

NEW YORK & NEW JERSEY HARBOR NAVIGATION CHANNEL DEEPENING

A Project Manager's Perspective

Bryce Wisemiller
Project Manager
U.S. Army Corps of Engineers
New York District



U.S. ARMY



US Army Corps
of Engineers New
York District
BUILDING STRONG®



Channel Deepening in the Port of NY & NJ

1989

1994

1999

2002 2004

2007

2011

2016

Phase 1 (35 ft to 40 ft)

Kill Van Kull & Newark Bay Channels

Phase 2 (40 to 45 ft)

Port Jersey Channel (41 ft)

Arthur Kill Channel

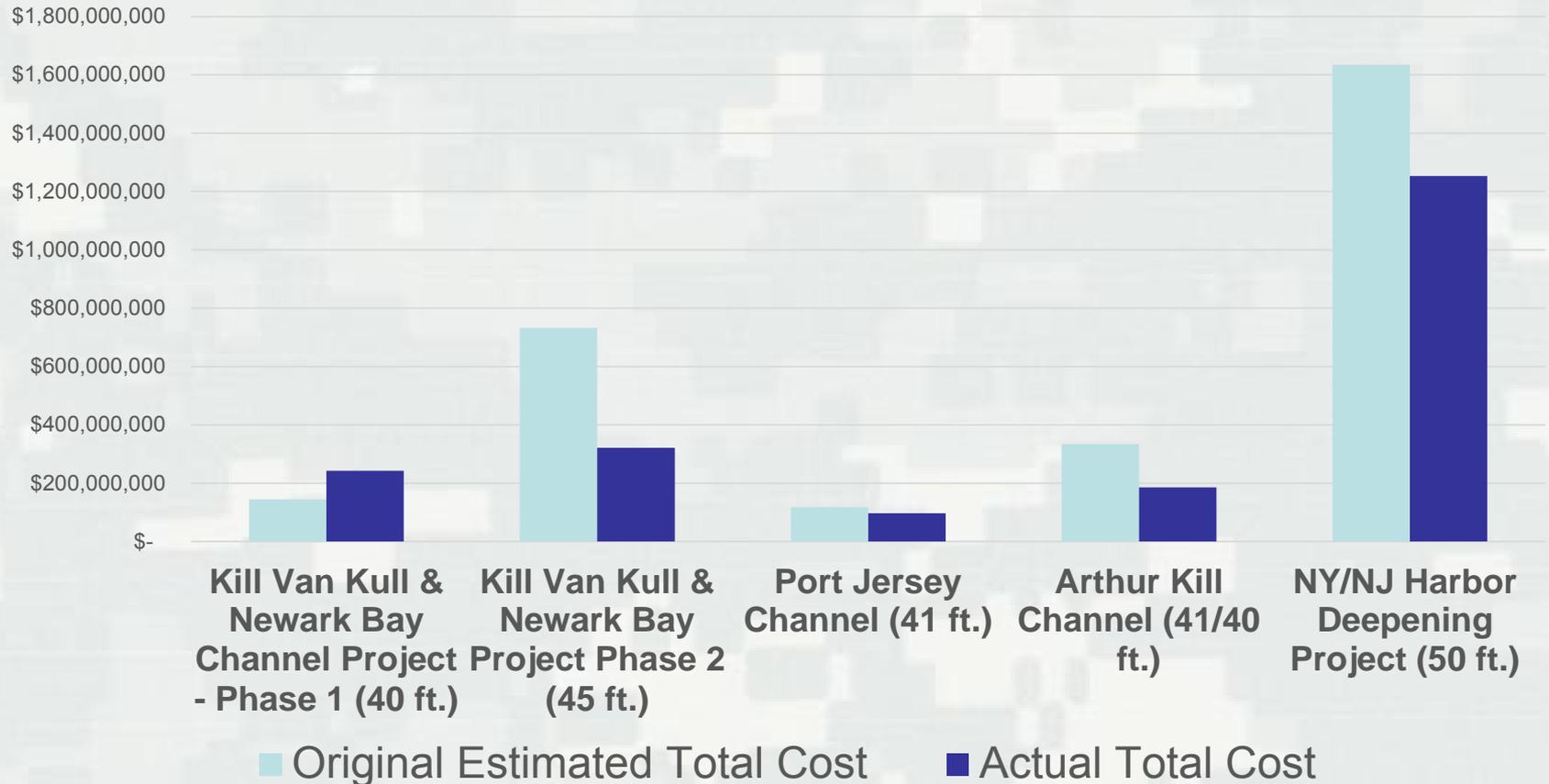
41 ft

40 ft

NY/NJ Harbor Deepening (50 ft)

