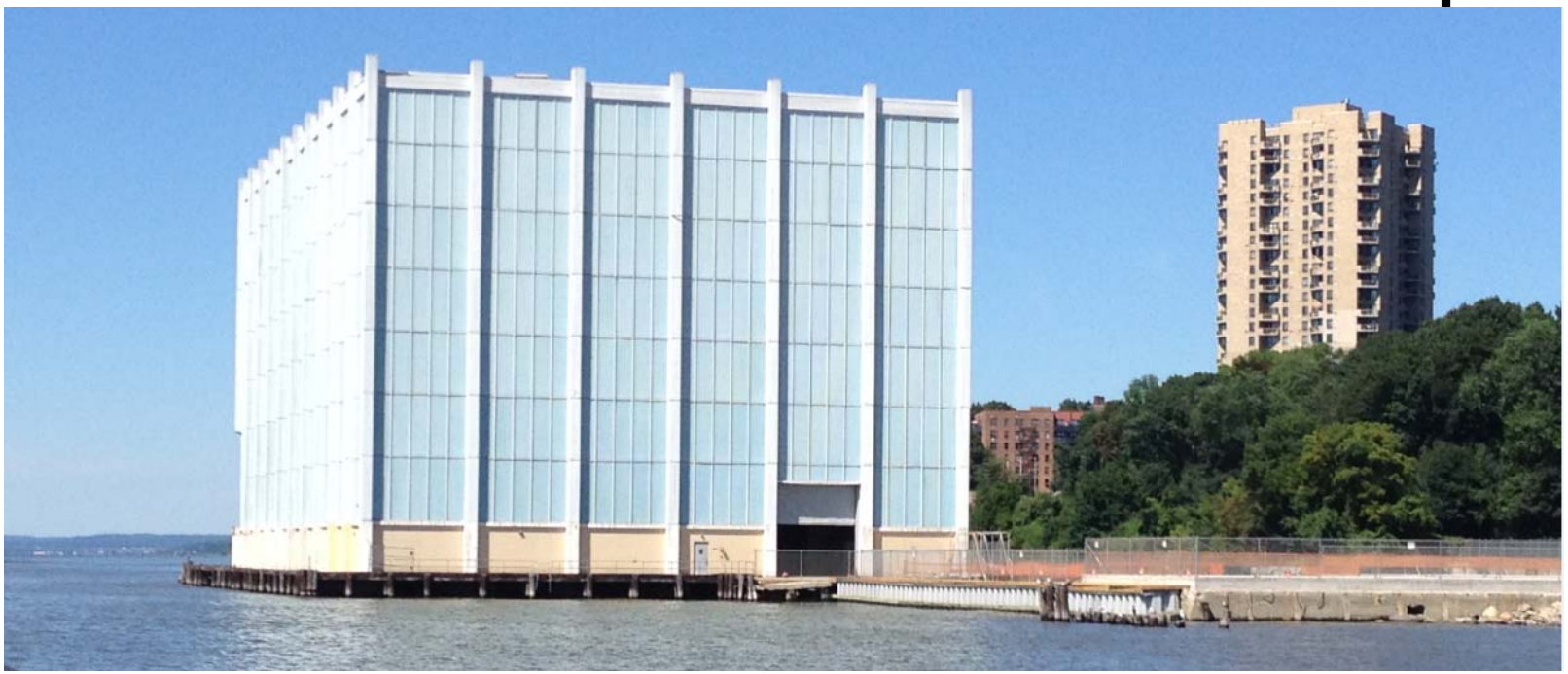
Former BICC Cables Site
Hudson River Sediment Cap



Michael Newton, LSRP, PG and Janos M. Szeman, P.E.

Agenda

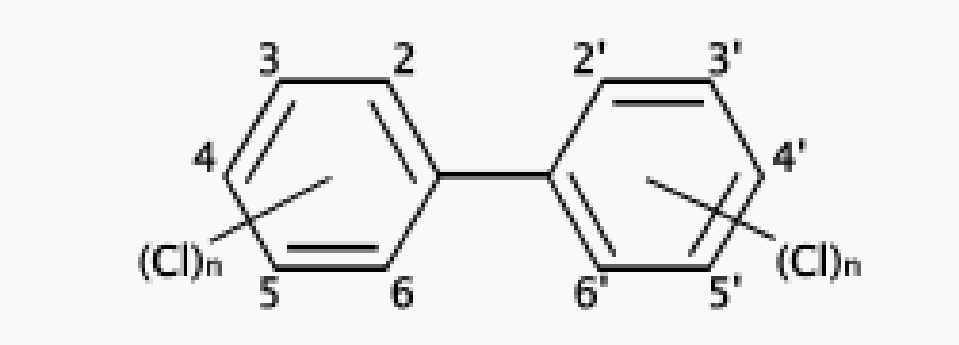
1. Welcome and Introductions
2. BICC Site History
3. BICC Site Impacts
4. Project Stakeholders
5. Remedial Actions (March 2005 ROD, July 2014)
6. Engineering Controls
7. Hudson River Sediment Remediation
8. Conceptual Site Model
9. OU-2 Sediment Remediation
10. NYSDEC Selected Remedy: Multi-Layer SCS
11. WECV Study
12. Multi-Layer SCS Construction
13. SCS Construction Approach
14. SCS Remote Sensing System
15. Site Management Plan

PAPER INSULATED CABLES

Why were PCBs used at the BICC Site?

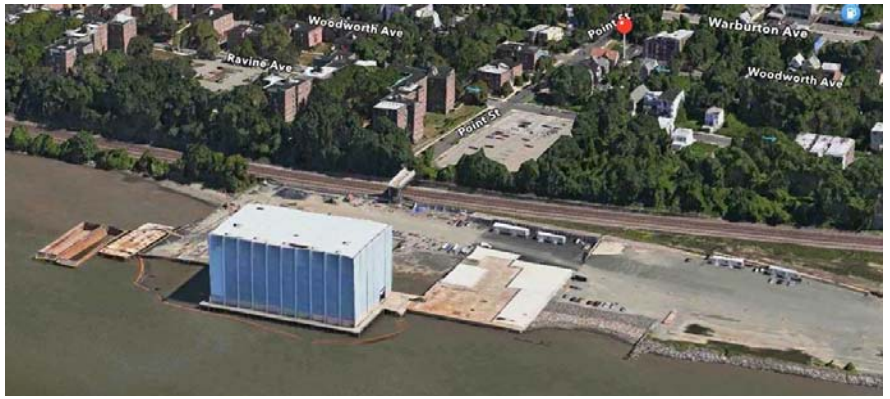
Polychlorinated Biphenyls (PCBs)

A. **PCBs – Organic Chlorine Compound**
B. **USEPA Persistent Organic Pollutants (POPs)**
C. **Present in the Dielectric Fluid for BICC High Voltage Cables**
D. **Hydrophobic**
E. **Resistant to Temperature Change, Acids, Bases, Oxidation, Hydrolysis**



PCBs and the BICC Site

A. **Waterfront Facility for Shipping Purposes**
B. **Research Facility (EPRI Building)**
C. **Historical Fill Placement to Expand Shoreline**
D. **Wire and Cable Manufacturing Facility**
   - **Paper-Insulated, Lead-Jacketed Cables**
   - **Rubber Jacketed Cables**
   - **Armored Submarine Cables**
E. **Floor Drains discharged to the Hudson River**
F. **Commercial Rail Siding for Delivery & Shipments**



BICC Site Operations

A. S.S. Hepworth & Company

Sugar machinery and tools manufacturer 1886 to 1890.

B. India Rubber Percha Insulating Company

Wire and cable manufacturer 1890 to 1915

C. Habirshaw Wire Company

Fabricated paper-insulated, lead-jacketed cables, rubber-insulated and jacketed cables, and armored submarine cable 1915 to 1930.

D. Phelps Dodge

Fabricated paper-insulated, lead-jacketed cables, rubber-insulated and jacketed cables, and armored submarine cable 1930-1960's

Polyethylene and ethylene propylene rubber cables 1960's to 1984

Source of PCB Contamination

E. Cablec/BICC Cables Corporation

Manufactured same products as Phelps Dodge 1984 to 1996

Site closure in 1996

Project Stakeholders

A. Former Remediation Team, Responsible Party & Engineer
B. BCP Volunteer
C. NYSDEC DER and F & W
D. USEPA
E. Responsible Party

BICC Site Impacts

A. Groundwater
   - VOCs

B. Soil
   - PCBs
   - Lead

C. Sediment
   - PCBs

Remedial Actions – 2005 ROD

A. Building Demolition

B. Upland Hot Spot Excavation

C. Asphalt Cover System

D. Sediment Excavation & Backfill

E. Engineering Controls

A. Waterfront Stabilization Measures
B. Pavement Cover System
C. Soil Cover System
D. Sediment Cover System

F. July 2014 ROD Amendment, OU-1 and OU-2

Hudson River Sediment Remediation

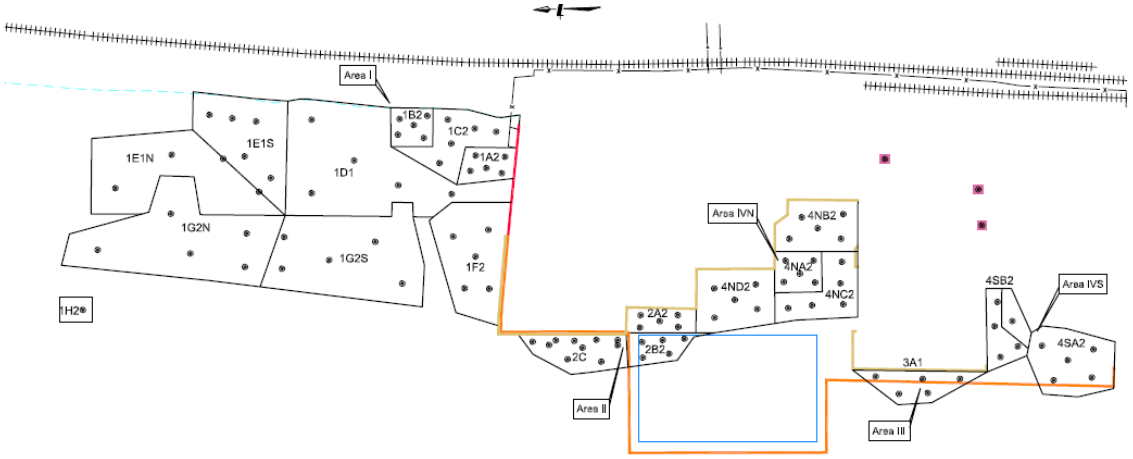
Hudson River Sediment Remediation

A. Operable Unit # 1

B. Operable Unit # 2

C. Dredge Certification Units (DCU)

- DCU Areas I, II, IV, and V
- DCU Area II (2A, 2B, & 2C)



Hudson River Sediment Remediation

A. Open Water Areas, OU-1

B. Under Building Area, OU-2

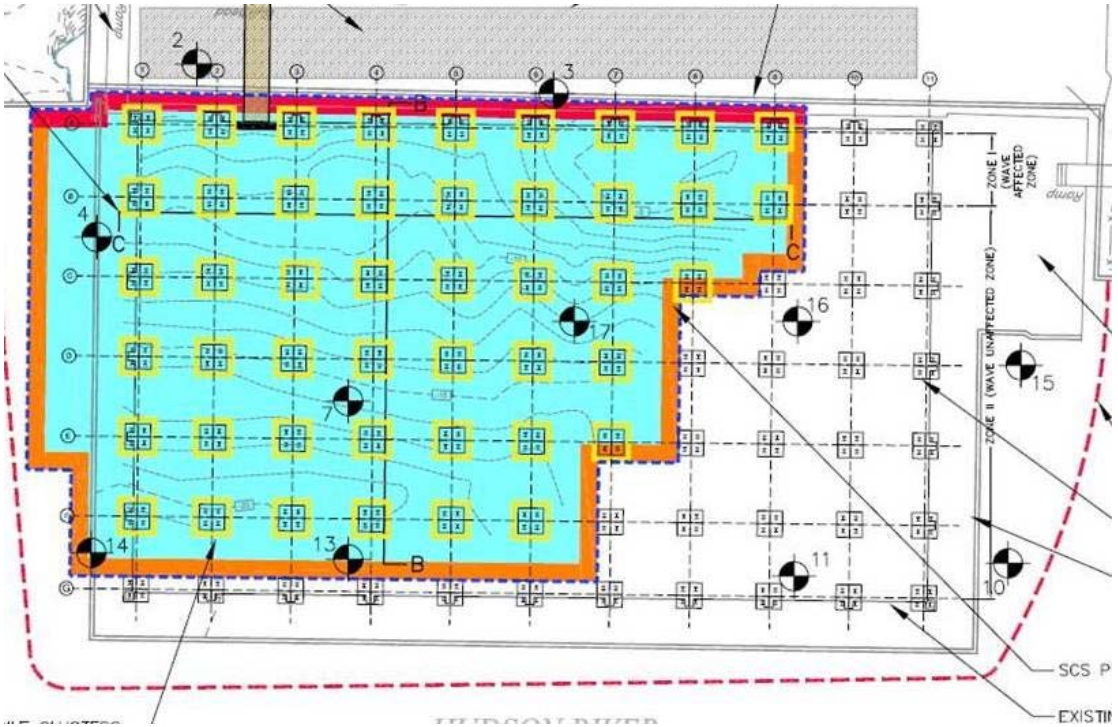
OU-2 Sediment Remediation Footprint

A. 16,000 Square Feet DCU Area 2B Impacted Sediment (at Depth) Footprint

B. 24,500 Square Foot Multi-Layer SCS Footprint

C. Minimum 5-Foot-Wide SCS Footprint Extension

D. 4,500 Cubic Yards of PCB Impacted Sediment



Conceptual Site Model

PCB Impacted Sediment Remediation Engineering Control

A. ROD Design Requirements

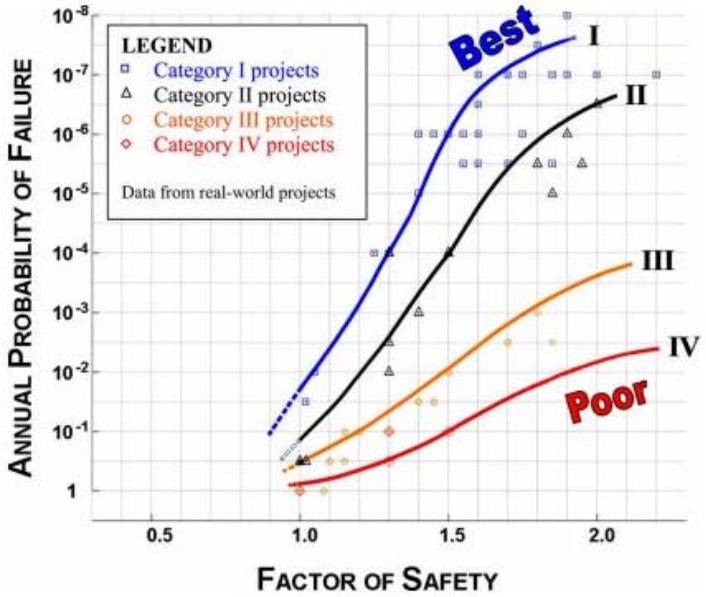
B. 50 % (1.5 Safety Factor)

