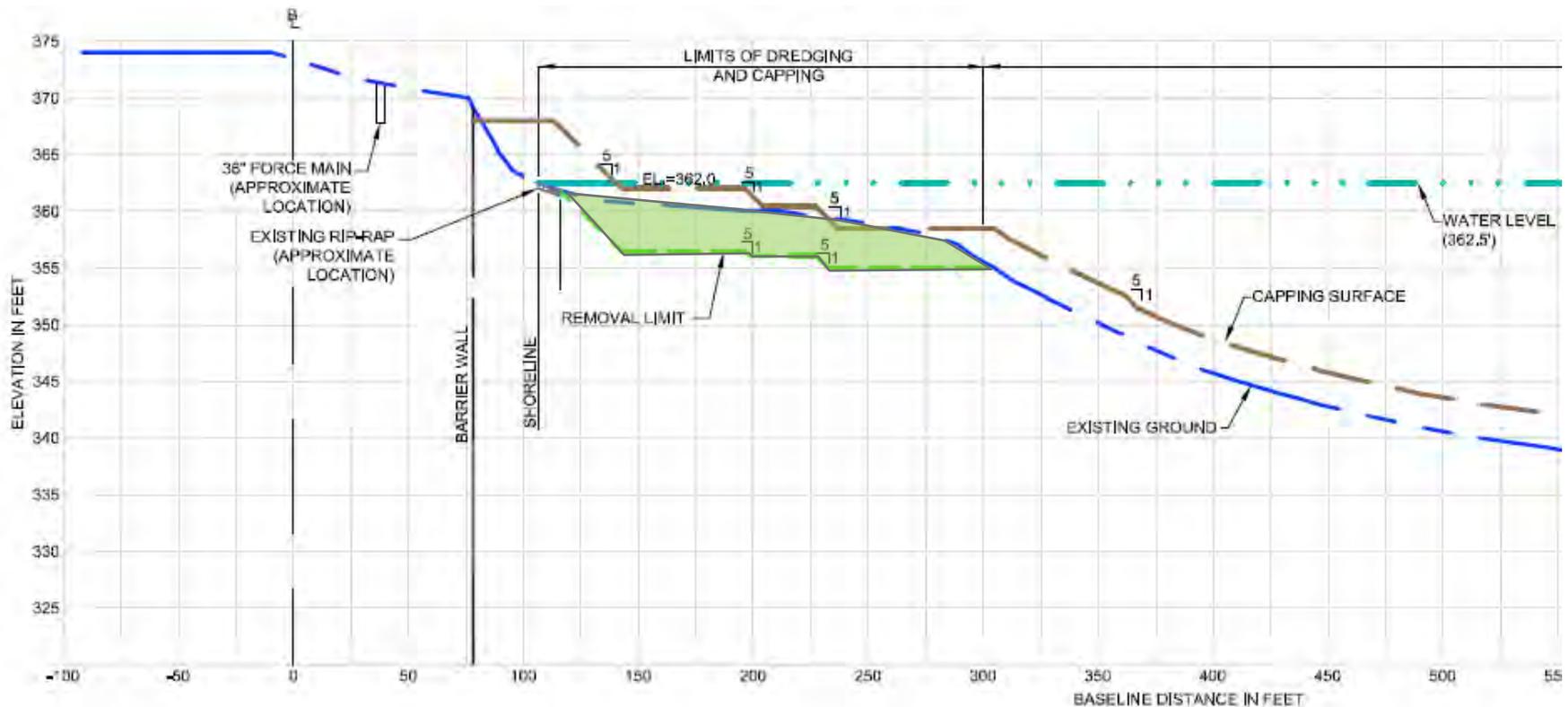
Variable Conditions

- Variability of dredged sediment
 - Hardened Solvay waste (concrete/limestone)
 - Black, oily, fine sediment (fluff)
- Dredge areas
 - Dredge areas located 1 - 3 km apart
 - On-water boosters
 - Varying tie-in points to pipeline