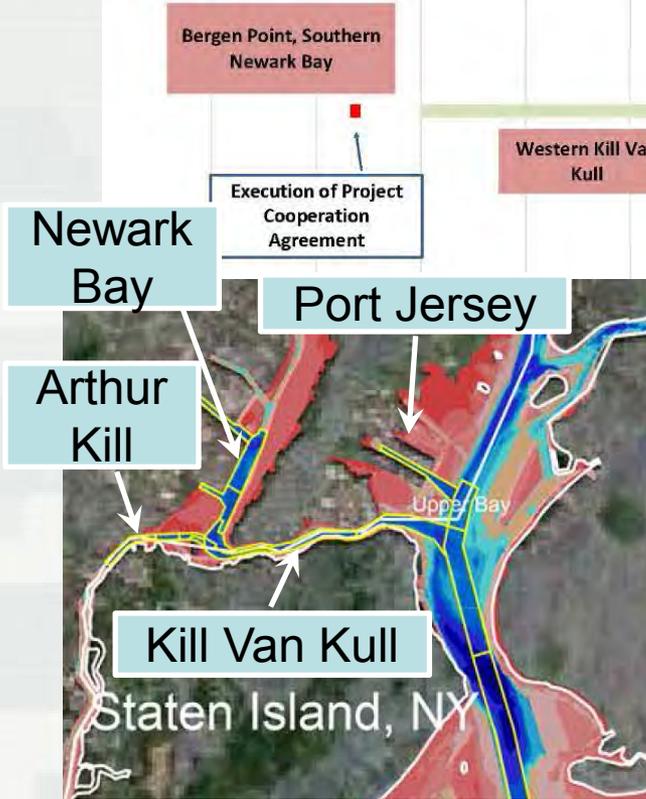


Deepening Project's Costs



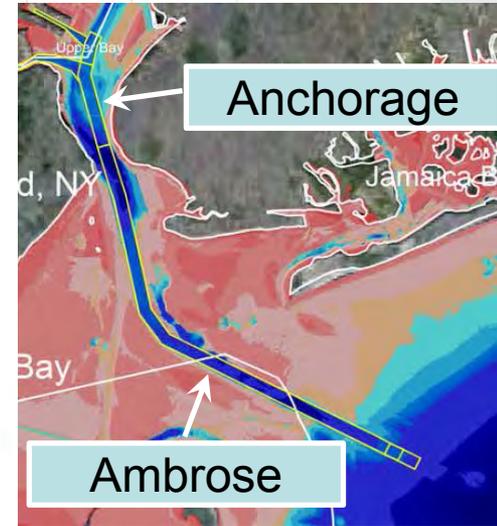
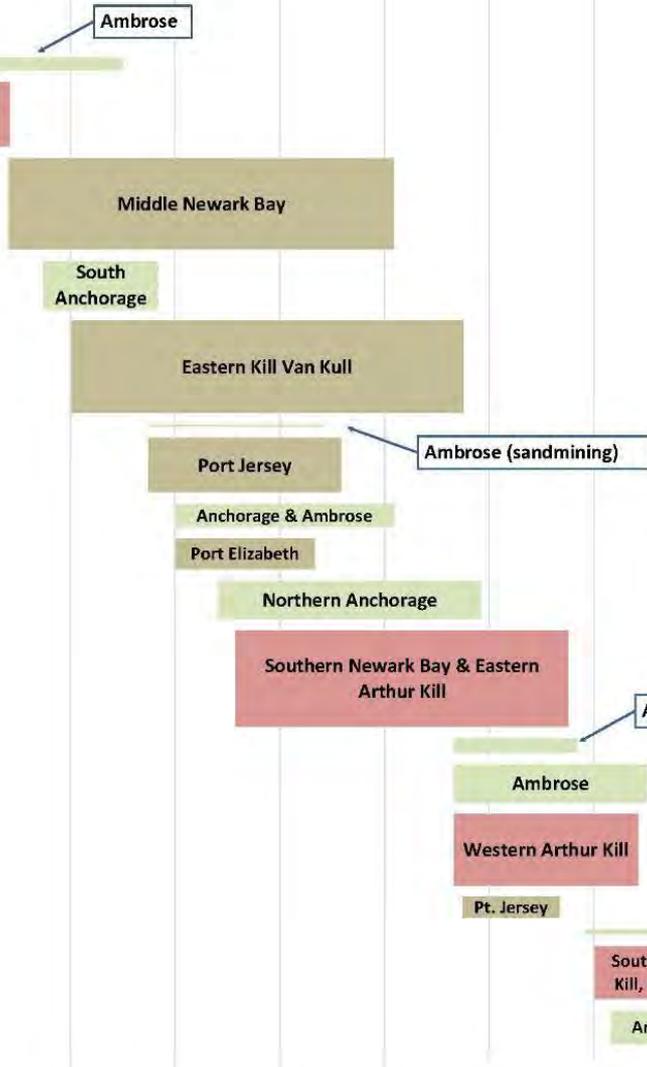
NY/NJ Harbor 50 ft. Deepening Contracts

2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016



Execution of Project Cooperation Agreement

- Soft Material (Silts and/or Sands)
- Hard Material (Glacial Till, Clay and/or bedrock)
- Hard Material Largely Requiring Drilling & Blasting



Port Jersey

Project Completion

South Western Arthur Kill, Western Pt. Eliz.

Anchorage, KVK & NB

Anchorage & Port Jersey Utility Corridors



Notable Project Features

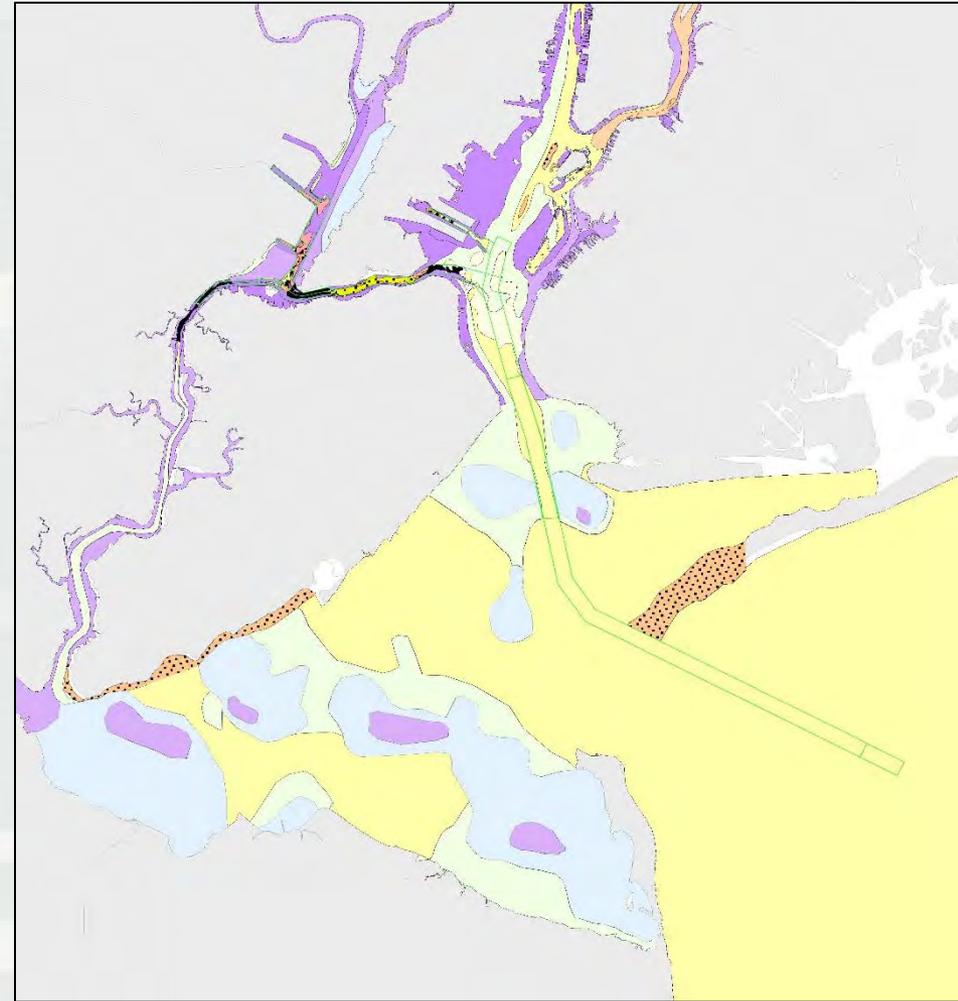


- Geologically Varied & Challenging
- Bedrock Drilling & Blasting Operations
- Wetland & Air Mitigation
- Beneficial Use of Dredged Material
- Environmental Monitoring – benthic, suspended sediment from dredging & other sources
- Utility Protection Features in Port Jersey Channel