C. SCS Integrity
   - Wave Energy
   - Current Velocity

D. Access Constraints under EPRI Building

E. Risk Based Science

How extensive was your Alternatives Analysis?



Sediment Remediation Alternatives Analysis

A. Four Separate Sediment Remediation Alternatives Analysis
B. Six Dredge Attempts (Unsuccessful)
C. 5 Attempts – 97 Cubic Yards
D. 6th Attempt – 57 Cubic Yards
E. NYSDEC Approved Dredge Abort Criteria
F. Technical Impracticability (TI) Determination

Photograph 1: Sediment and Debris removed from Strainer Box (10/9/2013)

OU-2 Sediment Remediation Alternatives Analysis

A. Dredge Excavation from the Floor of the EPRI Building

- **Select Demolition of Two Way Slab**
- **Limited Geometry and No Access**
- **Telescoping Arm Excavators**

OU-2 Sediment Remediation Alternatives Analysis

B. Mini-Excavator Dredge

C. Hydraulic Dredge

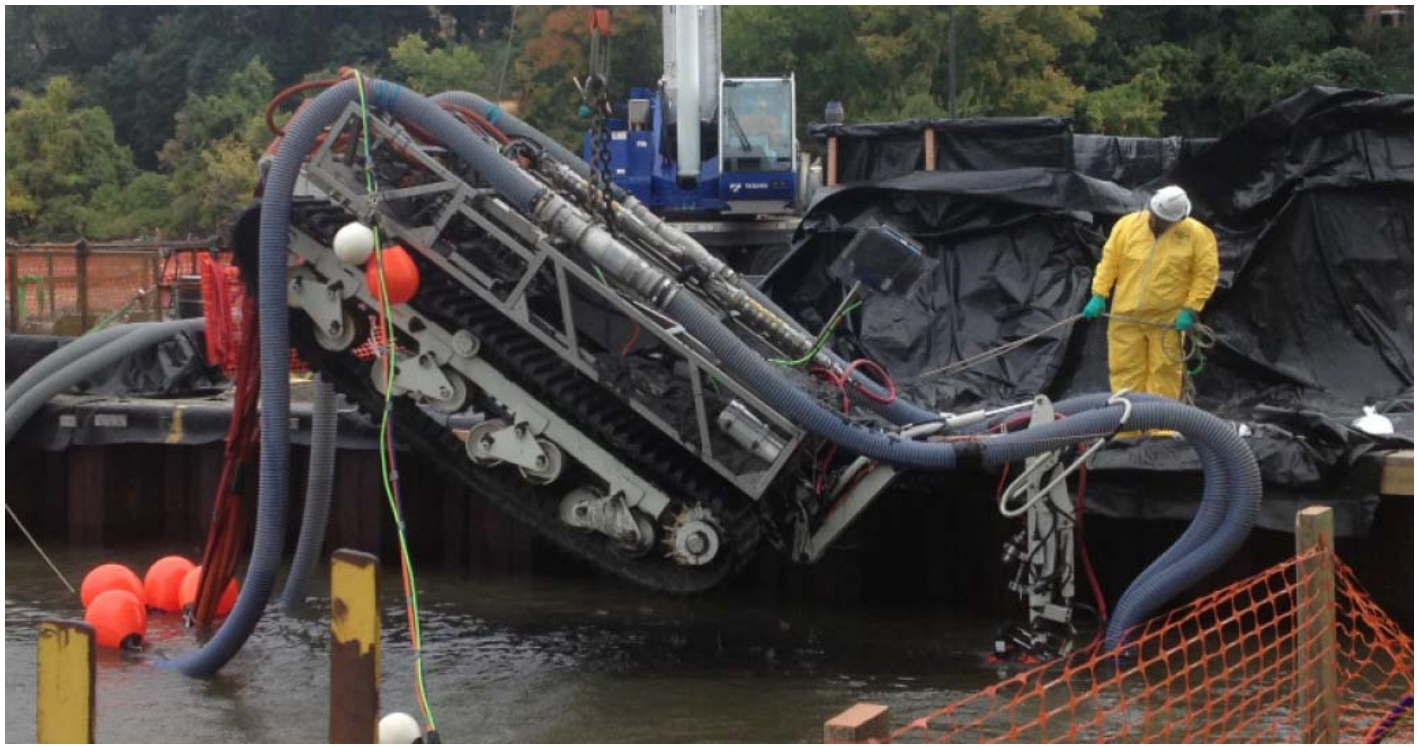
- **Vacuum Dredge**
- **Auger Dredge**
- **Pit-Hog Dredge**

OU-2 Sediment Remediation Alternatives Analysis

D. **Diver Assisted Dredge**
E. **Hybrid Dredge Techniques**
F. **Robotic Dredge**

OU-2 Sediment Remediation: Robotic Dredge

1. **NYSDEC Approved Abort Criteria: 100 Cubic Yards per Day (24/7 Effort)**
2. **22 Days - On Water**
3. **18 Days - Production Dredge**
4. **Only 57 Cubic Yards of Dredge Excavation**
5. **Less then Two 20'x 20' Cells**



OU-2 Sediment Remediation: Robotic Dredge

Photograph 2: Sediment located on Scancrawler after being removed from the Hudson River (10/10/2013)

Photograph 3: Rock stuck in the track of the Scancrawler - preventing movement of equipment (10/10/2013)

Regulatory Framework

A. **Regulatory Review and Decision Process**
B. **Technical Justification Report (TJR)**
C. **Sediment Cap Design Workplan**

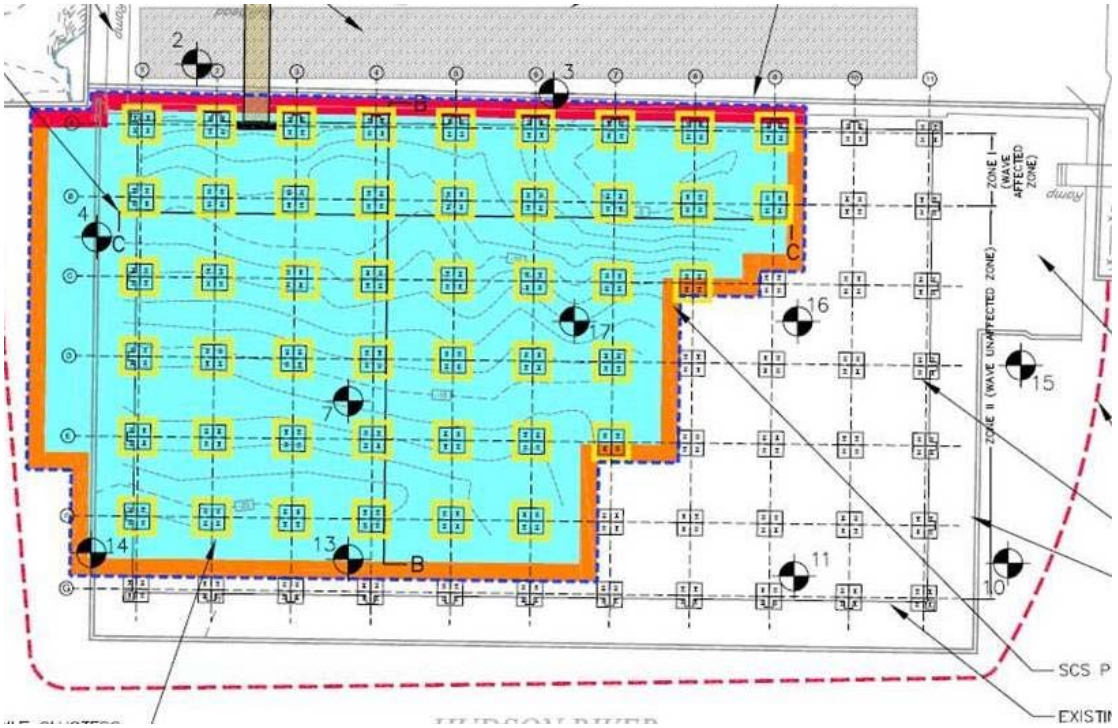
Photograph 13: Sediment located within the inside of the Scancrawler (10/21/2013)

OU-2 Sediment Remediation Footprint

A. 6 Dredge Attempts

B. Multi-Layer Sediment Cap
   1. Active Treatment & Containment Layer
   2. Scour Protection
   3. Armor Protection
      - Stone Rip Rap
      - Concrete Blocks
      - Articulated Concrete Block Mats
      - Concrete Armour Units

C. In-Situ Stabilization of Impacted Sediment



What was the HEC RAS Model controlling factor: wave energy or velocity?

Wave Energy

Wave Energy & Current Velocity (WECV) Study

A. July 2014 OU-2 ROD Requirement

B. HEC-RAS Model

C. Multi-Layer SCS Integrity/Stability Review

D. Energies Acting on Multi-Layer SCS

E. SCS Settlement

F. Constructability

G. Conclusions

   A. Current Velocity
      - SCS Scour Protection Layer
      - TenCate GT500 Geotubes

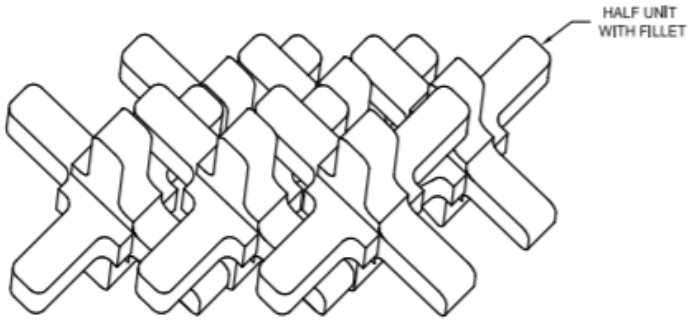
   B. Wave Energy
      - Zone I SCS Armor Protection Layer
      - Zone II SCS Armor Protection Layer

What is the average Hudson River velocity in the Site area?

Armor Protection (Wave Energy & Scour)

Stone Rip Rap & Concrete Blocks

Concrete Armor Units



5. INSTALL 2ND ROW OF A-JACKS USING SAME ALIGNMENT IN ORDER TO CONSTRUCT MODULES. SUCCESSIVE ROWS ARE PLACED TO ACHIEVE DESIRED MODULE DIMENSION (AS SPECIFIED BY OWNER, INSTALLING CONTRACTOR OR AUTHORIZED PROJECT REPRESENTATIVE).

