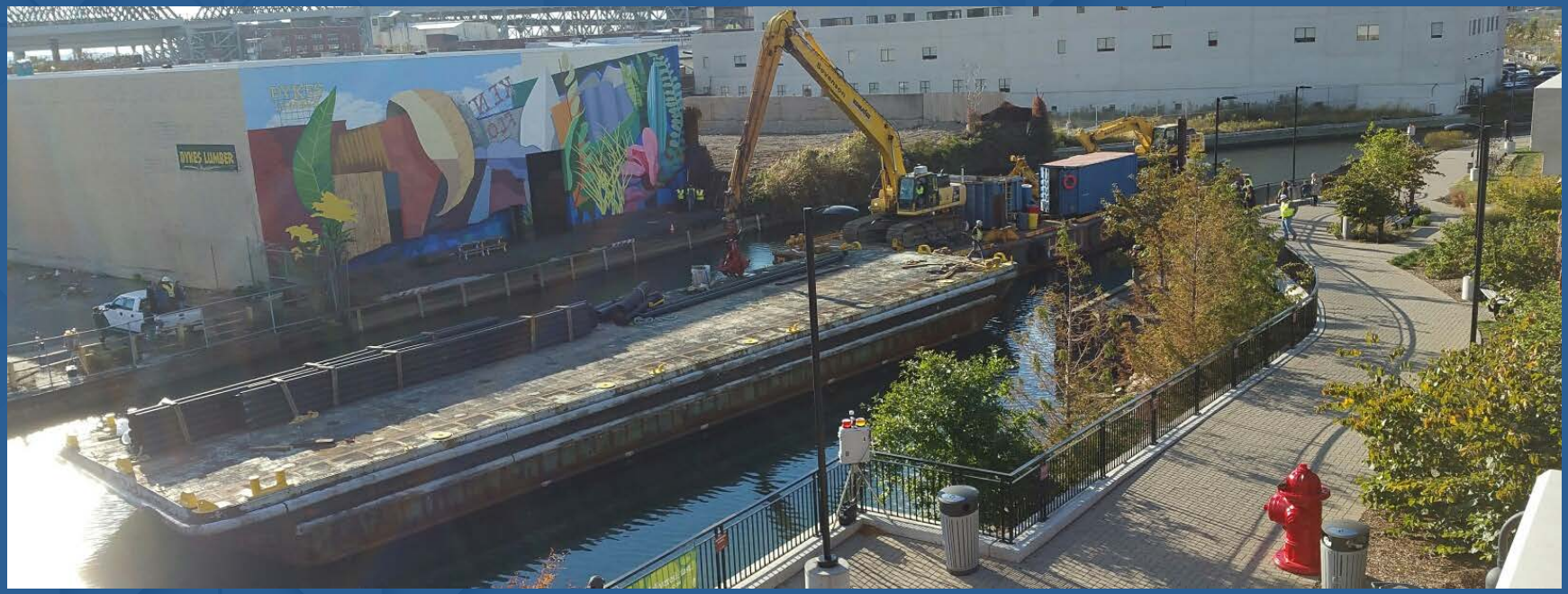

Gowanus Canal – Sediment Treatment and Beneficial Use

J. Fears, R. Hyatt, D. Nicholas, J. Gasser, J. Brinkman

WEDA Dredging Summit & Expo ‘18

Geosyntec consultants

Presentation Preview

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- Gowanus Canal Brief History and Background
- Major Remedial Design Components
- Sediment Treatability Study & Results
- Pilot Study Sediment Processing Operations
- Conclusions & Considerations