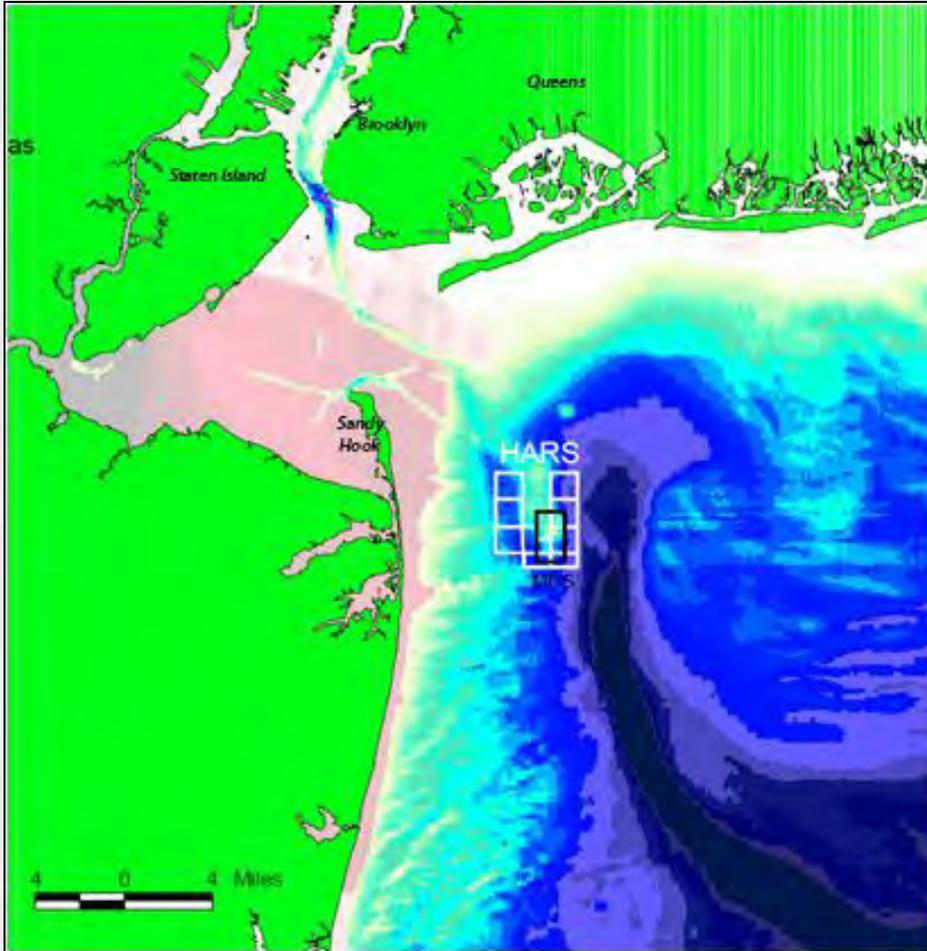


Surficially Geologically Varied & Challenging

- Surficial Holocene Sediments vary greatly physically, chemically and biologically
- Predominantly sandy material from the Lower Bay was directly suitable for remediation material at the HARS or for beneficial use (e.g., marsh restoration)
- Siltier material from inner harbor areas oftentimes not suitable for placement at HARS due to exposure to historic contamination
- Non-HARS suitable material was either beneficially used in remediating upland impacted sites in the region or, when necessary, disposed in the Newark Bay Confined Disposal Facility (NBCDF) owned & operated by the Port Authority of NY & NJ



What is the HARS?

