Optimizing Dredged Material Management at Gowanus Canal

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Introduction

Designated a Superfund Site in 2010, the United States Environmental Protection Agency issued a Record of Decision (ROD) in 2013 mandating the cleanup and dredging of the 1.8-mile (2.9-kilometer) man-made Gowanus Canal in Brooklyn, New York. The dredged material to be removed from the Canal consists primarily of several feet of soft sediment along with a lesser volume of alluvial and glacial native deposits. The material to be removed was affected by discharges from industrial, commercial, municipal and combined sewer discharges. **In accordance with the ROD, management of dredged material will include stabilization or thermal treatment prior to beneficial use.** Treatability studies were performed to evaluate dredged material for material handling properties and disposal characterization. Additional data were collected during pilot study operations to evaluate logistics, treatment effectiveness, and end-use acceptability of dredged material management processes.

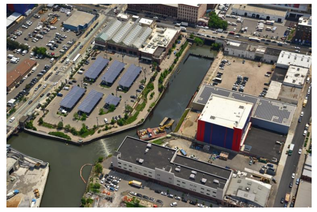

FIGURE 1: Gowanus Canal 4th Street Turning Basin Pilot Study Location.

FIGURE 2: Supersack of Portland cement ready for mixing into dredged material.

Treatability Study Investigation

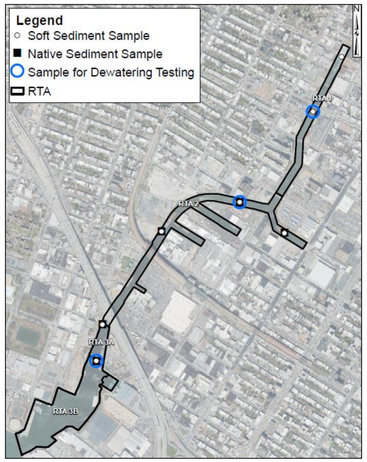

FIGURE 3: Sediment sampling locations.

FIGURE 4: Homogenized material (left) and vibratory table for liquid release testing (right).

Geosyntec performed bench scale and laboratory testing to determine the appropriate treatment and end-placement option for dredge material.

- Sediment samples were collected from seven locations throughout the Canal.
- Homogenized samples stabilized with 8%, 12%, and 15% by wet weight Portland cement.
- Samples covered, cured, and analyzed:
  - Day 1: Liquid release test
  - Days 1, 4, 7: geotechnical analysis
  - Day 3: Chemistry/toxicity analysis

Analytical and geotechnical testing indicated:

- Treated dredge material considered nonhazardous based on toxicity, reactivity, corrosivity, and ignitability testing
- Contaminant concentrations tended to decrease or remain the same when stabilized with Portland cement
- Dosage of 8% Portland cement prevented liquid release for native sediment
- Majority of soft sediment samples stabilized with 8% and 12% cement
- All samples passed paint filter testing at a separate laboratory facility

The data obtained from the treatability study provided critical information for assessment of treatment and end-use placement options for dredged material from the Canal. This dataset was used in discussions with permitted placement facilities to compare with facility-specific criteria and assess end-use acceptability.

Pilot Study Investigation

The Pilot Study was conducted from October 2017 to December 2018 and included evaluation of bulkhead support, dredging, and capping methods. One of the major objectives of the TB4 Dredging Pilot Study was to evaluate the processes for managing dredged material and to identify constraints for material handling, sequencing of barges, and transportation of dredged materials.

FIGURE 5: Dredge material passing through onsite vibratory grizzly screen to separate oversized debris from sediment.

FIGURE 6: Debris separated from sediment at offsite facility.

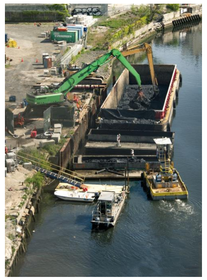

FIGURE 7: In-barge mixing of sediment with Portland cement.

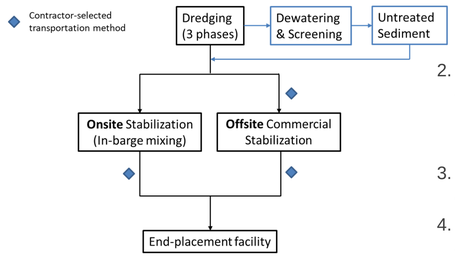

FIGURE 8: Process flow diagram for sediment treatment and management during pilot study operations.

Pilot Study Processing Operations:

1. Settling/Dewatering
   - Loaded hopper scows (100 CY) moored to staging site bulkhead for at least 30 minutes of settling
2. Dredge Water Treatment
   - Decant water pumped to onsite dredge water treatment system; approx. 25 gallons decanted per ton of dredged material
3. Debris Separation
   - Vibratory grizzly screen with 6-inch bar spacing
4. Stabilization
   - In-barge mixing and offsite stabilization
5. Waste Characterization Sampling
   - Conducted at least 24 hours following stabilization and solidification

Results and Lessons Learned

Dredge material stabilized offsite received a dosage of 8% Portland cement and curing times were extended if needed (i.e., to account for higher water content). Dosages of Portland cement used for in-barge mixing varied depending on the water content of the dredge sediment (Table 1).

TABLE 1: Summary of Portland Cement Stabilization Quantities via In-Barge Mixing

Dredge Phase	Sediment Quantity[a] (tons)	Portland Cement Dosage (%)
Access Channel	654	7%
	787	8%
	787	8%
	725	17%
Phase II	822	3%

[a] Quantity of dredged sediment estimated based on barge drafts.

Throughout the duration of the pilot study, approximately 760 tons of debris were removed, 16 tons of metal debris were recycled, 3,775 tons and 17,500 tons of sediment were stabilized via in-barge mixing and offsite processing, respectively. Based on characterization sampling, processed dredge material was used for pre-cover material at a landfill facility. An archaeologist visually inspected large debris and/or potentially culturally significant items.

FIGURE 9: Debris recovered from the Canal. Clockwise from top left: Metal dredge bucket, stamped bricks, fisherman anchor, coffee pot, wagon wheel, and metal block pulley.

Conclusion

The dual approach of bench scale and pilot scale testing of dredged material provided valuable insight into the characteristics of treated material, logistics of treatment, and possibilities for end-use. Lessons learned as a result of the pilot study include:

- Following removal of large debris (>5 ft in any dimension) during a prior phase of the pilot study, approximately 3% to 5% of total dredge material by weight was debris.
- In-barge mixing did not cause any bottlenecks in processing operations or offsite transport of debris.
- Use of the offsite 4-deck cascading vibratory screen proved to be more reliable (i.e., fewer breakdowns) than the onsite vibratory screen.

This knowledge base will reduce future risks—from pricing to environmental exposure—during full scale implementation of the dredging remedy.