Gowanus Canal – Brooklyn, NY

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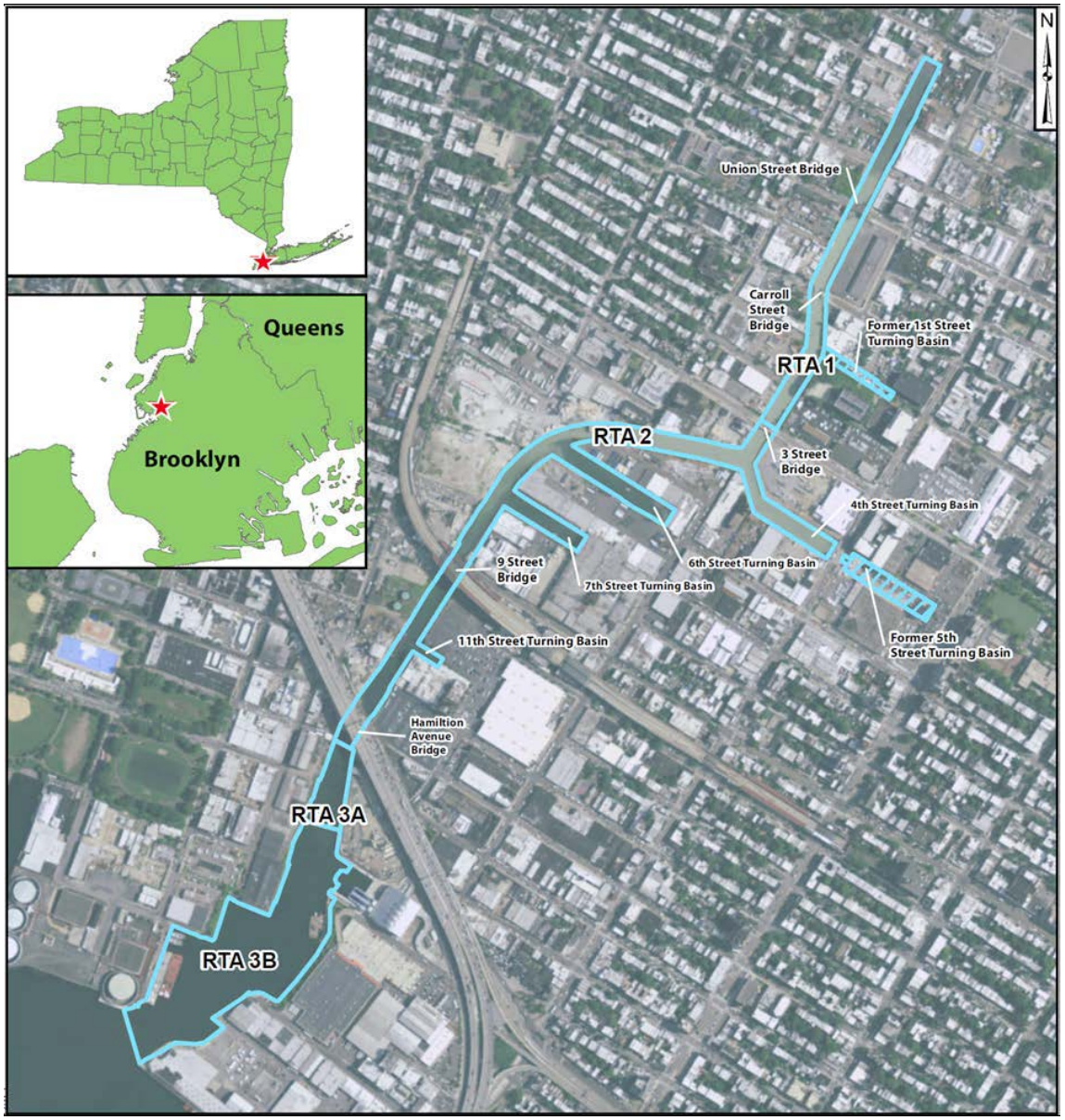
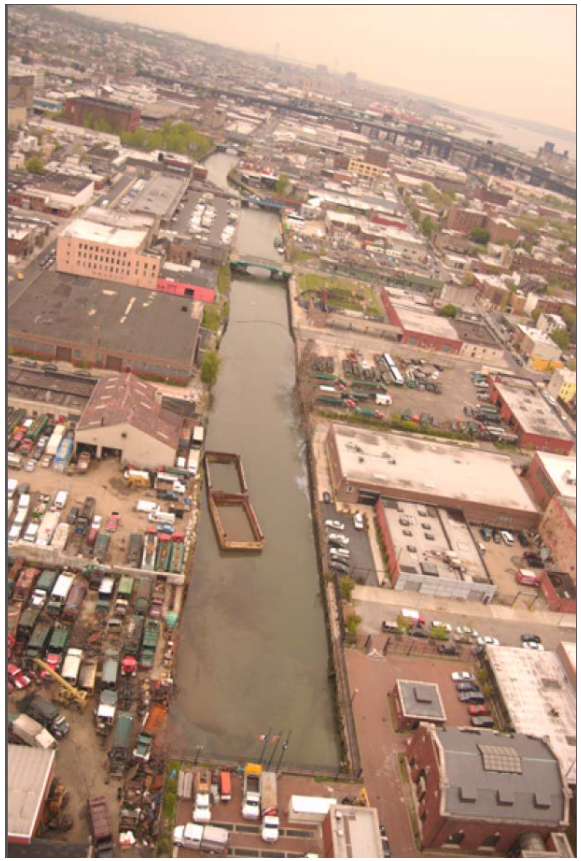
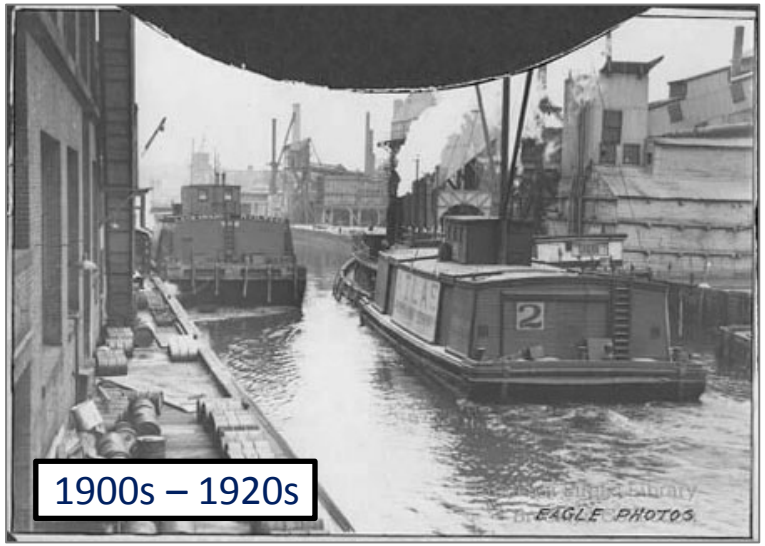