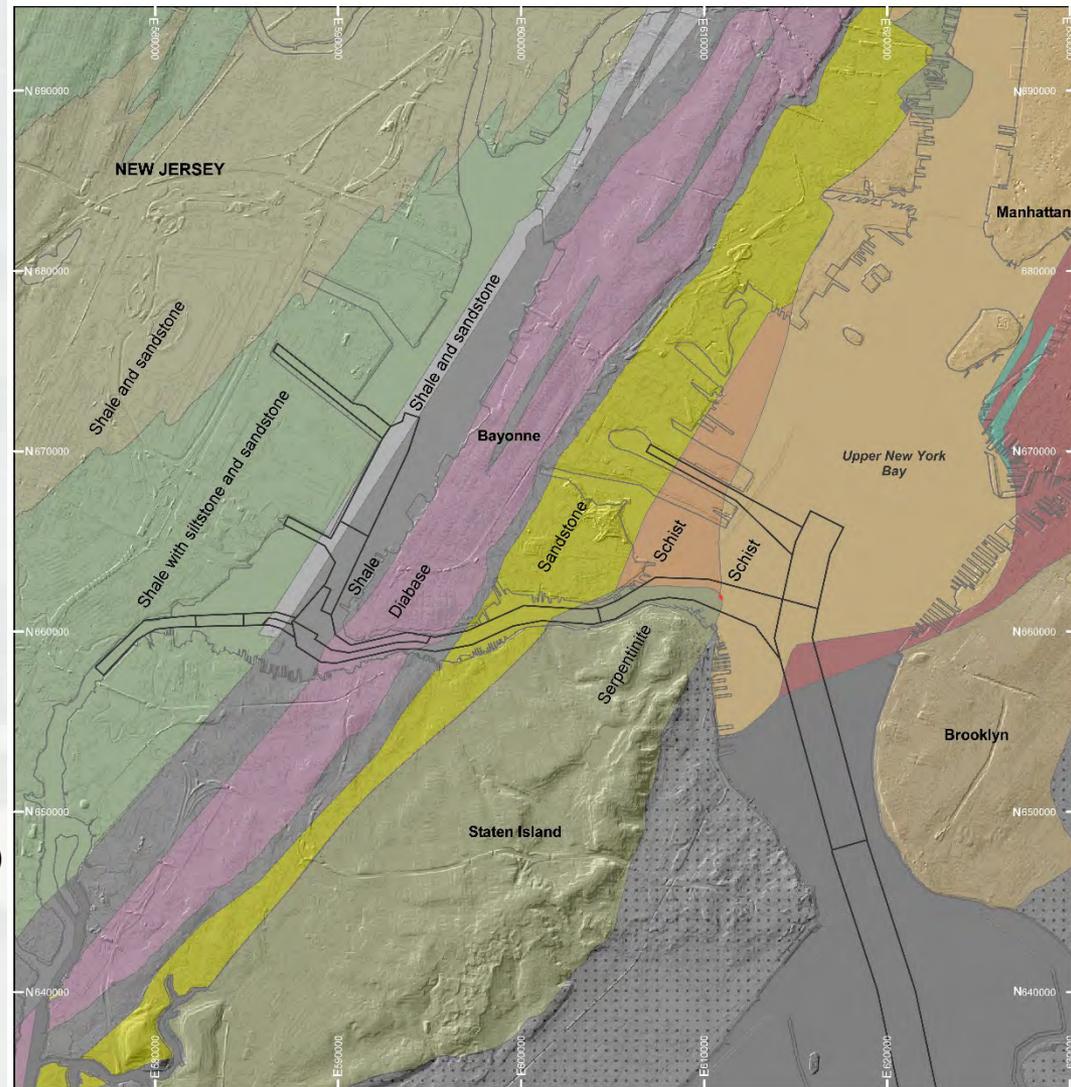


- In September 1997, the USEPA de-designated and terminated the use of the Mud Dump Site (MDS) and simultaneously re-designated the site and surrounding areas that had been used historically as disposal sites for dredged materials as the Historic Area Remediation Site (HARS).
- The sea floor of the HARS is being remediated by placing a thick cap of clean dredged material on top of the surficial sediments that are contaminated from previous disposal of dredged and other materials.



Sub-Surface Even More Geologically Varied & Challenging

- Glacial Till (the terminal moraine mixture of clays, sands, gravels, and boulders) and varved red-brown clay underlies the surface in portions of Port Jersey, Kill Van Kull, Newark Bay and Arthur Kill
- Underlying bedrock includes igneous, metamorphic and sedimentary strata
 - ▶ Harder bedrock, notably Diabase, Sandstone, and Pegmatite, required drilling & blasting pretreatment prior to mechanical dredging (excavator and/or clamshell dredges)
 - ▶ Softer bedrock, notably Serpentinite and Shale, was able to be fractured using cutterhead dredges (no pumpout) then removed with mechanical dredges



Dredging Equipment Used



Clamshell



Cutterhead



Hopper Dredges



Excavator (Backhoe)

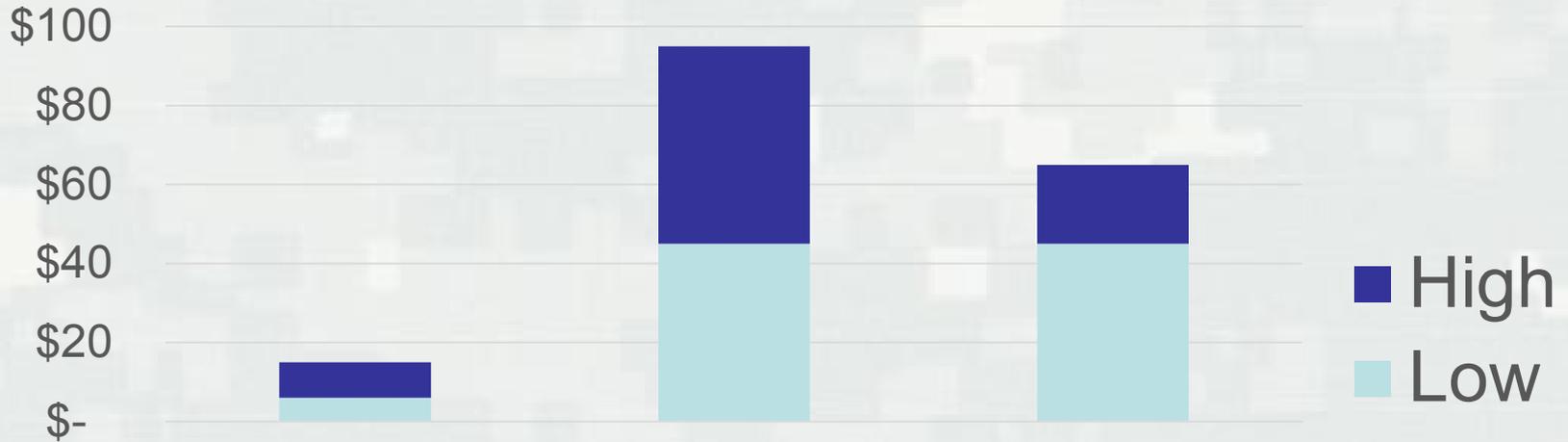


Drill Boats



BUILDING STRONG®

General Cost/CY of Dredging & Managing Different Materials



Typically Dredged With:

Soft HARS Suitable Materials - Silts and Sands

Clamshell & Hopper Dredges

Soft non-HARS Silts

Closed Bucket Clamshell Dredges

Hard Bedrock Materials - Glacial Till, Clays & Bedrock

Clamshell & Excavator Dredges, possibly with Cutterheads and/or Drilling & Blasting



Bedrock Drilling & Blasting Operations

- Extensive Public Outreach
- Vibration and Noise Carefully Monitored both by Contractor & Corps' Independent Consultant
- Pre & Post Blasting Inspections of Structures in Precautionary Zone
- Drilling & Blasting Avoided in Areas with Thinner Lifts of Softer Bedrock by Using Cutterhead & Excavator Dredges
- Corps follows US Bureau of Mines Guidelines



- Vibration from Blasting may not exceed these limits:
 - ▶ Historically Designated Structures
0.5 in/sec (Standard Used)
 - ▶ Residential Structures
1.0 in/sec
 - ▶ All Other Structures
2.0 in/sec



Bedrock Drilling & Blasting Operations (contd.)