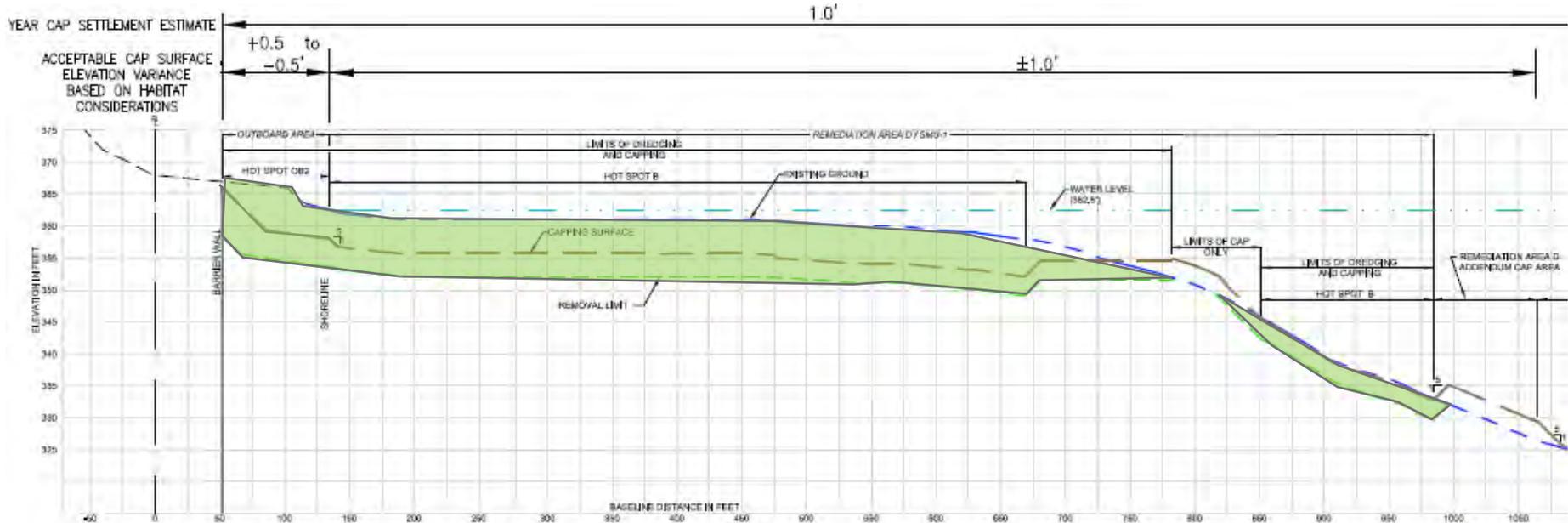
Dredge Prism Design

- Nearshore dredging for cap placement
 - No net loss of surface area
 - Driven by design thickness of cap
 - Shallow water



Dredge Prism Design

- Uniform 2 meter removal
 - Mass volume/contaminant removal
 - $>1M m^3$
 - Solvay waste material



Additional Dredging Complexities

- Dredging adjacent to sensitive infrastructure
 - POTW discharge
 - Groundwater cut-off walls and collection trenches
 - Culturally significant/historic resources (e.g., sunken barges)
 - Navigation channel
- Dredging to create wetlands in upland areas
- Debris management
- Shallow dredge cuts



Dredge Contractor Procurement

- 30% Design Submittal: July 2009
- Contractor Selection: June 2010
- Final Design: March 2012
- Design Input
 - Equipment
 - Tolerances
 - Anticipated production rates
 - Debris removal
 - Sub-aquatic vegetation control
 - Nearshore dredging
 - Regulatory buy-in

Hydraulic Dredges

- Three dredges mobilized
 - Two production dredges
 - One specialty dredge



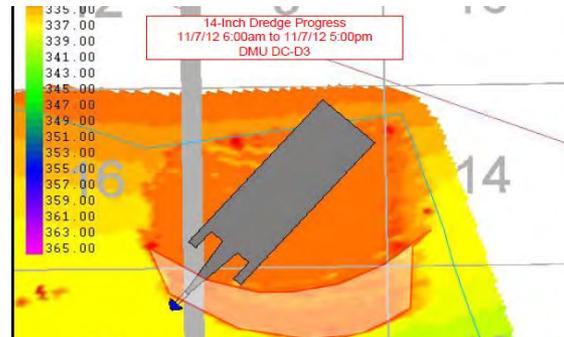
16" Marlin Dredge
40' Wide x 104' Long
21,000 L/min