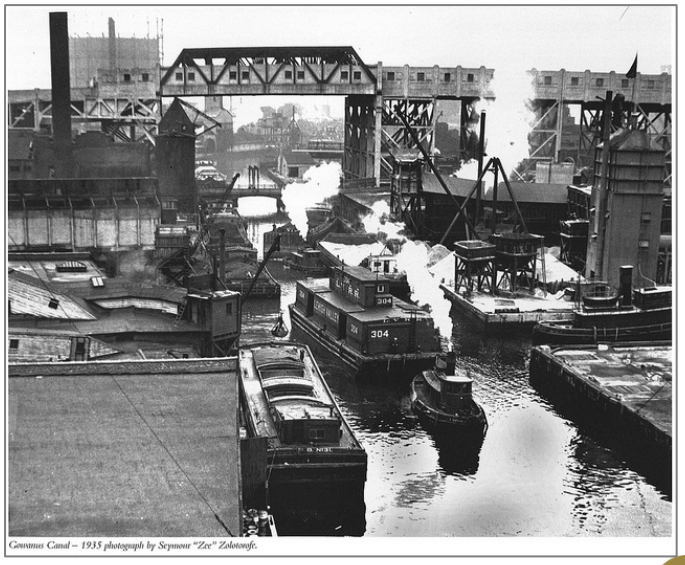
- 1.8 mile (2.9 km) man-made canal



Gowanus Canal History

- Authorized: 1848
- Constructed: 1853 – 1869
- Peak operation: 1915-1950
  - 25,000 vessel trips/year and 60 dock facilities
- By 2000
  - 500 vessel trips/year and 5 dock facilities





Contaminants of Concern & EPA Action

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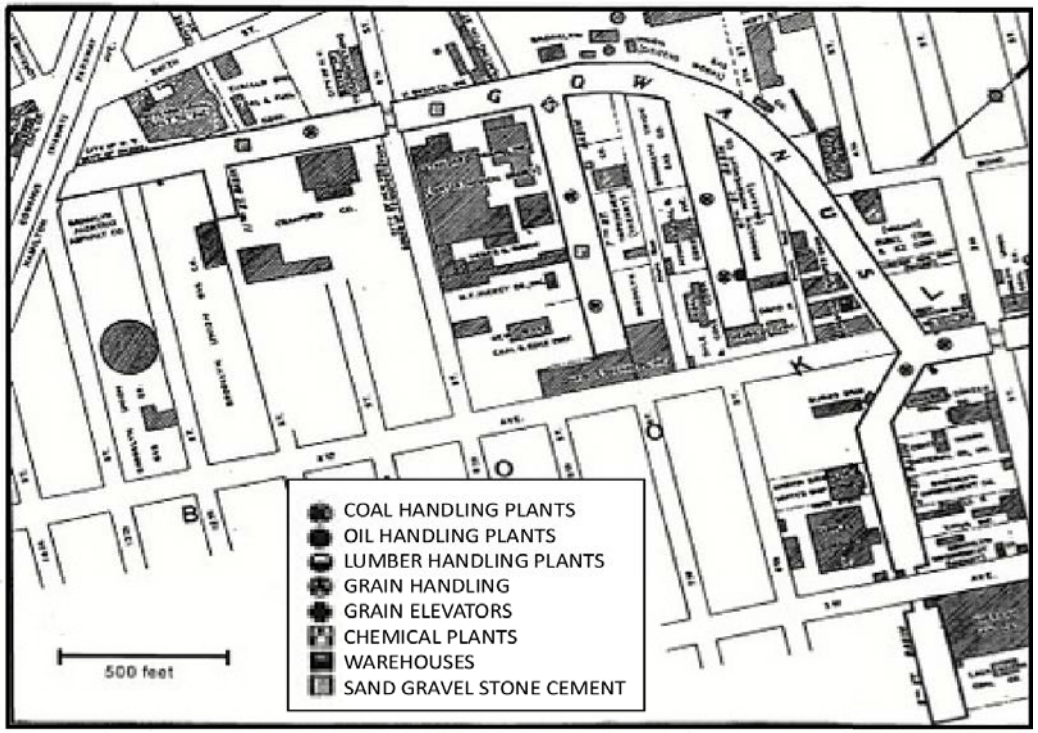
- Industry and CSOs lead to elevated levels of PAHs, PCBs, heavy metals, and sewage