Required Closure of Over Half the Channel Width – Which Necessitated Acquiring / Deploying Articulated Buoys to Maintain Navigation in Arthur Kill Channel due to Narrower Channel Width

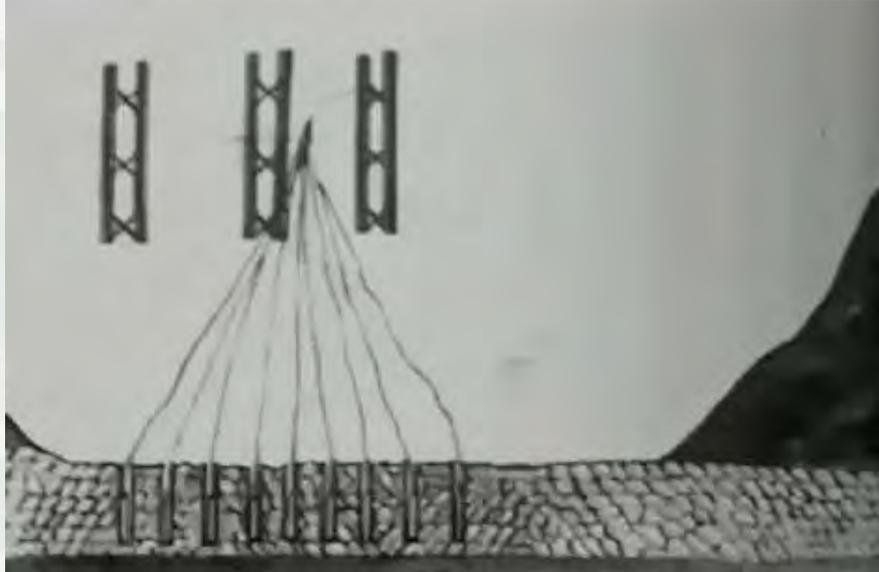
Drill Boat
"Kraken"



Drilling & Blasting in the Arthur Kill, Then & Now

1920

2012



New York & New Jersey Harbor Wetland Mitigation Program

Wetlands Restoration:

Four mitigation sites have restored 143 acres of wetlands (1.5 million plants):

- Elders Point Marsh Island Restoration, Jamaica Bay, NY (50 ft. HDP)
- Woodbridge Creek Ecosystem Restoration Project, Woodbridge, NJ (50 ft. HDP)
- Salt Marsh Restoration at Key Span site, Staten Island, NY (AK 41 ft.)
- Joseph P. Medwick Park, Carteret, NJ (AK 41 ft.)



BUILDING STRONG®

New York & New Jersey Harbor Air Mitigation Program

Clean Air Act Conformity:

- Required to offset NOX emissions from Dredges
- Constantly Monitored & Tracked by Inter-Agency Regional Air Team
- Required monthly reporting by Contractors with some Contracts having Yearly Emission Limits
- Retrofitted 21 tug engines in the NY/NJ Harbor
- Retrofitted 12 ferry engines (e.g., Staten Island) with generator kits
- Excess Available Air Offsets Facilitated Emergency Coastal Restoration following Hurricane Sandy
- Improved Air Quality in Region will Far Outlast Deepening Construction



BUILDING STRONG®

Beneficial Use of Dredged Material



- Additional Cost-Shared (\$37M total) Marsh Island Restoration within Jamaica Bay, NY
 - ▶ Elder's Island West
 - ▶ Yellow Bar Marsh
- Plumb Beach Coastal Storm Risk Project
- Lincoln Park Remediation/Restoration, Jersey City, New Jersey
- Additional New York State Funded Restoration
 - ▶ Black Wall, Jamaica Bay, NY
 - ▶ Ruler's Bar, Jamaica Bay, NY
- New Jersey Funded Habitat Enhancement Site in former MOTBY Channel, Bayonne, NJ
- Capped PANY/NJ's Newark Bay Confined Disposal Facility



Beneficial Use of Dredged Material Examples

Brownfield Remediation



Bayonne Landfill: 4MCY
(many other landfills & brownfields remediated also)



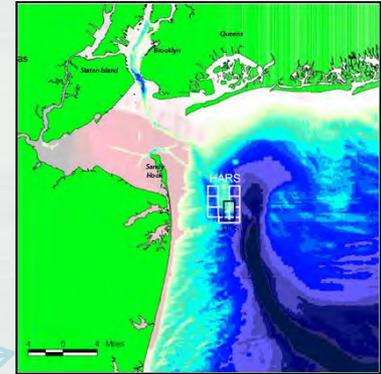
Lincoln Park: 339,000 CY

Beach Nourishment/Shoreline Stabilization



Plumb Beach: 133,000 CY

Remediation



Capping HARS (+O&M): ~56 MCY



NY/NJ Harbor Deepening:
~50 M CY



Capping NBCDF: 230,000 CY



Fish Reefs: ~11 MCY rock

Ecosystem Restoration: Jamaica Bay Marsh Islands



U.S. ARMY
Elders East: 249,000 CY
40 acres



Elders West: 302,000 CY
40 acres



Yellow Bar: 375,000 CY
44 acres



Black Wall: 155,000 CY
20 acres



Rulers Bar: 92,000 CY
10 acres



Rulers Bar: 92,000 CY

Black Wall: 155,000 CY

Yellow Bar: 375,000 CY

Jamaica Bay Marsh Island Restoration

Plumb Beach Shoreline Stabilization: 133,000 CY Ambrose Sand Placed in 2012 Prior to Hurricane Sandy



Habitat Enhancement Site

- Funded by New Jersey (\$5M) to Offset loss of 12 acres of sublittoral habitat in Port Jersey Channel Construction
- Involved placement of 935,000 CY of glacial till (dike) and sand from the Port Jersey Channel Deepening to enhance approximately 43 acres of sub-littoral habitat within an unused former military terminal channel by returning it to shallower depth consistent with the surrounding flats area