14" Shark Dredge
20' Wide x 68' Long
21,000 L/min



8" Morary Dredge
11' Wide x 42' Long
5,700 L/min



GPS RTK System
Trimble 461 with
Dredgepack Software

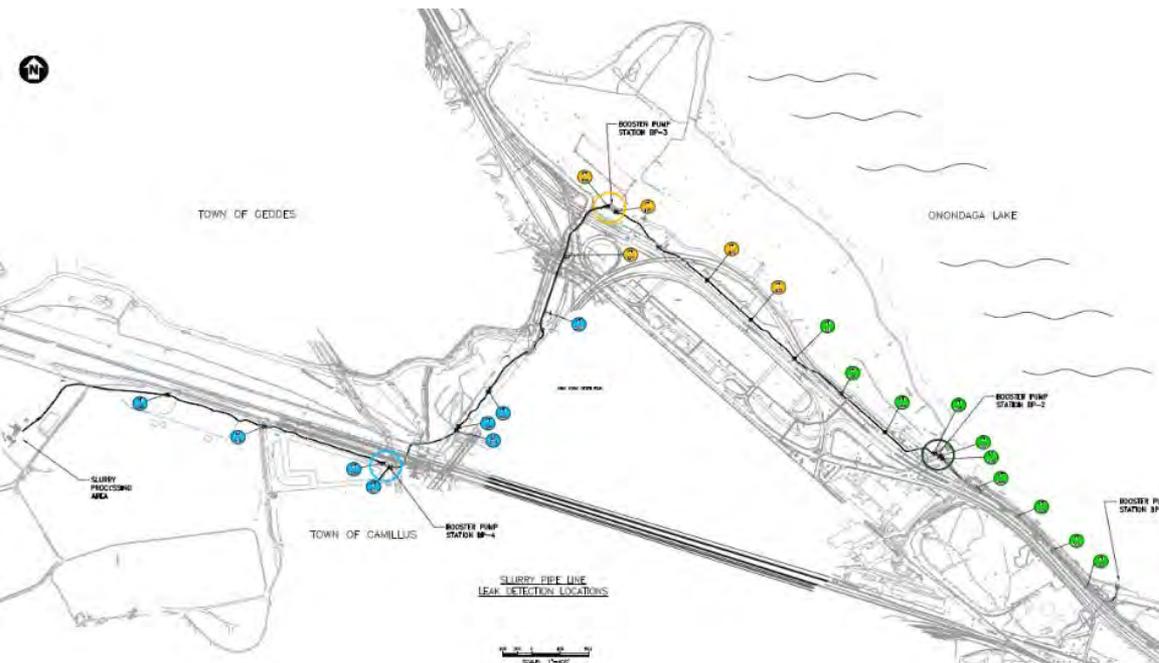
Slurry Pipeline System

- 6-km long above ground
- Design flowrate – 20,800 L/m
- Four booster pump stations (600 hp)
- Double-walled pipe/100% secondary containment
- Multiple road/rail crossings



Slurry Pipeline System

- Secondary containment
 - Double-walled pipe
 - Lined enclosures for boosters
- Leak detection
 - Pressure/liquid sensors
 - Enclosure sump level alarms



Pre-Dredging Debris Removal

- Tire field (~2,500 tires)
- Wooden pilings
- Tree/brush
- Aquatic vegetation
- Abandoned utilities