INDUSTRIES OF GOWANUS CANAL (CA. 1942)

- **Mar 2010**
  National Priorities List
- **Jan 2011**
  Remedial Investigation
- **Dec 2012**
  Feasibility Study
- **Sept 2013**
  Record of Decision

Gowanus Canal Design Overview

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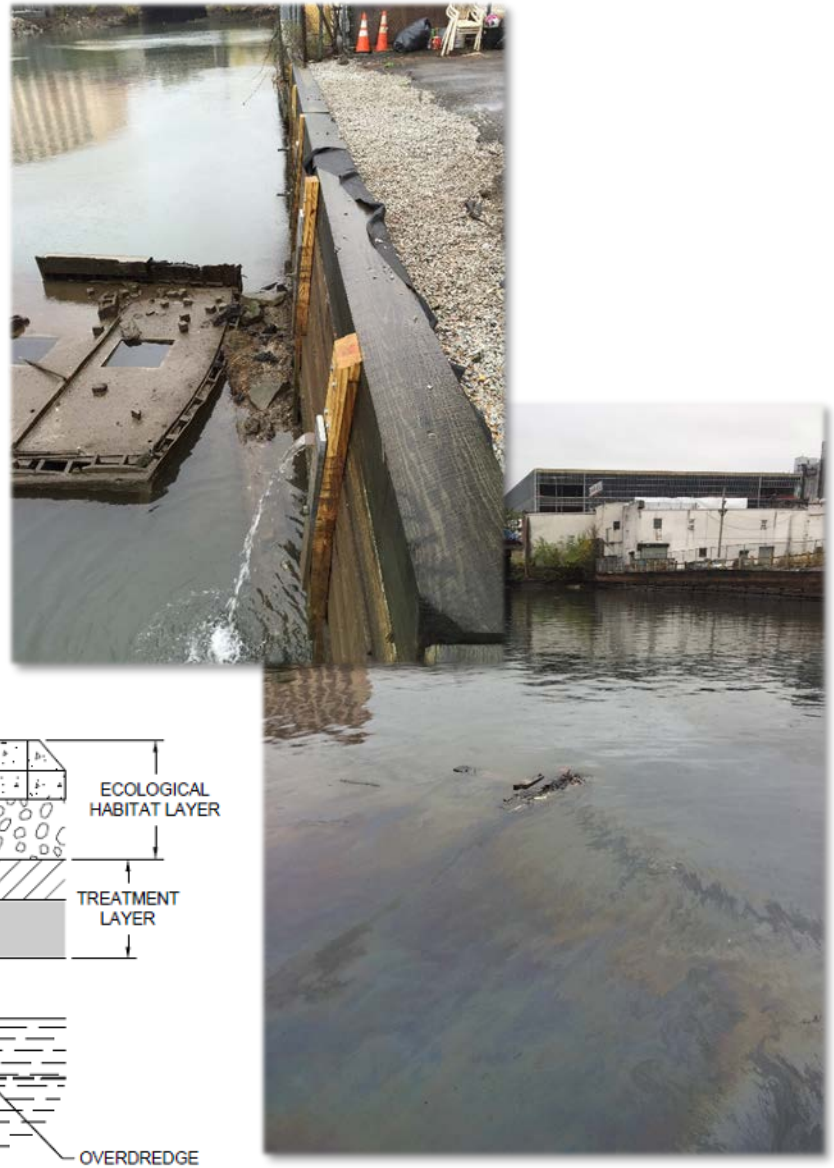
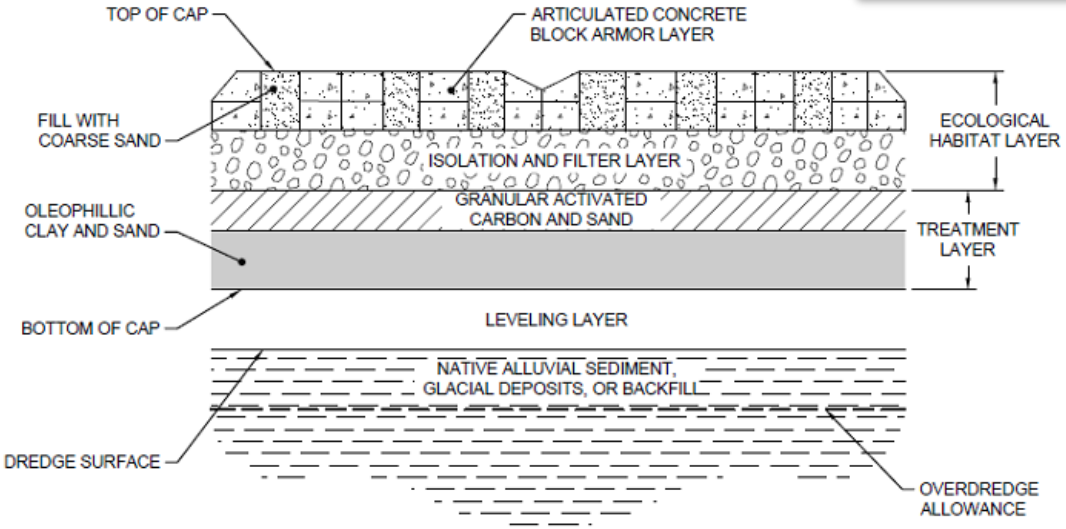
- Bulkhead repairs
- Dredging
- Ex-situ treatment
- Dredge water treatment
- In-situ stabilization
- Capping