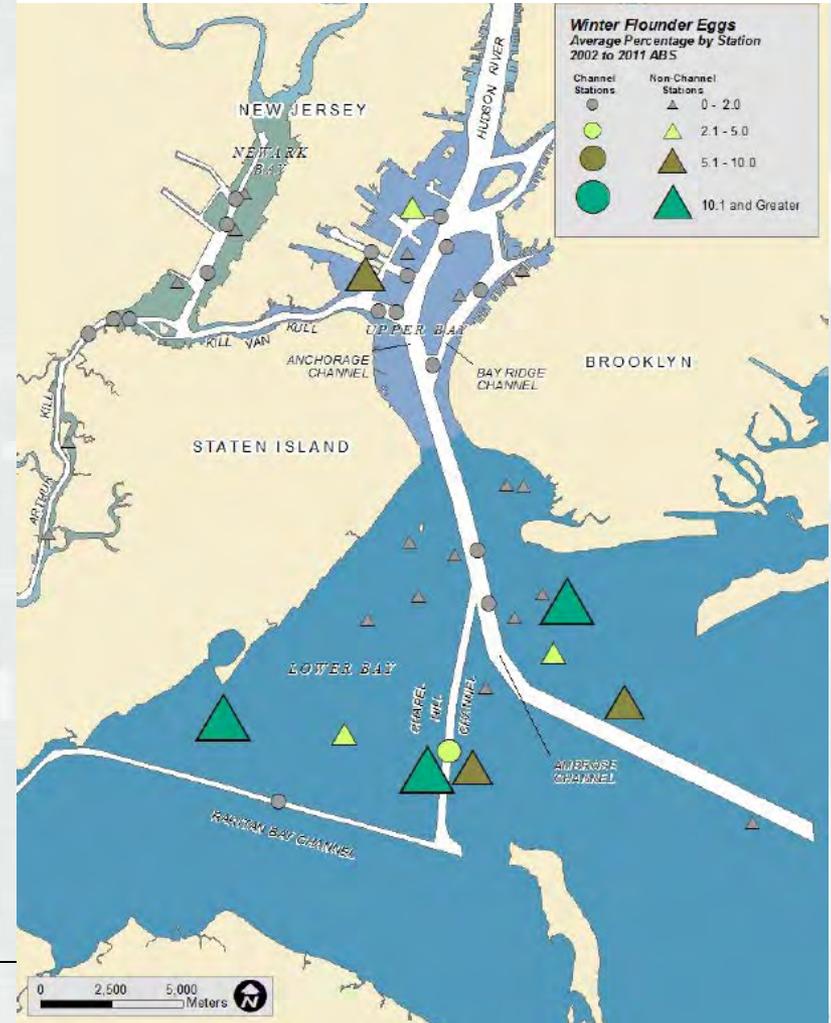


Extensive Environmental Monitoring During Project Construction

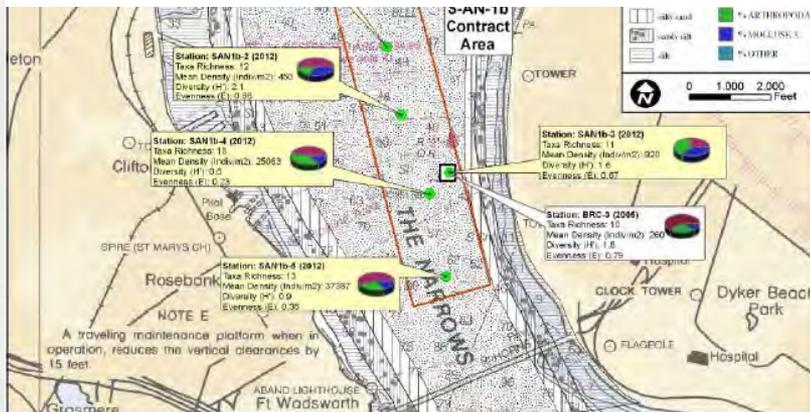
Benthic & Biological Recovery Studies:

- ▶ Informing Resource & Regulatory Agencies
- ▶ Refining Environmental Windows to Better Protect Estuary Resources

Winter Flounder Egg Distribution in Estuary



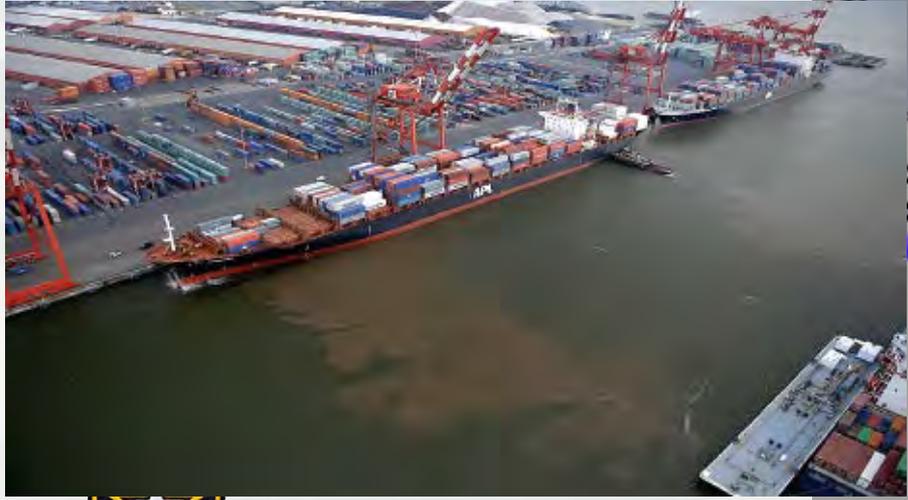
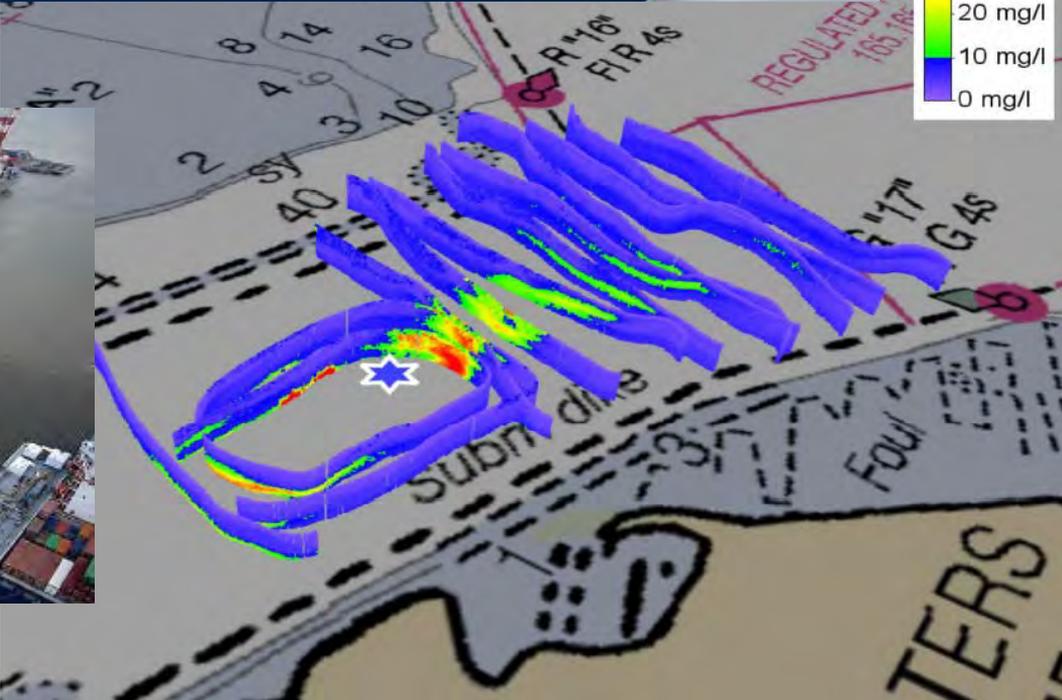
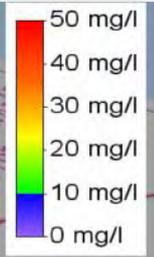
2005 and 2012 Benthic Taxa & Surface Sediment