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

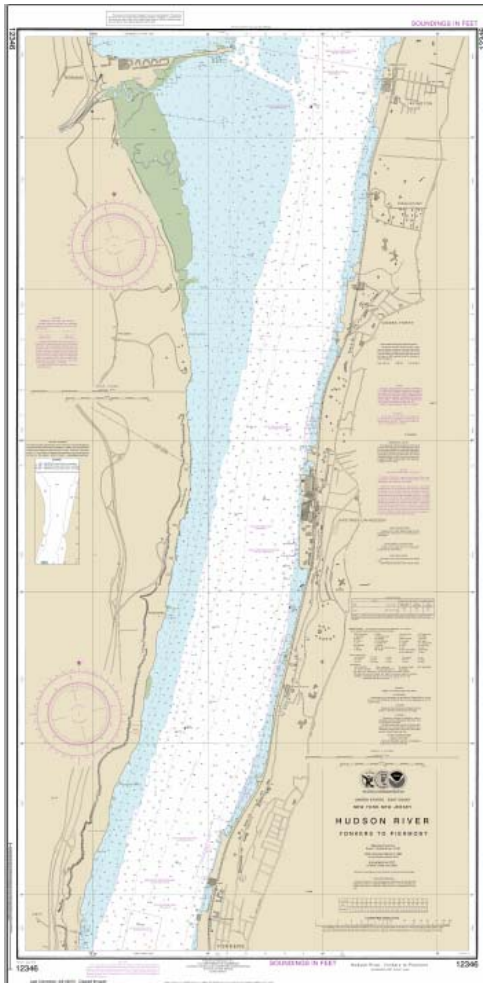
WECV Study – SCS Armor Protection Layer

A. **Current Velocity**

1. SCS Scour Protection Layer
2. TenCate GT500 Geotubes

B. **Wave Energy**

1. Zone I SCS Armor Protection Layer
2. Zone II SCS Armor Protection Layer



Zone 1 (Shallow), Less than 5 Feet of Water: D_{50} = 48 Inches

WECV Study – SCS Armor Protection Layer

1. Class V Rip Rap
2. Angular Stone Rip Rap (Variable D_{50} Sizes)
3. 24-Inch-Long ConTech A-Jacks

Class	Layer Thickness (in.)	Max Velocity (ft./s.)	Wave Height (ft.)		PERCENT FINER BY WEIGHT											
					D_{10}			D_{50}			D_{85}			D_{100}		
					Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)
I	18	8.5	-		5	5	4	50	10	8	100	13	10	150	15	12
II	18	10	-		17	7	6	170	15	12	340	19	15	500	22	18
III	24	12	2		46	10	8	460	21	17	920	26	21	1400	30	24
IV	36	14	3		150	15	12	1500	30	25	3000	39	32	4500	47	36
V	48	17	4.8		370	20	16	3700	42	34	7400	53	43	11,000	60	49

d_o = gravel material d□ = angular rock riprap
Wt = weight in pounds

Selected Remedy: Multi-Layer SCS

A. **ROD Design Requirements**

B. **50 % (1.5 Safety Factor)**

C. **Major Events**

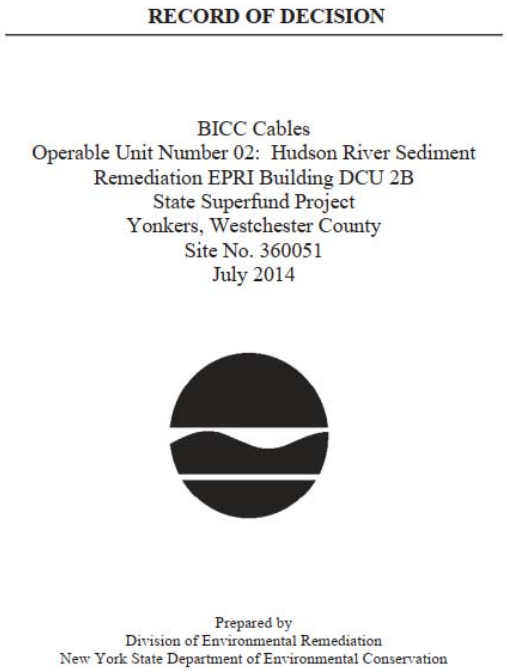
D. **SCS Integrity**
   - Wave Energy
   - Current Velocity

E. **Access Constraints under EPRI Building**

F. **Risk Based Science**

G. **Post-Remediation Monitoring Program**

H. **Post-EPRI Building Demolition Removal**



RECORD OF DECISION

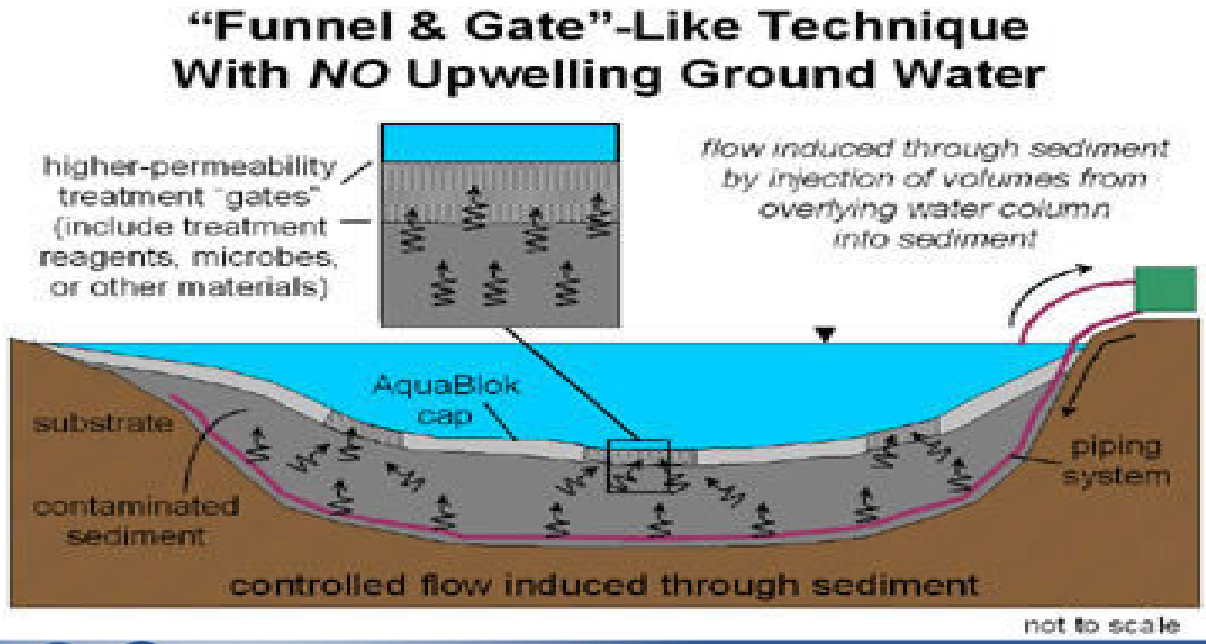
BICC Cables
Operable Unit Number 02: Hudson River Sediment
Remediation EPRI Building DCU 2B
State Superfund Project
Yonkers, Westchester County
Site No. 360051
July 2014

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

Selected Remedy: Multi-Layer SCS

Five Key Components:

1. Cushion Sand Layer
2. Active Treatment and Containment Layer
3. SCS Ballast Protection Layer
4. SCS Armor Protection Layer
5. Habitat Mitigation Layer



Active Treatment and Containment Layer

1. **CETCO Organoclay Reactive Core Mat: 0.8 lb/ft^2 of Organoclay between two geotextiles**
2. **CETCO Granular Activated Carbon Reactive Core Mat: 0.4 lb/ft^2 of GAC between two geotextiles**
3. **Geotextiles provide:**
   a. Separation – no intermixing and reduced bio-intrusion
   b. Reinforcement – tensile strength
4. **Continuous and Overlapping Active Treatment and Sediment Cap:**
   - Successful Installations under Bridges/Piers and around Piles
5. **Utica, New York Harbor Print PCB-Impacted Sediment Remediation:**
   a. 11.2012 Project Completion
   b. 7-Acre Site
   c. Reactive Core Mat and Bulk Organoclay around Piles

Regulatory Decisions: Multi-Layer SCS

A. NYSDEC Project Remedial Action Plan (PRAP)
B. NYSDEC ROD for OU-2 Area
C. NYSDEC RAWP
D. USEPA Risk Based Approach Approval
E. NYSDEC Section 401 Water Quality Certificate
F. USACE Nationwide Permit # 38
G. NOAA NMFS – Habitat Mitigation
H. Fish Window Waiver Request

PERMIT COMPLIANCE CHECKLIST

Regulatory Decisions: Multi-Layer SCS

Dispute Resolution

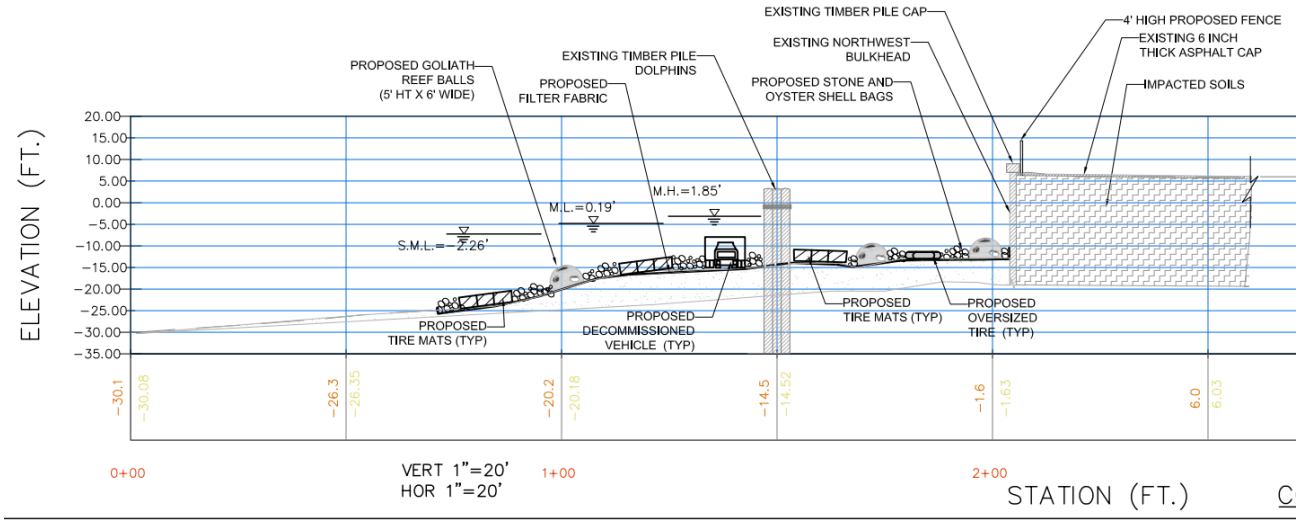
A. BCP – 45 Day Review Period for RAWP

B. Actual Regulatory Review at 4 Months to 8 Months

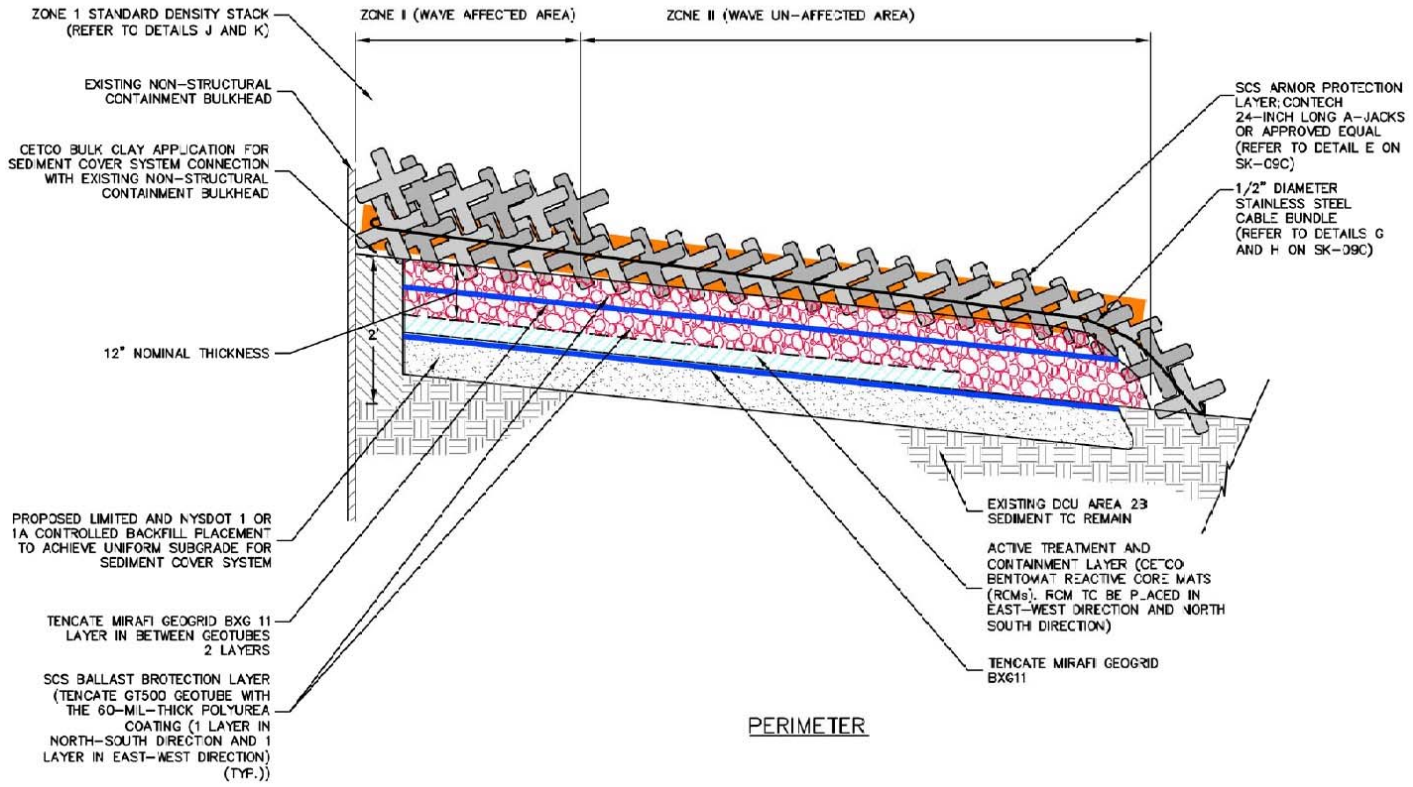
C. Lead Agency "Management"