Remedial Design Pilot Testing

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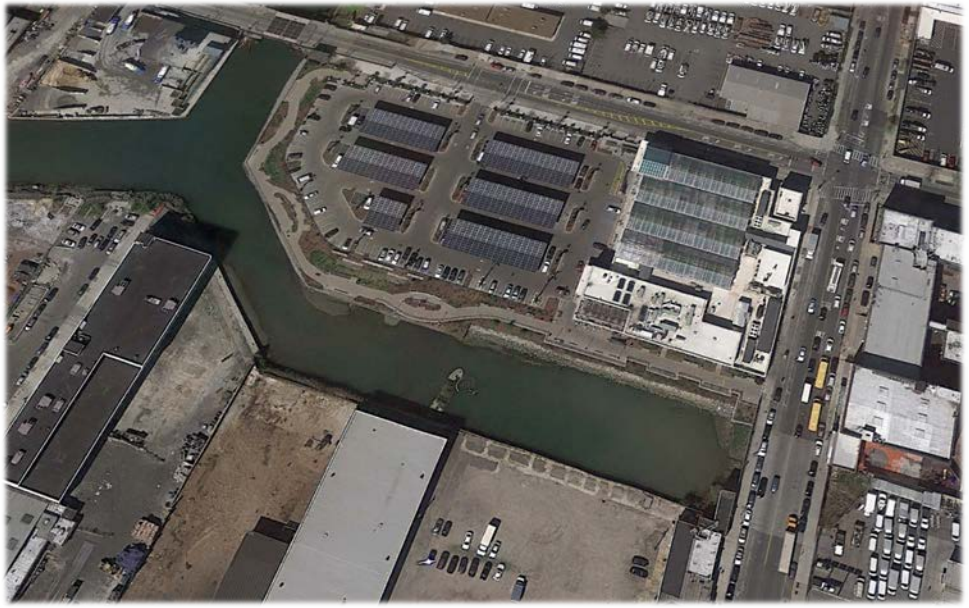
- Comprehensive Pilot Study in the 4th Street Turning Basin to aid design efforts
- Three phases
  - Site staging area preparation (Fall 2016)
  - Debris removal (Fall 2016)
  - Dredging, bulkhead stabilization, and capping (Fall 2017-present)



Dredged Material Treatment

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- Dredged material - Primarily soft sediment overlying alluvial and glacial native deposits
- ROD Requirements: Stabilization or thermal treatment prior to beneficial use
- Treatability testing conducted to:
  - Evaluate dredged material handling properties and disposal characterization
  - Determine appropriate treatment and end-placement option for dredged material