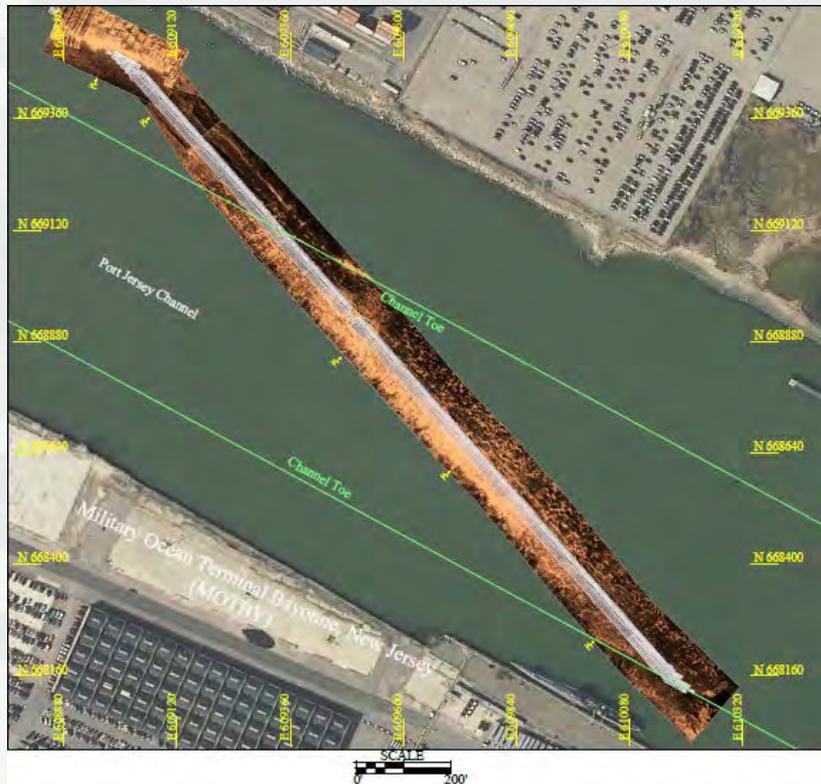
Extensive Environmental Monitoring During Project Construction (contd.)

Multiple Suspended Sediment Studies from Dredging, Storms & Other Sources

New York and New Jersey Harbor Deepening Project
DREDGE PLUME DYNAMICS IN NEW YORK/NEW JERSEY HARBOR
SUMMARY OF SUSPENDED SEDIMENT PLUME SURVEYS PERFORMED DURING HARBOR DEEPENING
April 2015



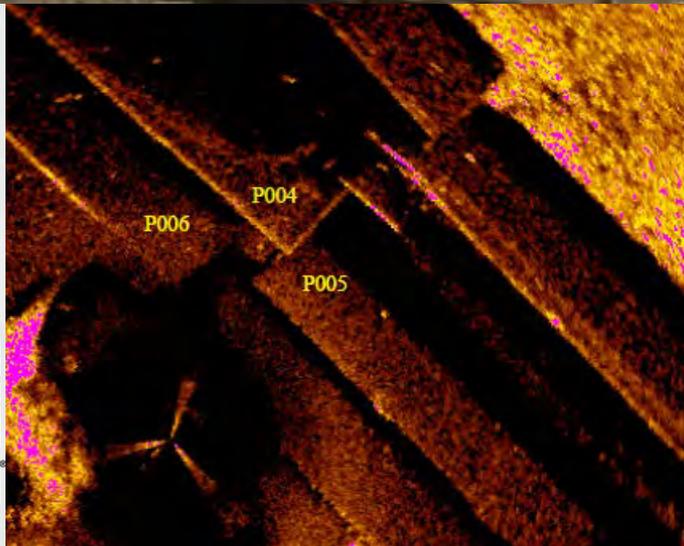
Utility Protection Features in Port Jersey Channel



- Protection-in-Place Measures Required During Channel & Berth Deepening to Ensure Utility Tunnel Safety
- Utility Tunnel – Nearly One Hundred Year Old, Hand Dug 12 ft. Inside Diameter Treated Effluent Outfall Tunnel Owned by the Passaic Valley Sewerage Commission (New Jersey State Agency)
- Protection-in-Place Measures Involved:
 - ▶ Overdigging Channel by Approximately 1 ft. to allow 6 inch thick $\frac{3}{4}$ inch bedding stone topped with 430 separate 5 inch thick, 30 ft. long by 4 ft. wide steel plates



Utility Protection Features in Port Jersey Channel (contd.)



- Protection-in-Place Measures Involved:
 - ▶ Each 4 ft. by 30 ft. by 5 inch thick steel plate weighed approx. 13 tons
 - ▶ The cost of steel alone was over \$10M
 - ▶ Plates were required to be 1% of flat, centered within 1 ft. perpendicular of the PVSC tunnel center line, and no more than 4 inches apart from each other
- Initial Placements Impacted by Plates Sliding Unexpectedly Down Side Slope
- Schist Rock Outcrop in Center of Channel Required Protection-in-Place Modifications During Construction



Other Project Accomplishments



- Utilized over \$25M of ARRA and \$14M of Sandy Disaster Act Federal Funding
- Provided 407,000 CY of Sand Fill Material for MOTBY Redevelopment (@ \$0.01/CY)
- Greatest Anthropogenic Removal in Estuary of Existing Contamination from Continued Environmental Exposure – HARS suitable sediments (now) in Northern Anchorage, Port Jersey and Lower Newark Bay



BUILDING STRONG®

Unexpected Challenges



- Multiple Ollisions with Excavators, Broken & Collapsed Booms on Clamshells & Excavators
- Lawsuits
- Radioactive Materials
- Unexploded Ordinance
- Hurricane Sandy
- Debris from Past Bulkhead Failures
- Clearing Utility Areas