D. 2013/2014 – July 2014 OU-2 ROD

E. 2015 – Habitat Mitigation

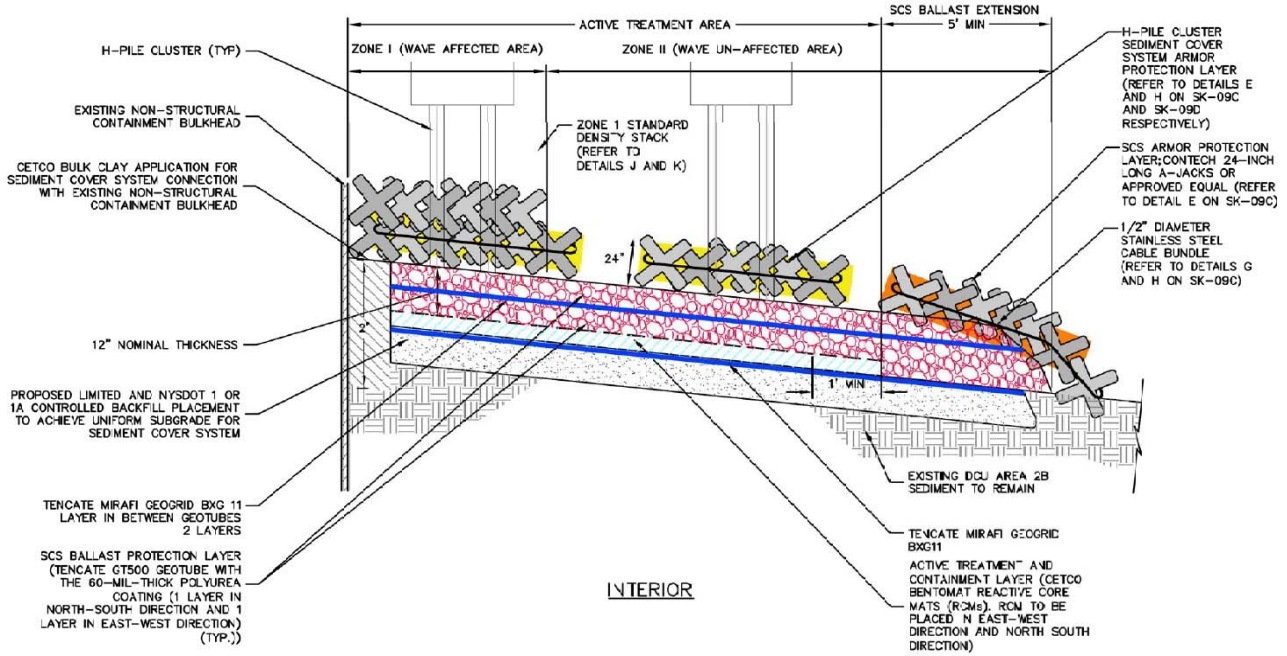


Multi-Layer SCS: Perimeter



PERIMETER

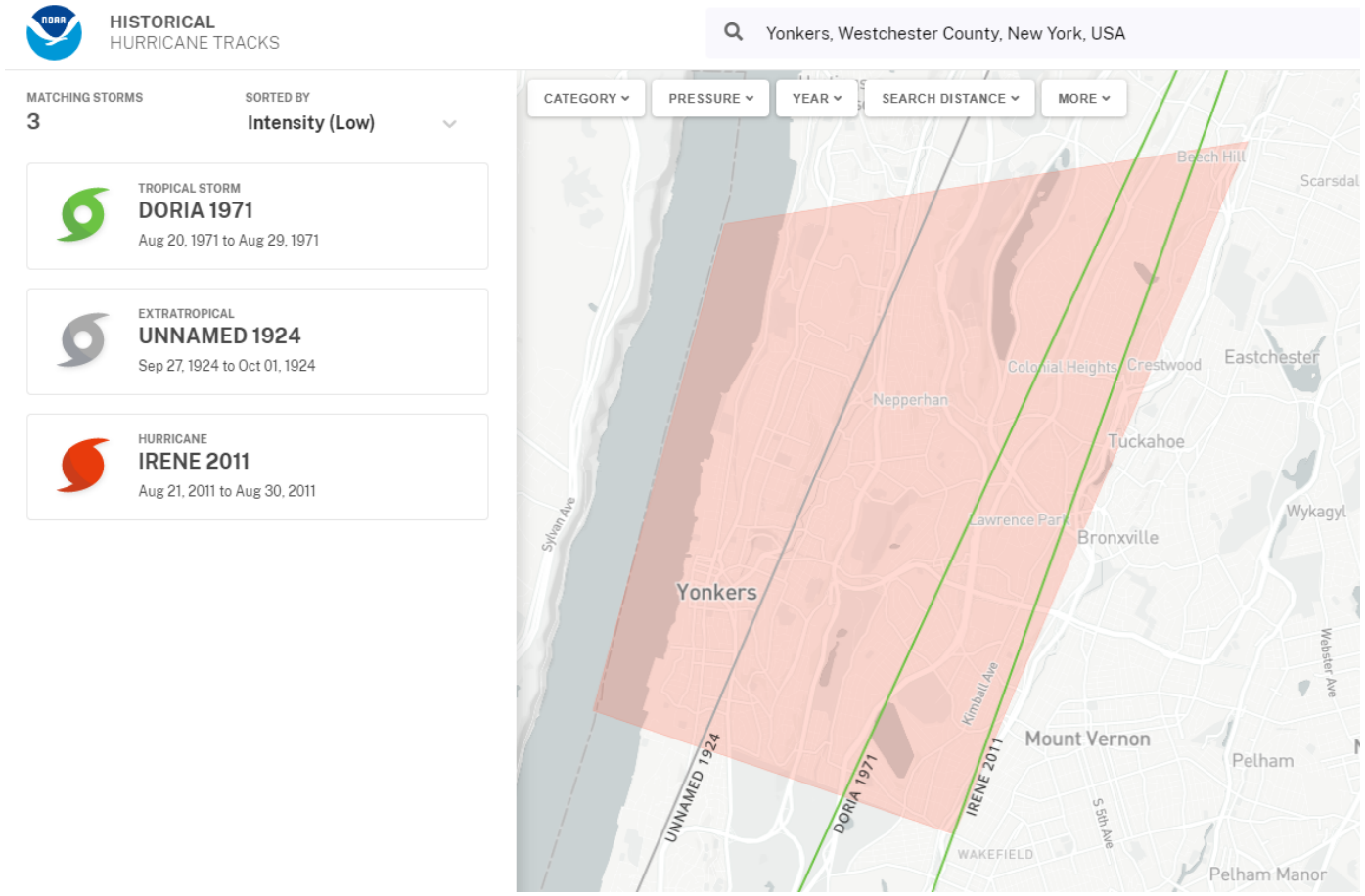
Multi-Layer SCS: Interior Section



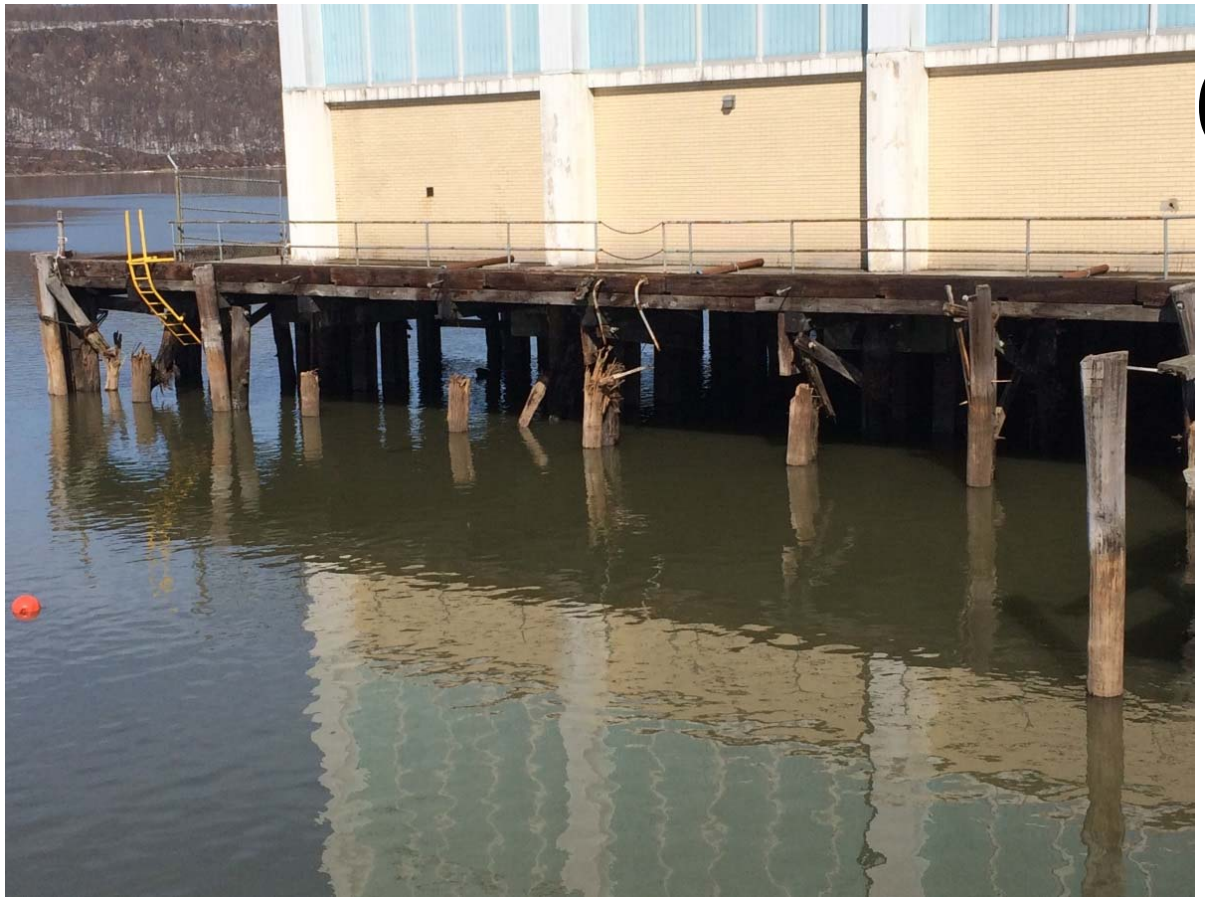
A PROPOSED MULTI-LAYER SEDIMENT COVER SYSTEM DETAIL (TYP.)
NOT TO SCALE

How important is your Contingency Plan?