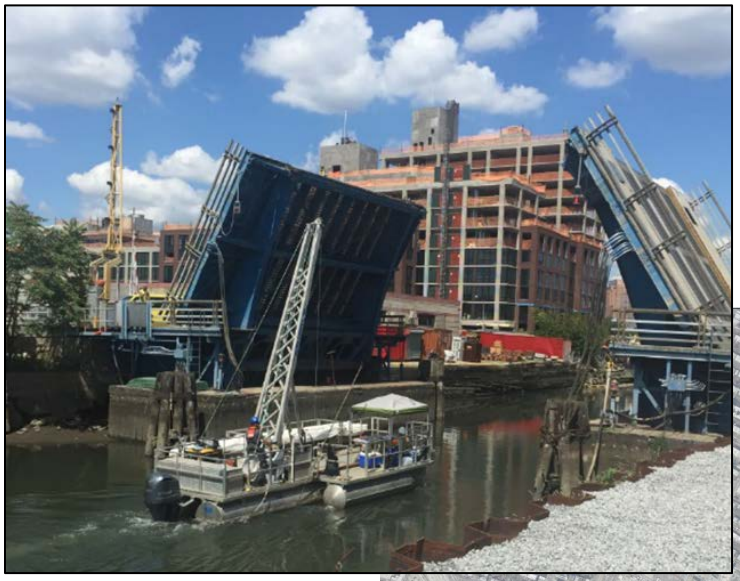
Dredged Material Treatability Testing

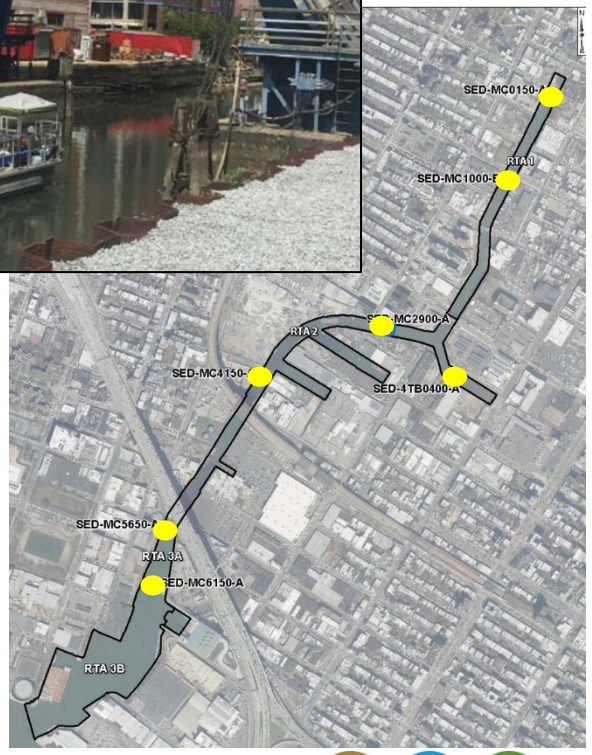
Geosyntec consultants

- Objectives
  - Verify that stabilized dredged material can be managed as a nonhazardous waste
  - Optimize Portland cement mixing ratios
  - Provide physical and chemical data to permitted end-use facilities to evaluate acceptability of dredged material

Sampling Program

- Sediment core collection
- Identify soft/native interface
- Homogenize soft/native material for analytical testing
  - Bulk chemistry, toxicity, geotechnical parameters





Stabilization Testing

- Homogenized samples stabilized with 8%, 12%, and 15% Portland cement by wet weight
  - Mixed for 30 minutes with shovel, mud mixing drill, or cement mixer
- Cover and cure
  - Day 1: Liquid release test
  - Days 1, 4, 7: analyze for geotechnical parameters
  - Day 3: Crush and analyze for bulk chemistry and toxicity

Treatability Study Results

Geosyntec consultants

Geotechnical Testing – Major Observations

Parameter (Average)	Soft Sediment	Native Sediment
Moisture Content	106%	27%
Specific Gravity	2.36	2.65
Organic Content	17%	4%

Treatability Study Results

- Analytical Testing
  - Treated dredged material considered **nonhazardous** based on toxicity, reactivity, and ignitability testing
  - Contaminant concentrations tend to decrease or remain the same when stabilized with Portland cement
- Liquid Release Testing
  - Dosage of 8% Portland cement prevented liquid release for native sediment
  - Liquid released for majority of soft sediment samples stabilized with 8% and 12% cement