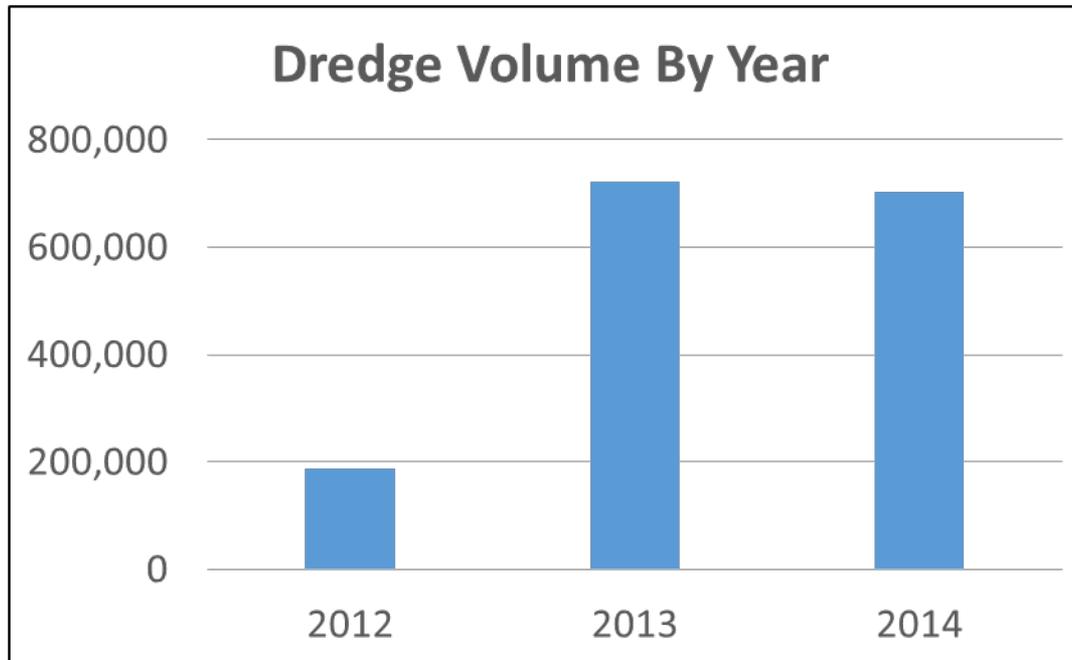
Dredging Operations

- 24 hour, 6 days/week operation
- Complexity of achieving high uptime factor
- Variability of sediment
- Water management with discharge restrictions (anticipated 30 shutdown days)



Dredging Productivity Metrics

- Dredge start: 7/17/12
- Dredge finish: 11/3/14
- 1.6M M³ dredged



Overall System Component Uptime

	2012	2013	2014
WTP Operations	93.2%	96.8%	98.4%
Dredging Operations	94.6%	93.6%	89.1%
Booster/Pipeline	94.9%	95.2%	95.3%
Thickener	96.0%	95.8%	96.6%
Bagfield Operations	98.0%	98.2%	98.0%

Winter Shutdown/System Optimizations

- Cutterhead/teeth modification
 - Applied to 16" dredge
 - Address calcified Solvay Waste
- Hypack GPS enhancements
 - Improved lateral and elevation control
- Booster system optimization
 - Rebalancing of coordinated boosters
 - Increase system capacity
 - Decrease blockage risk
- Leak detection enhancements
- HDPE pipe erosion
 - Significant wear (30 - 40%)
 - Highest at fittings and booster discharge
 - Replacement/Rotation



Key Factors for Early Finish

- Cooperative teamwork between multiple companies
- Dedicated team of several hundred local employees working 24/6 for three seasons
- Dedicated on-site Regulatory Oversight Team
- Wet weather management improvements to mitigate WTP downtime
- Proactive management of key factors impacting schedule



Dredging Lessons Learned

- Spare parts
 - On-site
 - Organization
- Local vendor support
 - Craft
 - HDPE pipe vendor
 - Vac truck
 - Equipment rental/support
- Project uptime logs
 - Trends analysis
 - Identify the squeaky wheel(s)!
- HDPE pipe
 - Wear rates
 - Thickness monitoring
 - Replacement



Erosion in HDPE Pipeline

Thank you!



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OBG

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