NOAA – Historical Hurricane Tracks



Hudson River Ice Flows



Construction & Safety Concerns

SCS Construction

A. NYSDEC & USEPA Concern for Multi-Layer SCS Installation

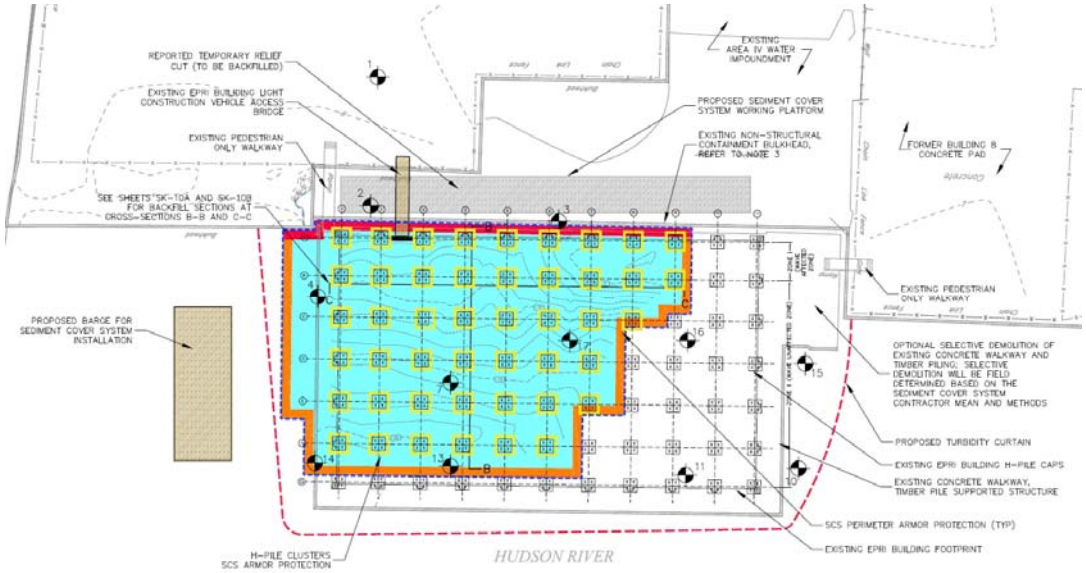
B. Comprehesive Constructability Review

C. 2 Phases of SCS Contractor Bids

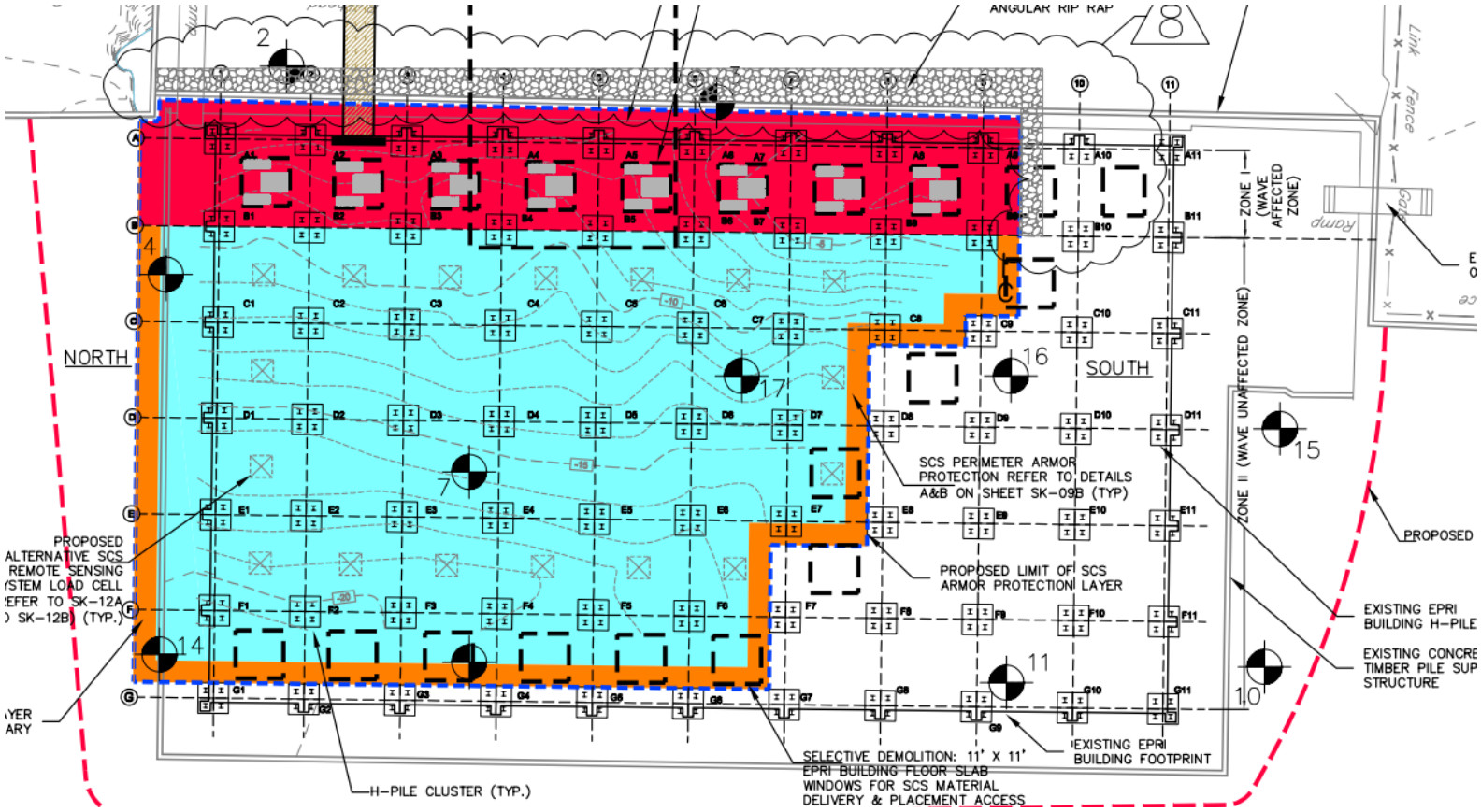
1. 2013 Dredge Management & SCS Construction
2. 2015 SCS Construction

D. Experienced and Qualified Marine Contractors

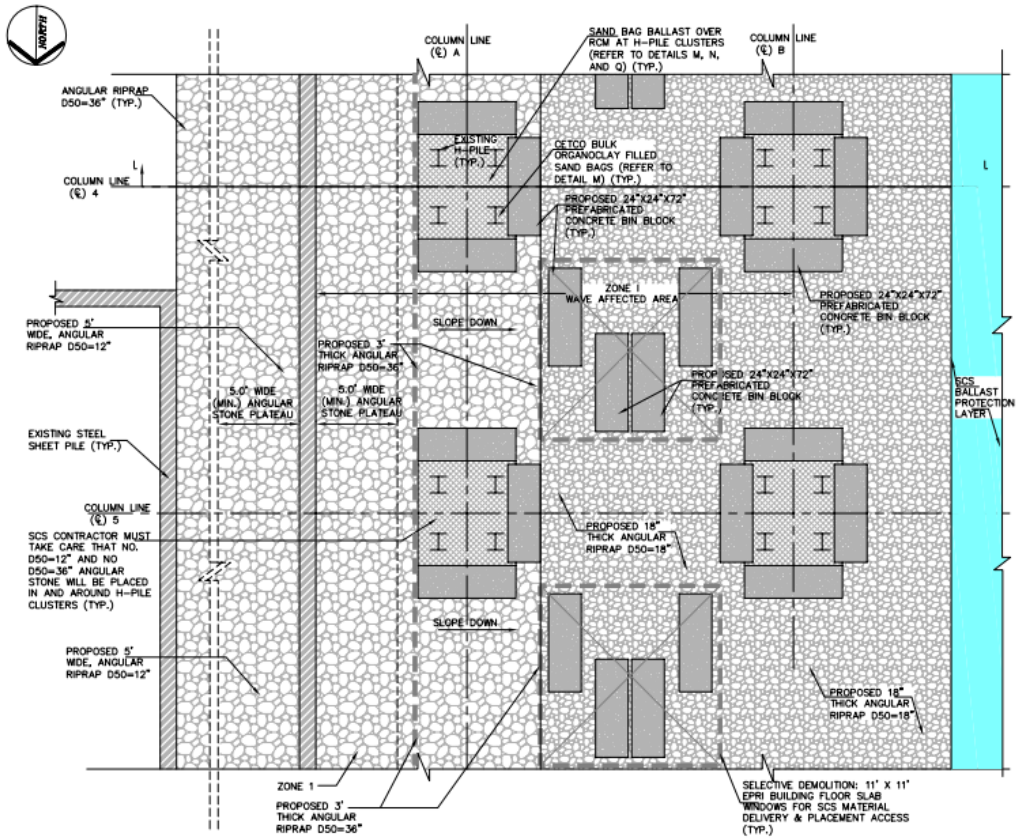
- Contractor Incentives



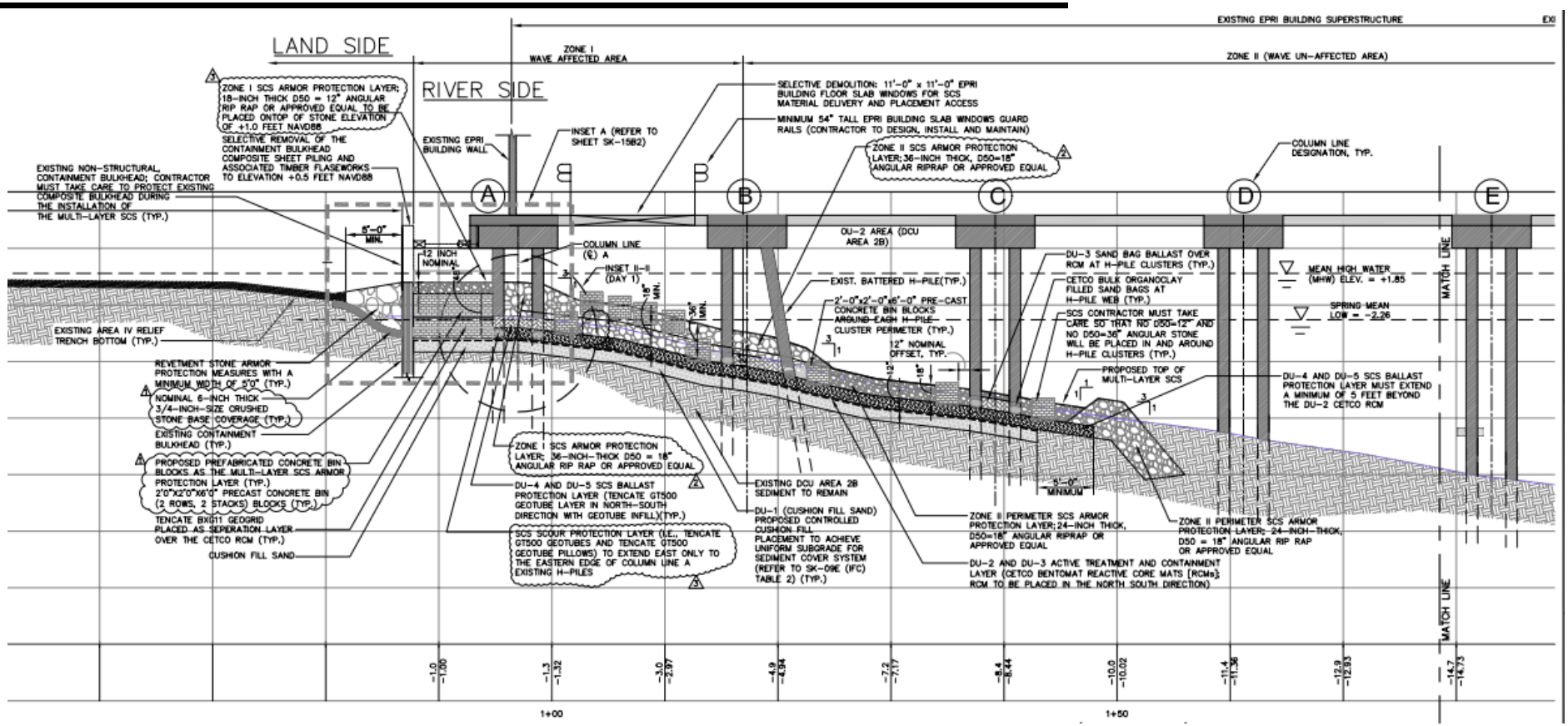
SCS: Issued for Construction



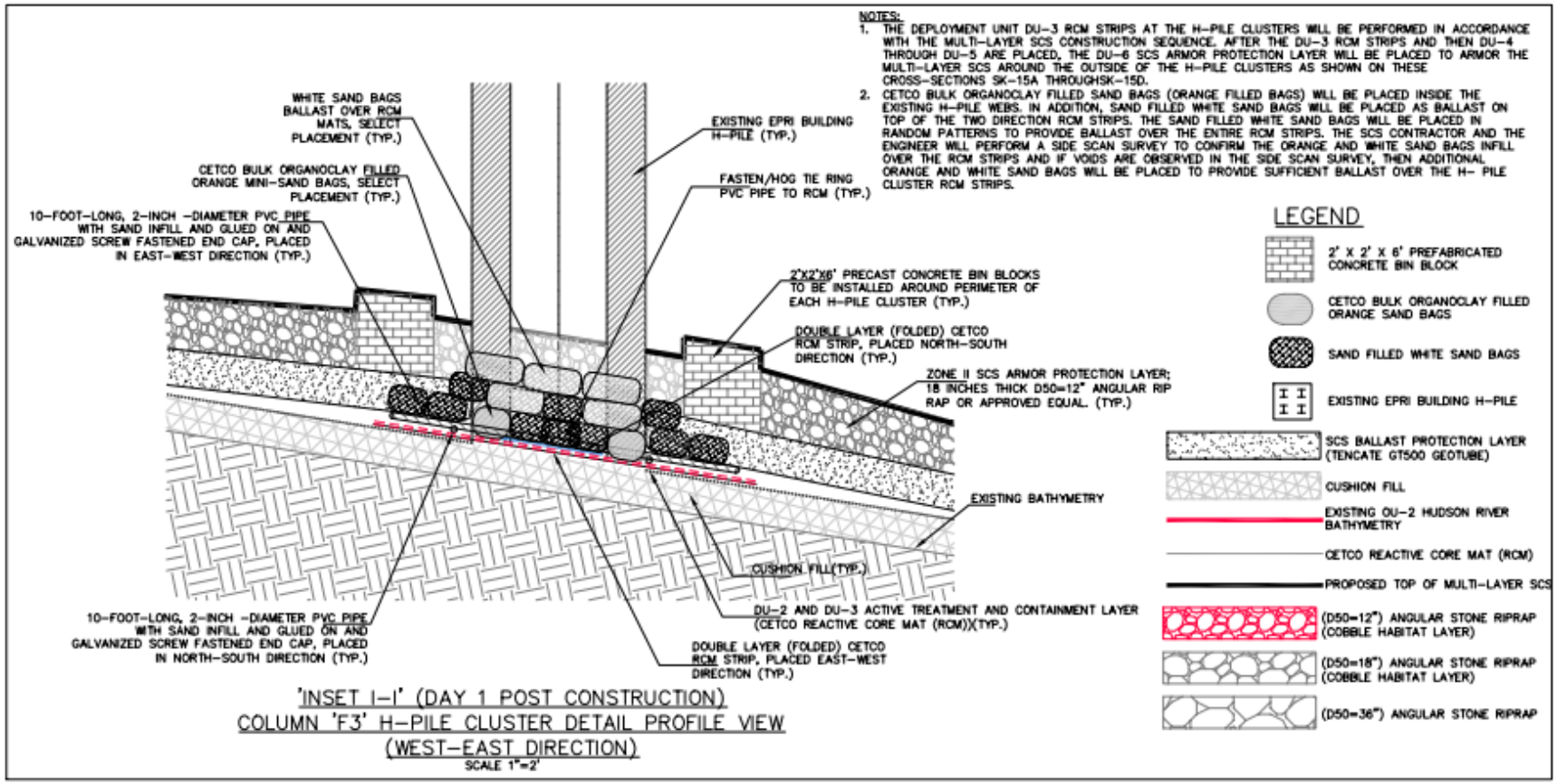
SCS: Issued for Construction



SCS: Issued for Construction



SCS: Issued for Construction

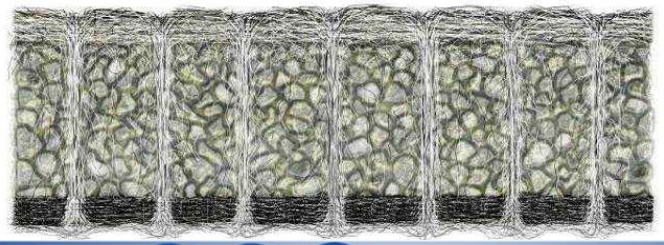


SCS DESIGN & PERMITTING QUESTIONS

Multi-Layer SCS Construction

Multi-Layer SCS Deployment Units (DUs)

1. **DU-1:** Cushion Sand Layer
2. **DU-2:** First Layer of Reactive Core Mat (RCM) Panels
3. **DU-3:** Second Layer of RCM Panels and Bulk Organoclay at H-Pile Clusters
4. **DU-4:** Geotubes Installations (North-South, East-West)
5. **DU-5:** SCS Armor Stone Installation and Concrete Blocks
6. **DU-6:** SCS Load Cells and Remote Sensing System



Multi-Layer SCS Construction

1. **Vertical Clearance Constraints**
2. **Timing Restrictions**
   - A. **NYSDEC and USACE Fish Window**
   - B. **Tide Cycle**
   - C. **Major Storm Events**
   - D. **Winter Weather**
3. **Robust CQC/CQA Program**
   - **Deployment Unit (DCU) Completion Reports (Contractor & Engineer Signatures)**
4. **Specialty Marine Contractor with Divers**
5. **Diver Direct Placement of Cushion Sand, RCM, & Geotubes**
6. **Specialty Tools: Rock Delivery Barge**

REACTIVE CORE MAT™ is designed to provide a simple method of placing active materials into subaqueous sediment caps.