Pilot Study - Background

- Evaluate processes for managing dredged material
  - Initial processing
  - Dewatering
  - In-barge mixing
  - Dredged material transport
  - Receipt by off-site facilities
  - Constraints

Pilot Study – Dredging/Processing Overview

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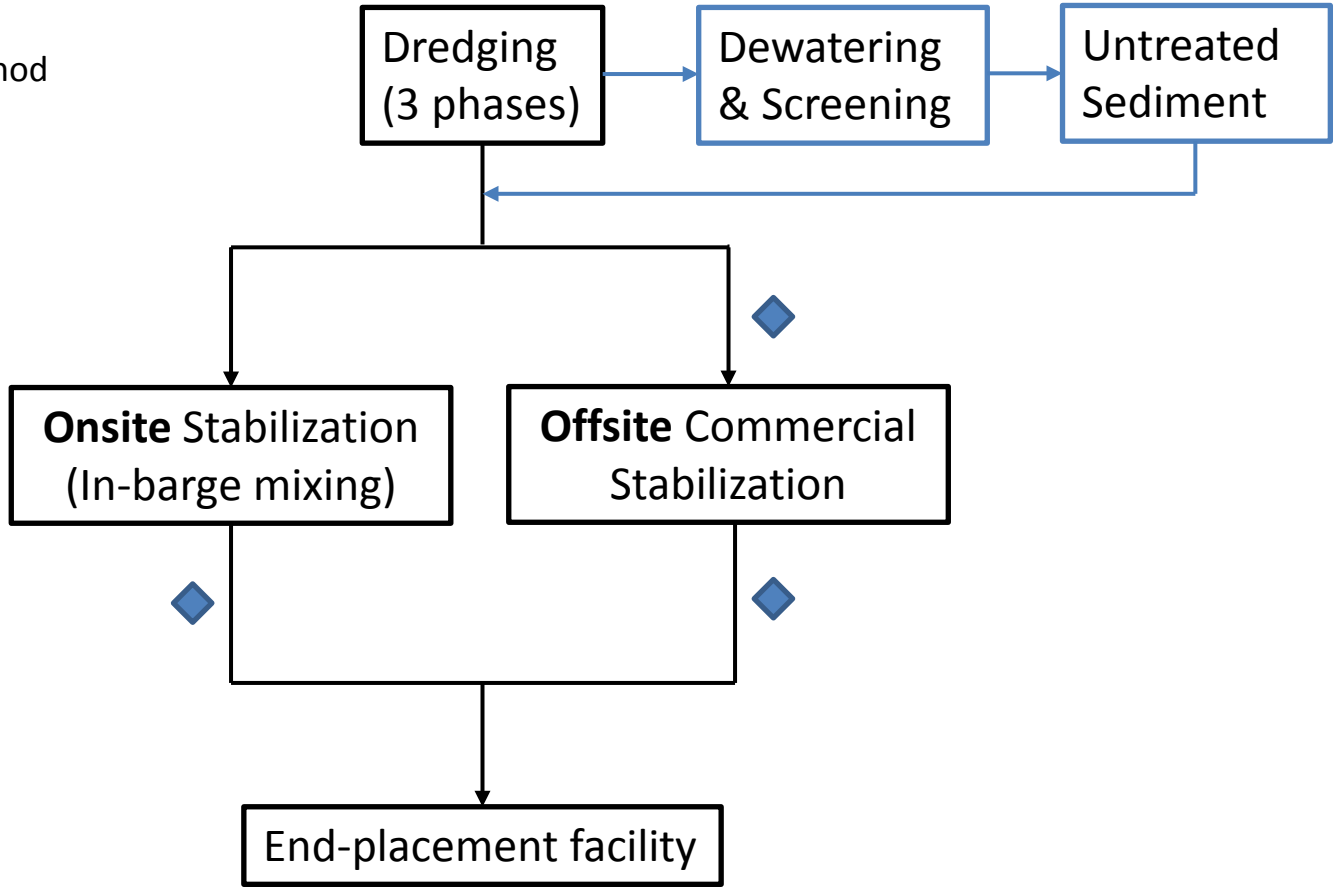
◆ Contractor-selected transportation method



Pilot Study – Processing Operations

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1. Settling/Dewatering

- Loaded hopper scows (100 CY / 75 m^3) moored to staging site bulkhead for 30 minutes of settling (minimum)

Pilot Study – Processing Operations

Geosyntec consultants

2. Dredge Water Treatment

- Decant water pumped to onsite dredge water treatment system; approx. 25 gallons decanted per ton of dredged material (105 liters per metric ton)