Multiple Ollisions with Excavators, boom breaks/collapses



Newark Bay Main Stem Channel, January 24, 2008



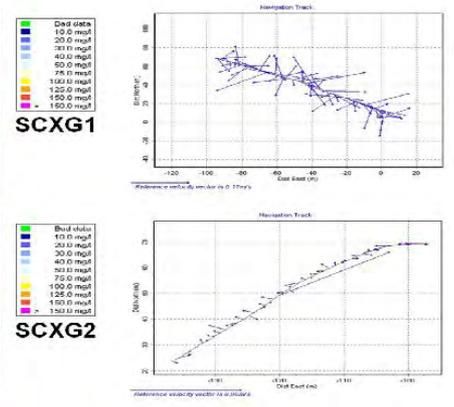
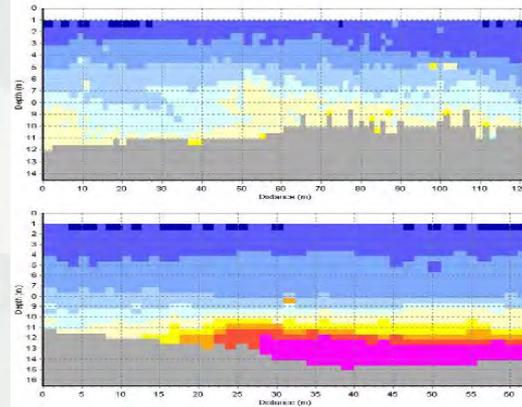
Lawsuits

- Newark Bay (2005-2008)**
 Brought about by concern the ongoing HDP construction would interfere with the EPA's newly designated study of Newark Bay (related to the Diamond Alkali Superfund Site)
- Patent Infringement (2005-2011)**
 Plaintiffs alleged Government endorsed various contractor's infringing on 8 patents relating to processing of dredged material

Silt Curtain Demonstration Project in Newark Bay



Sensor Mounted on Env. Bucket for Nearfield TSS Pilot Study



Radioactive Materials

- In February 2012, a dump truck carrying debris separated from non-HARS material dredged from lower Newark Bay repeatedly triggered a radiation alarm at a weigh station
- Historic reports that Uranium was offloaded in lower Newark Bay for the Manhattan Project in the 1940's
- Immediate investigations confirmed that the radiation alarm was triggered not by Uranium but by naturally occurring radioactive materials (mudstones) present in geologic formations in lower Newark Bay



Unexploded Ordnance



- Hopper Dredges Deployed UXO Screens for All Wetland Restoration Work Using Sandy Materials
- “Surprise” Discovery when Screening Non-HARS Material for Debris in 2015



Superstorm Sandy Impacts to the HDP

- Increased sedimentation in Newark Bay Shoals
- Created Navigation Hazards from Debris in Channels
- Necessitated Separating Contracts
- Delayed Project Completion due to Flooding of Water Siphon Relocation Tunnel



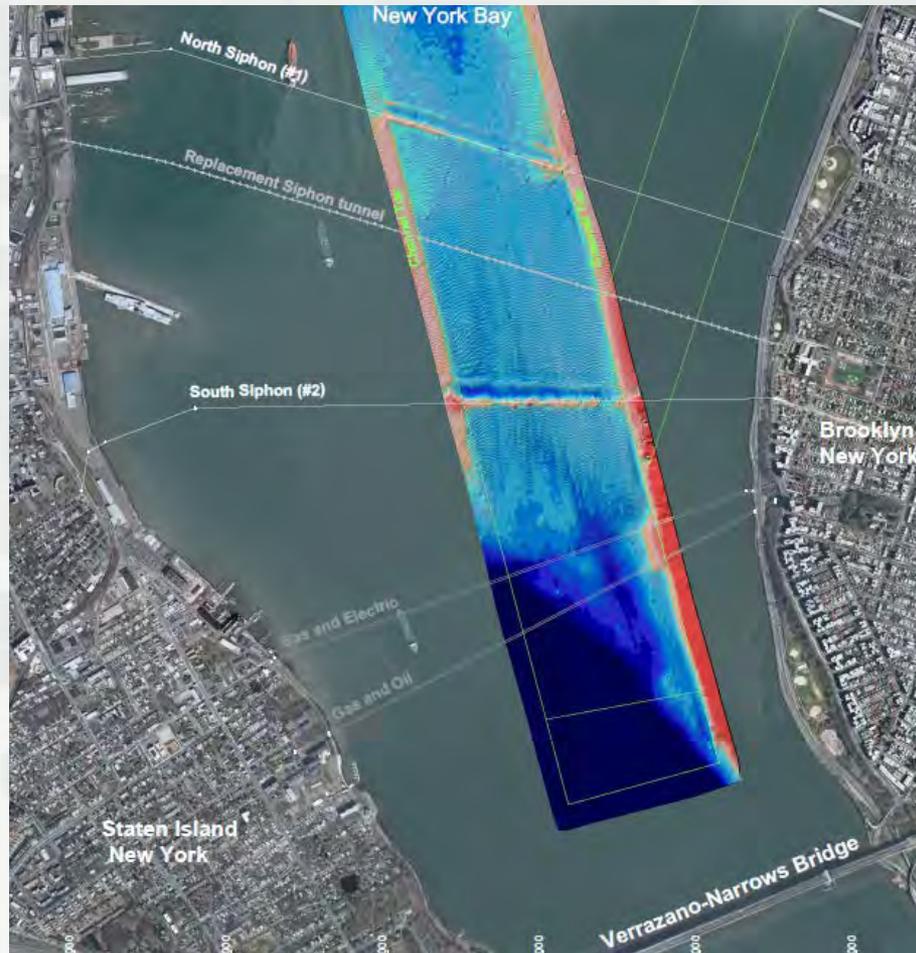
Debris from Past Bulkhead Failures

Following broken bucket, several large debris discovered migrating down Port Jersey Side Slope from historical bulkhead failure at former MOTBY



Clearing the Utility Areas

- Only Remaining Deepening Construction
- 10 Utility Lines in 5 corridors in Anchorage & Port Jersey Channels Operated by 6 different Entities
- Abandoned Pipeline Debris in Arthur Kill Channel (40 ft. deepening)
- **New** Unexpected Challenge: Dredge Boom Collapse, June 7, 2016





What's Next?

- Port Authority Requested the Corps Perform a General Reevaluation Study to Ensure Channels Continue to Serve Port & Nation
- Possible Bend Easing and Anchorage Areas to Facilitate Current and Future Containership Usage in Port



View from Bridge of Containership *Smaller* than HDP Design Ship, Transiting the Kill Van Kull



Questions?