Site Preparation

1. **Demolish Perimeter Walkway**
2. **Reinforce Select Perimeter and Interior H-Pile Clusters**
3. **Mobilize Construction Equipment & Materials**
4. **Prepare Cell Specific CETCO RCM and TenCate Geotubes**

Multi-Layer SCS Construction

Multi-Layer SCS Construction

Multi-Layer SCS Construction

Multi-Layer SCS Construction

Multi-Layer SCS Construction

Weeks Marine, Inc.

Project:	BICC Sediment Cover System (SCS) Construction
Location	Former BICC Cable Site, Yonkers, New York
WMI Project No.	2015-0121
NYSDEC SITE NUMBER:	C360051

WEEKS

TABLE RCM - Reactive Core Mat Installation Quality Assurance and Quality Control Sign Off Sheet PS&S RECEIVED 12/22/2015

Note: SCS Installation Sub-Area is based on WMI Submittal #9 SCS Construction Work Plan DWG. No. WMI-2015-0121-SD-002. The RCM Design Installation area is based on area actually covered by RCM. The designed number of RCM pieces for each sub-area and the sizes of the RCM pieces are based on WMI Submittal #9 SCS Construction Work Plan DWG. No. WMI-2015-0121-SD-002.

SCS Installation Sub-Area	Completion Date	Design Installation Area (SF)	Actual Installation Area (SF)	Design Number of RCM Pieces (EA)	Actual Installed RCM Pieces (EA)	WMI Engineering Resident/Project PM	Approval Signature	PS&S Site Representative	Approval Signature	Date Approved
Area A-1	11/14/2015	2470	2470	7	7	Lee Xiaolong		Janos M. Szeman		11/16/2015
Area A-2	11/14/2015	2340	2340	6	6	Lee Xiaolong		Janos M. Szeman		11/16/2015
Area B-1	11/25/2015	2040	2040	6	6	Lee Xiaolong		Janos M. Szeman		11/30/2015
Area B-2	11/25/2015	1890	1890	5	5	Lee Xiaolong		Janos M. Szeman		11/30/2015
Area C-1	12/04/2015	1560	1560	5	5	Lee Xiaolong		Janos M. Szeman		12/07/2015
Area C-2	12/04/2015	1720	1720	5	5	Lee Xiaolong		Janos M. Szeman		12/07/2015
Area D-1	12/07/2015	1590	1590	5	5	Lee Xiaolong		Janos M. Szeman		12/08/2015
Area D-2	12/07/2015	1680	1680	5	5	Lee Xiaolong		Janos M. Szeman		12/08/2018
Area E-1	12/10/2015	1590	1590	5	5	Lee Xiaolong		Janos M. Szeman		12/11/2015
Area E-2	12/10/2015	1240	1240	4	4	Lee Xiaolong		Janos M. Szeman		12/11/2015
Area F-1	12/15/2015	1070	1070	5	5	Lee Xiaolong		Janos M. Szeman		12/15/2015
Area F-2	12/15/2015	790	790	4	4	Lee Xiaolong		Janos M. Szeman		12/15/2015
Total	12/15/2015	19980	19980	62	62	Lee Xiaolong		JANOS M. SZEMAN PS&S ENGINEERING, INC.		12/22/2015

Note: In Area A-1 and Area A2 between composite plastic sheeting and coloumn line A, there is no Geotube running in the North - South Direction over the RCM. Geogrid will be installed on top of RCM in that area.

NOTE:

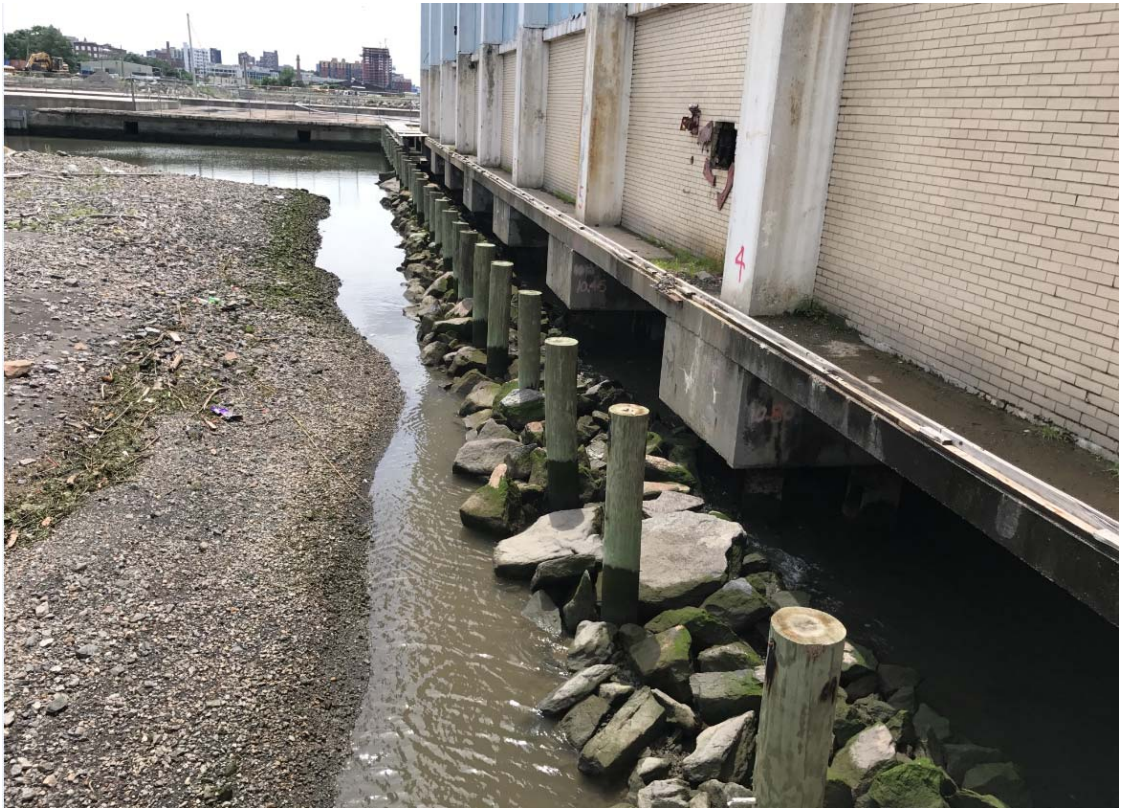
1. THE DAY 1 POST-CONSTRUCTION OBSERVED CONDITION OF THE TOP OF THE MULTI-LAYER SEDIMENT COVER SYSTEM (SCS) ACTIVE TREATMENT AND CONTAINMENT LAYER (I.E., THE TOP OF THE CETCO REACTIVE CORE MAT) IS IDENTIFIED ON THE "TOP OF ACTIVE TREATMENT AND CONTAINMENT LAYER RECORD OF CONSTRUCTION PLAN" PREPARED BY PS&S ENGINEERING, INC. AND DATED 22 DECEMBER 2015.

Multi-Layer SCS Construction

1. Marine Contractor
2. Engineer
3. Third Party Engineer
4. Periodic Regulator Site Visits
5. Over 15,000 Hours Worked Safely
6. 0 First Aids
7. 0 OSHA Recordables

SCS CONSTRUCTION QUESTIONS

Does your Post-Remediation Care Plans consider Multiple Lines of Evidence?



Upland Areas – Site Management Plan (SMP)

A. **Asphalt Pavement Cover System**
B. **Revetment Stone Armored Shoreline**
C. **Steel, Composite Fiberglass, and Vinyl Sheet Pile Bulkheads**
D. **Conventional Visual Inspections**
   - **Apparent Deformation, Soil/Sediment Loss**
   - **Differential Settlement or Movement**
   - **Integrity Review**

Underwater Lands – SMP

A. **Bulkheads and Revetment Stone Armored Shoreline**

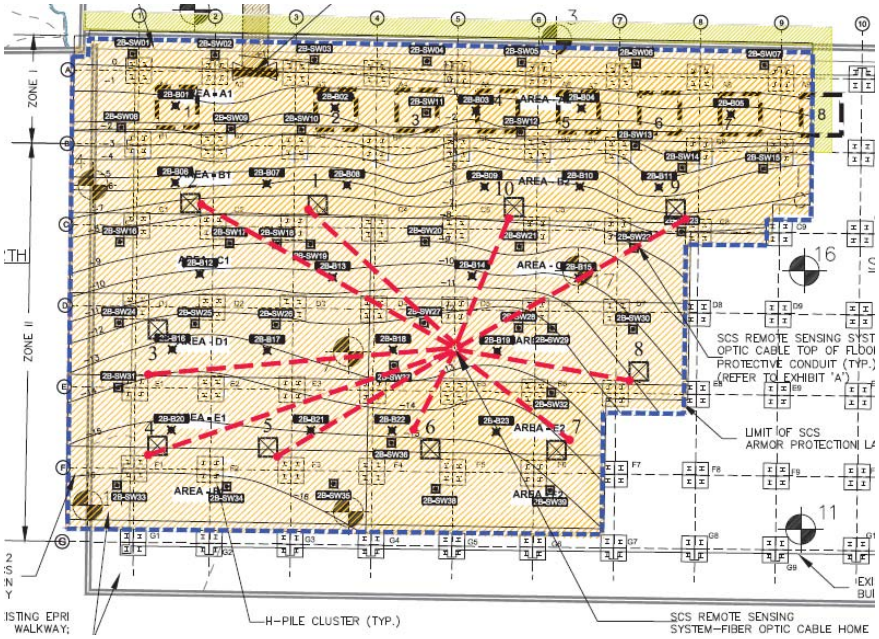
B. **OU-2 Sediment Cover System**

C. **Protective of Human Health and the Environment**

D. **SCS Integrity**

E. **SCS – Flexible Design for Differential Settlement**

- 70 feet to 80 feet of soft, compressible Hudson River sediments.
- 1 Foot of Primary Settlement observed during SCS construction.
- 3 Inches of Secondary Settlement (Creep) is anticipated.