Pilot Study – Processing Operations

Geosyntec consultants

3. Debris screening

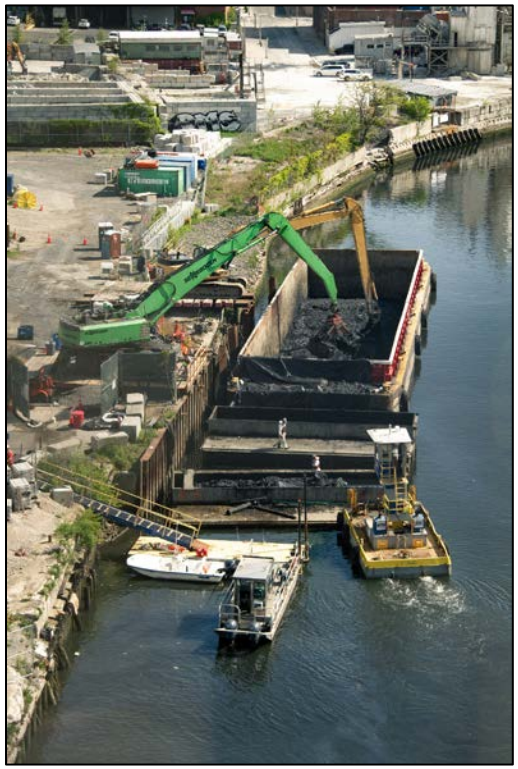
– Vibratory screen with 6-inch (15-cm) bar spacing

Pilot Study – Processing Operations

Geosyntec consultants

4. In-barge Mixing

- Type 1 Portland cement added using 1.5 metric ton supersacs; mixing time of 8 to 9 minutes per supersac
- Minimum of 18 hours cure time



Portland Cement Dosages per Scow

DOS Scow	Total Weight of Stabilized Sediment (Metric Tons)	Draft (m)	Percent Portland Cement
Scow 1	635	2.4	7%
Scow 2	771	2.7	8%
Scow 3	771	2.7	8%
Scow 4	771	2.7	15%

Off-site Processing and Stabilization

- Debris staging for archaeological review
- Measure weight of untreated sediment
- 8% Portland cement addition via pugmill

Conclusions & Considerations

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Portland cement:

- A dosage of 8% was sufficient to stabilize dredged material for beneficial use; 15% or greater could be required for clean-up pass

Loading technique:

- Use of 6-inch (15-cm) grizzly bars improved dredging production; however, breakdown of vibratory screen is potential bottleneck.

Transportation and Logistics

- Importance of covering scows during transport to minimize collection of rainwater

Conclusions & Considerations

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Beneficial Use

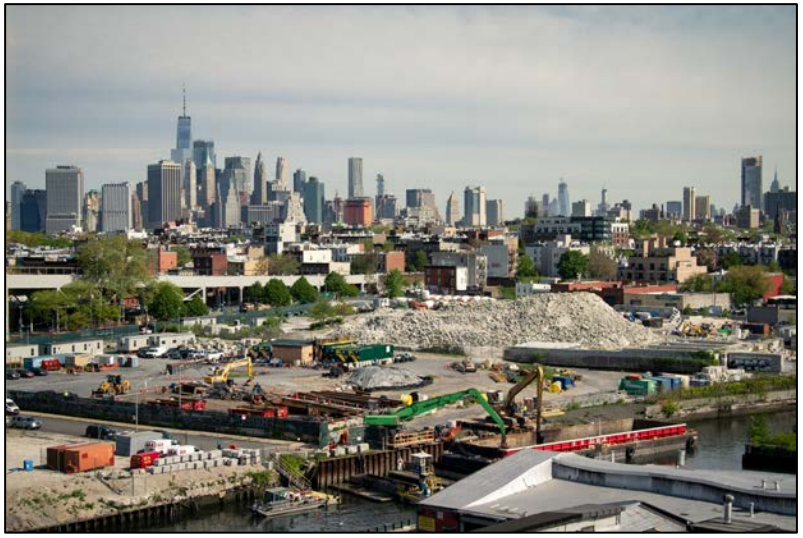
- Importance of pre-design testing of material, input from acceptance facilities, and early coordination of permit approvals
- Dredged material has been successfully treated, transported, and beneficially re-used as landfill pre-cover

Overall

- Valuable insight gained from dual approach of bench scale + pilot scale testing
- Data add to collective project knowledge and reduce future risk during full scale implementation

Acknowledgments

- Gowanus Canal Remedial Design Group
- Sevenson Environmental Services
- Geosyntec Team Members
  - Dave Himmelheber, Jay Beech, Howard Cumberland



Questions?