OU-2 Sediment Cap – SMP (MLE)

A. **Limited Access**
B. **SMP Monitoring Options**
C. **Bathymetry LE # 1**
D. **SCS Remote Sensing System LE # 2**

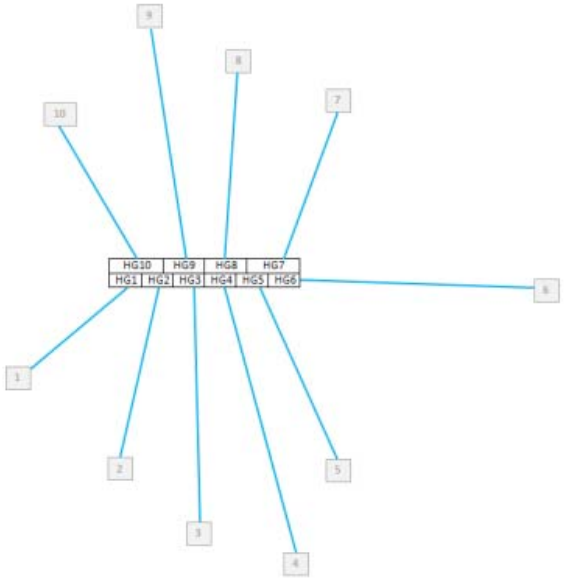


Figure 1: *schematic, single wire, HG cable layout*

OU-2 Sediment Cap – REMOTE SENSORS

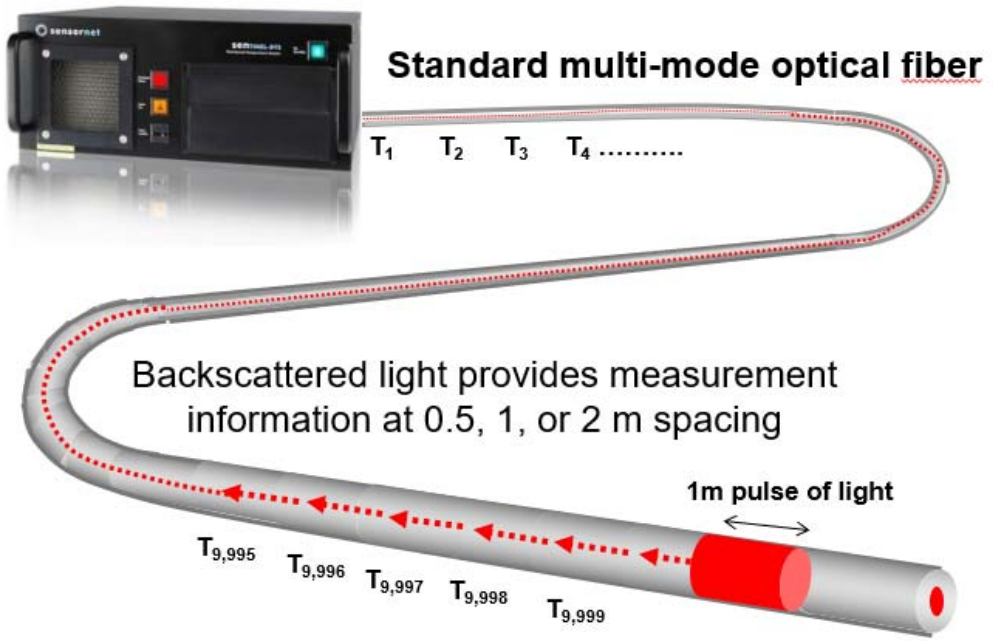
1. **Optical fiber sensors have a series of characteristics that are familiar.**
2. **Distributed sensors are designed so that the information is discriminated in the spatial mode.**
3. **The change in condition can be locally identified along the length of the fiber itself.**
4. **The localization of the measurements is possible through a "modified radar concept".**
5. **As long as the pulses propagate throughout the fiber, the effect of the temperature and strain on the optical pulses within the fiber is recorded as a function of time and enables the monitoring of the SCS relative position.**

Table 2: measurement configuration, parameters resume

	OPS loop 1	OPS loop .5	OPS Single end 1	OPS Single end .5
Sensor length [m]	2000	2000	1100	1100
Frequency start [GHz]	10.7	10.7	10.7	10.7
Frequency end [GHz]	10.9	10.85	10.9	10.9
Frequency step [GHz]	0.001	0.001	0.001	0.001
Spatial resolution [m]	1	0.5	1	0.5
Sampling Interval [m]	0.4	0.2	0.4	0.2

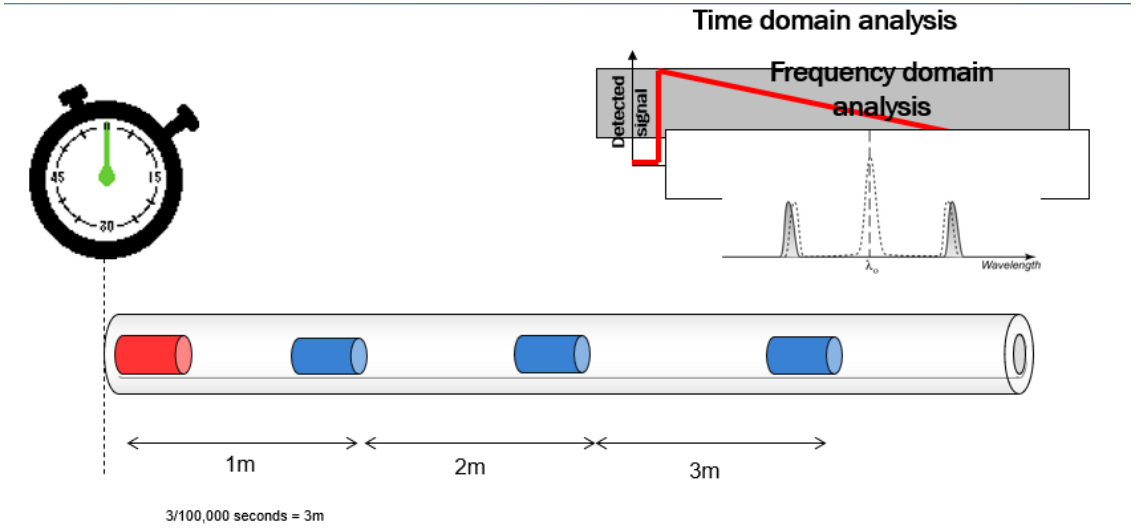
OU-2 Sediment Cap – REMOTE SENSORS

1. **SCS distributed sensing concept was an economical and safe SCS remote sensing approach where one single fiber replaced thousands of point sensors.**
2. **The fiber optics distributed sensor system relies on using a known and reproducible method by which the temperature and strain can interact with the light travelling within the fiber.**



OU-2 Sediment Cap – REMOTE SENSORS

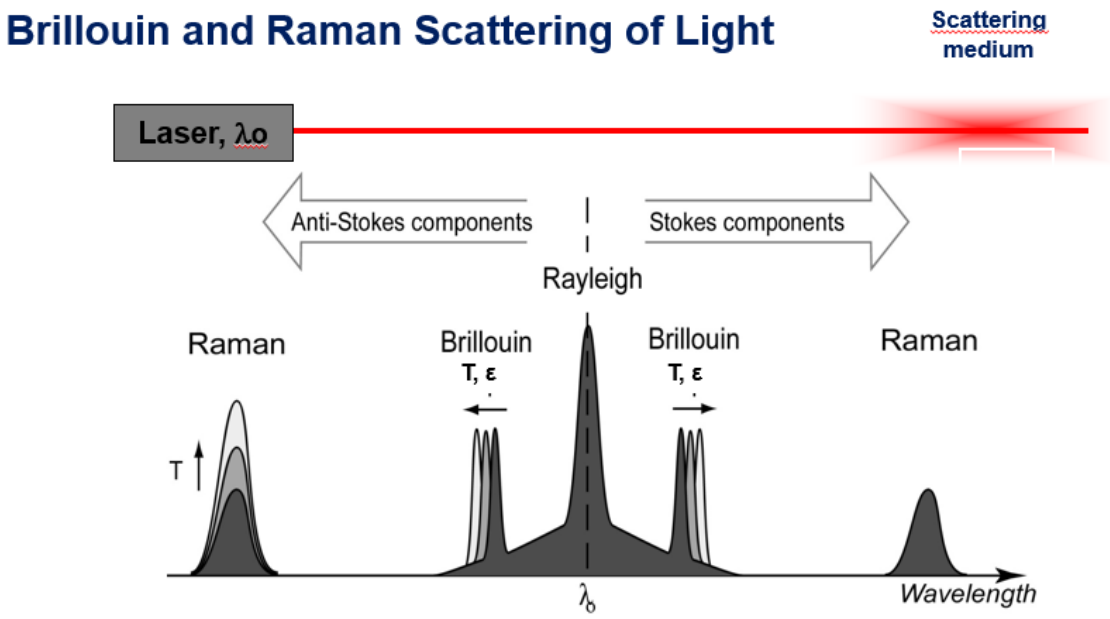
1. **The Roctest DiTeSt-ST200 is based on a detection scheme using a non-linear optical effect named Stimulated Brillouin Scattering. TIME OF FLIGHT PRINCIPLE.**
2. **This scattering process is an intrinsic property of the propagation of light in the silica material from which the sensing fiber is made.**
3. **The Brillouin scattering effect exhibits a well-known and reproducible response to the temperature and strain measurements.**



Simple principle – similar to time of flight (Radar)

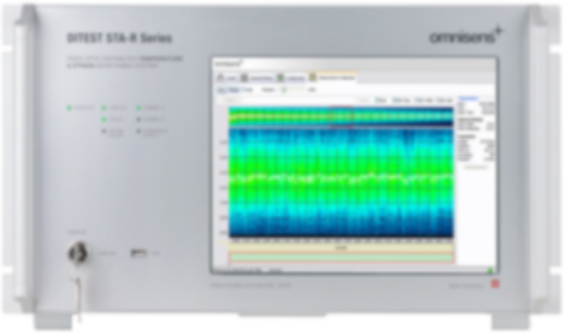
OU-2 Sediment Cap – REMOTE SENSORS

4. **The Brillouin interaction results in the generation of scattered light which experiences a frequency shift. This frequency shift depends linearly on the fiber strain and temperature.**
5. **The scattered light has a slightly different wavelength than the original light and the departure from the original wavelength is directly dependent on the strain and temperature of the fiber and will detect a deviation from the previous data set.**



OU-2 Sediment Cap – REMOTE SENSORS

Measurement range: 0 – 40 miles



Strain monitoring

- Strain range: -1.5 % to + 1.5 %
- Strain accuracy (typical): 20 με (0.02 mm/m, 0.002%) const. T
  60 με (0.06 mm/m, 0.006%) variab. T
  within the spatial resolution
- Strain resolution (STA202): 2 με (0.002 mm/m, 0.0002%)

Temperature Monitoring

- Temperature range*: -270° C to 500° C
- Temperature accuracy (typical): 1° C
- Temperature resolution (STA2002): 0.1° C

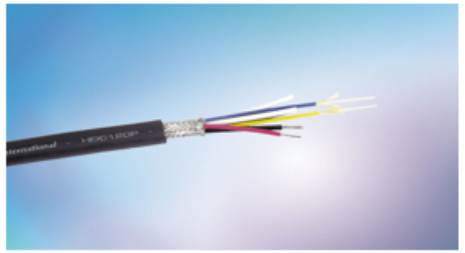
*Depends on the fiber cable type characteristics

Sensing cable

- Standard telecommunication singlemode fiber @ 1551.8 nm wavelength with ca 0.2 dB/km attenuation.

OU-2 Sediment Cap – REMOTE SENSORS

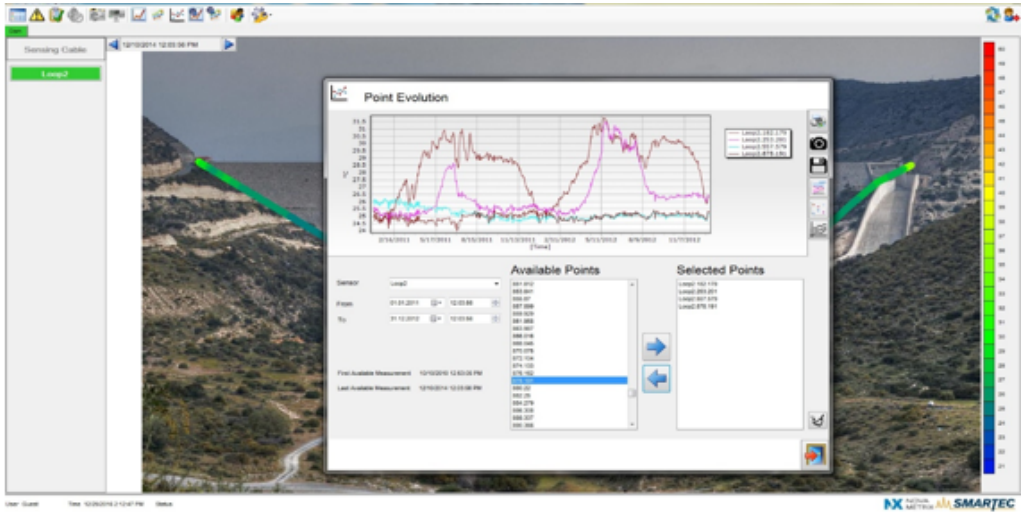
Leakage sensor and self heating cable

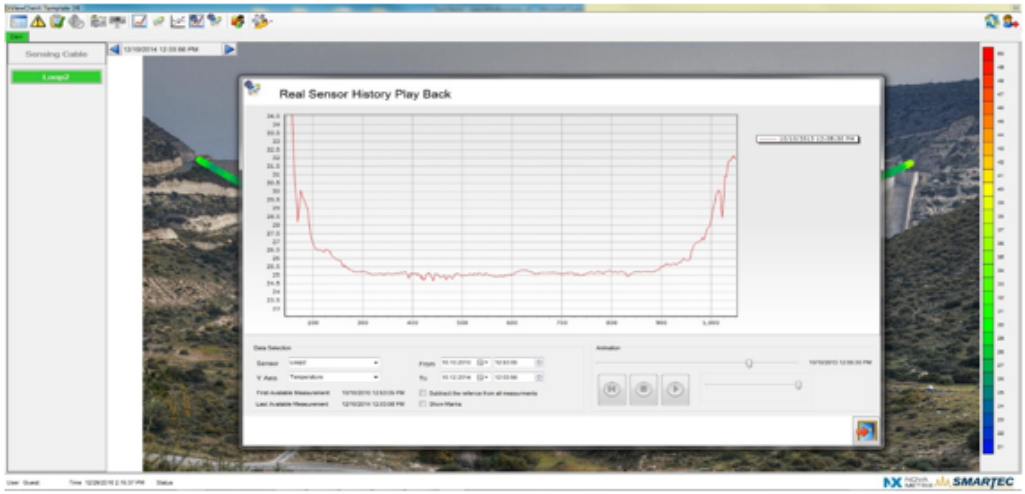


- *Temperature range:* -40° C to 85° C
- *Fiber:* 4MMF (ITU.T G.651)
- *Self heating cable:* Stainless steel + wires + copper

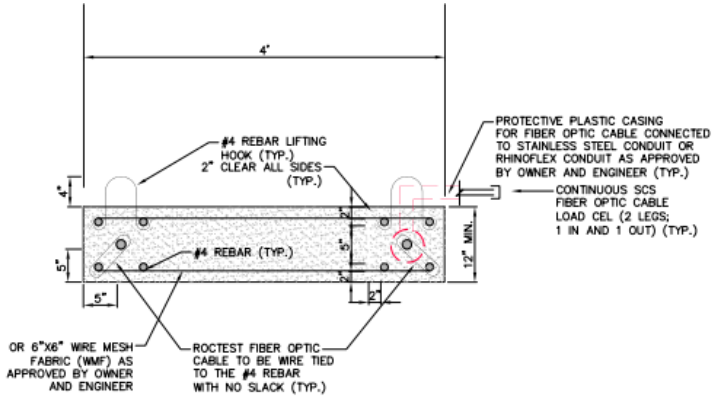
OU-2 Sediment Cap – REMOTE SENSORS

- Data management, analysis and visualization
- Representation of data superimposed with location maps and color-coding
- System Status Management
- *Automatic* and schedule measurements 24 / 7
- *Alert triggering*
- Warnings based on threshold and rate conditions
- Voice message, e-mail, SMS
- Data export in standard .txt or .csv files

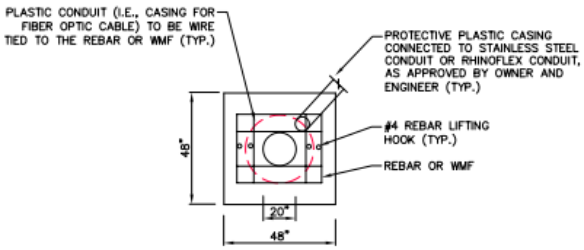




OU-2 Sediment Cap – REMOTE SENSORS

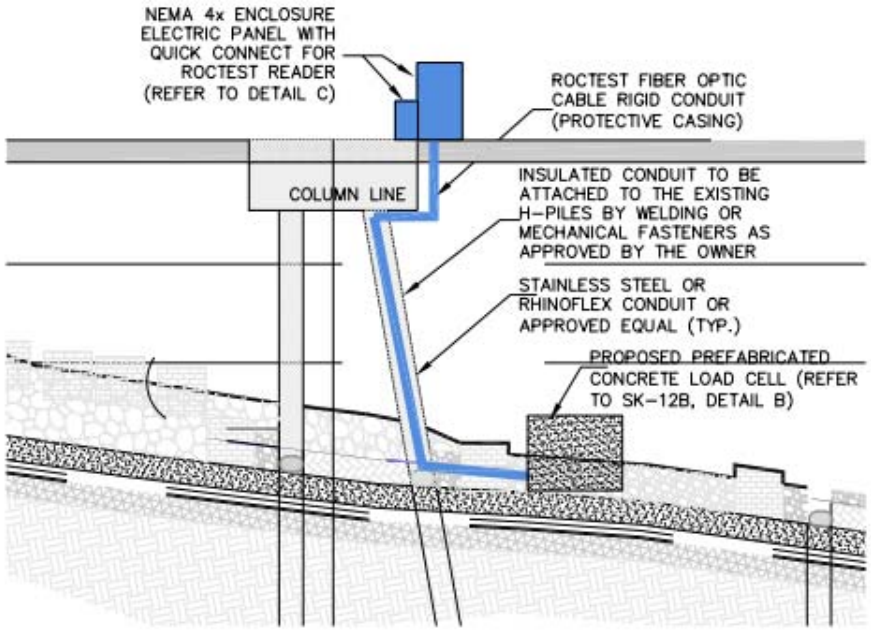


SCS LOAD CELL CROSS–SECTION VIEW (TYP.)



SCS LOAD CELL PLAN VIEW (TYP.)

B SCS LOAD CELL PLAN AND CROSS–SECTION VIEWS (TYP.)
NOT TO SCALE



A TYPICAL SEDIMENT COVER SYSTEM REMOTE SENSING INSTALLATION DETAIL
NOT TO SCALE

OU-2 Sediment Cap – REMOTE SENSORS

OU-2 Sediment Cap – REMOTE SENSORS

A. **10 Independent Sensing Lines Installation**

B. **Fusion of 10 Lines into Single, Sensing Loop**

C. **Minimized Number of Optical Channels for Sensor Scan & Simultaneously Measure Sensors in Single Scan**

D. **Established Coordinate System with Summary Table; Enables Effective Means of Comparison for Annual Measurement Campaigns**

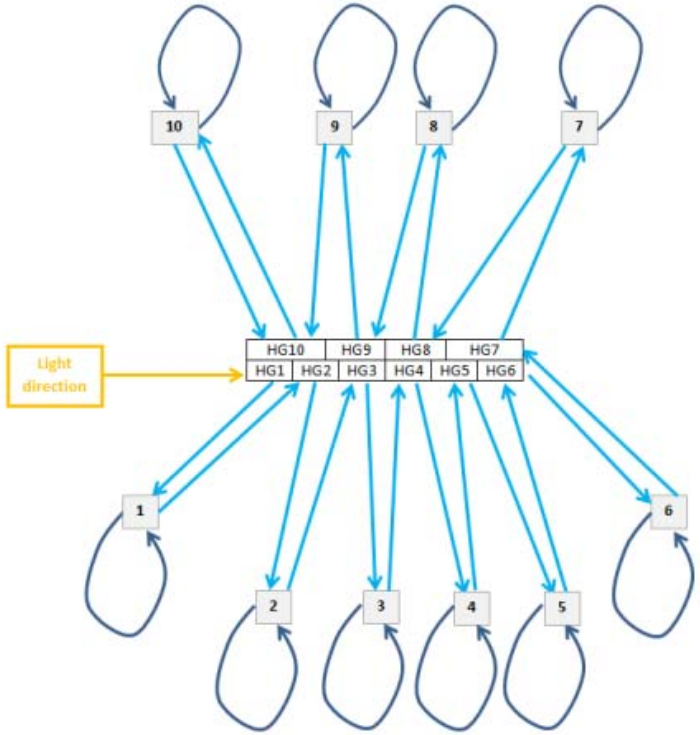


Figure 2: *schematic HG cable connection scheme with light direction*

OU-2 Sediment Cap – REMOTE SENSORS

1. Each monitoring event data set will be compared to the previous data sets.
   - Identify any variances
   - Indicate excessive SCS settlement or a potential breach.
2. The SCS Remote Sensing System observations in conjunction with the bathymetric survey measurements allow for the long-term integrity monitoring of the SCS.

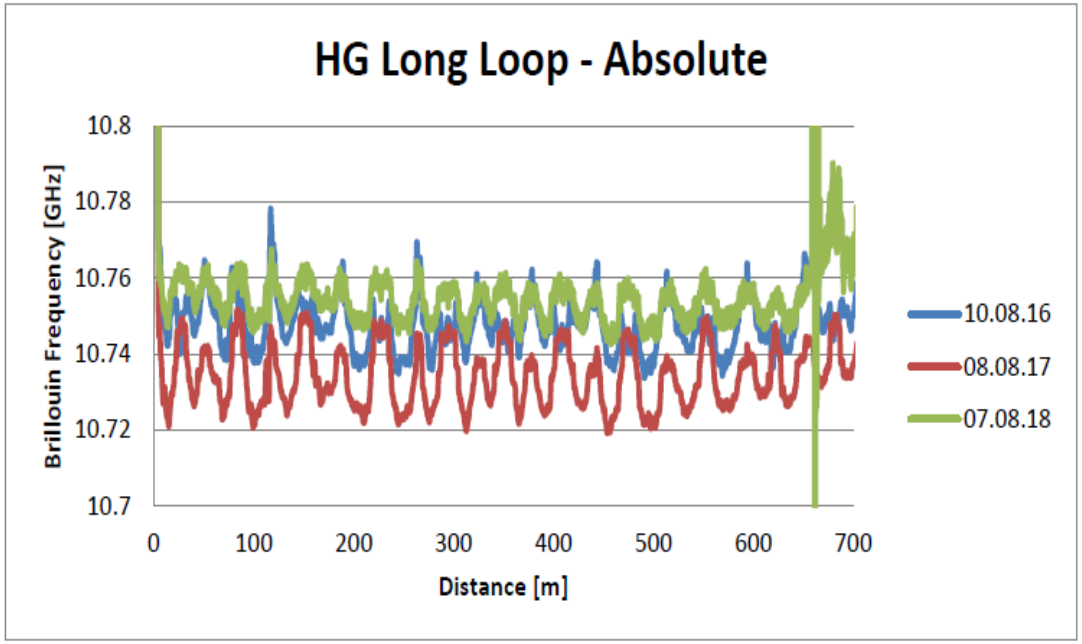


Figure 10: *Brillouin Frequency along the sensing line _ loop configuration 0.5 m spatial resolution*

OU-2 Sediment Cap – SMP

1. 4 Successful SCS Sensor Events to Date (2016, 2017, 2018, and 2019)
2. SCS is stable, integral and continues to operate as the designed engineering control.

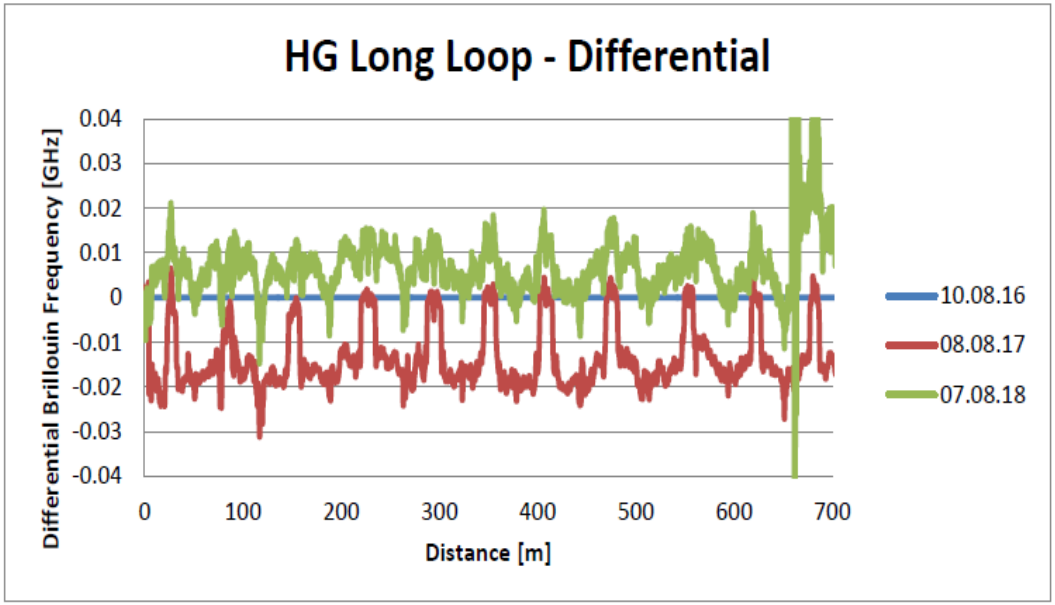
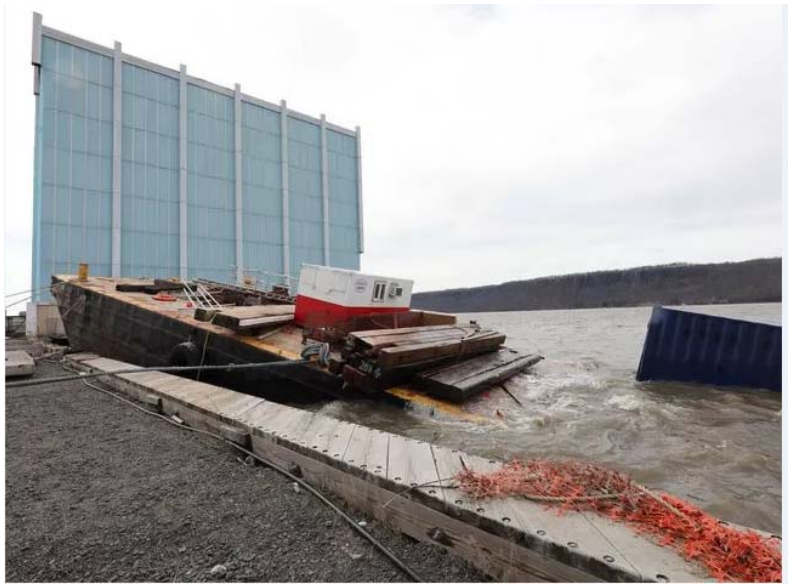


Figure 11: *differential Brillouin Frequency along the sensing line _ loop configuration 0.5 m spatial resolution*

March 2018, Nor'Easter Storm Event

1. Runaway Barge
2. Limited Damage to Steel Bulkhead Timber Walkway
3. No Damage to the SCS



SMP QUESTIONS

Lessons Learned

A. Program Management

- Lean Forward
- Stay In Front of Regulators
- Earn Credibility and Trust
- Maintain Momentum

B. Communication with other Regulatory Agencies

C. Constructability Review

D. Value Engineering Approach

E. Peer Reviews

Value Engineering

Thank You

1. USEPA

2. Contact Information

- **Michael Newton, mnewton@psands.com**
- **Janos M. Szeman, jmszeman@psands.com**