Environmental Protection

Gowanus Canal FS

EPA Meeting

February 2, 2012

Gowanus FS Summary

- CSOs exceed PRG for Ecological receptors for PAHs, but are within the uncertainty.
- PAHs sources are combination of urban background and municipal waste.
  - Urban background includes air emissions, auto exhaust, road surface, surface runoff
- Eco PRG is FLAWED. Normal range is 35-100 ppm for protection of invertebrates in sediment and not a basis for cleanup of industrial waterway.
- CSOs PAH levels are acceptable for Human Health Recreational Use - swimming in canal.
- CSO Volume Controls
  - Will not reduce PAH concentrations in CSO discharge
  - Will reduce total PAH loads that mix with canal sediments
  - CSO + harbor sediment mixing ratio is not well understood
    - Existing datasets indicate that the CSOs are typically 10% of total sediment deposits.
    - EPA believes that the Canal surface sediments are 100% CSO derived.
- Mixing ratios developed using 10 % CSO and 90% harbor sediments indicate that surface sediments in the canal will not exceed the Eco PRG post remediation.

Remedial Action Objectives (RAOs)

Three RAOs are identified in FS

1. **Ecological**

   - Reduce toxicity of canal sediments to benthic organisms by reducing PAHs, metals, and PCBs.
   - Total PAHs in the BAZ of canal sediment should not exceed 7.8 ppm
   - CSO PAHs 36 ppm; exceed Eco PRG at end of pipe. This does not account for solids contribution from harbor (5.8 ppm)

2. **Human Health**

   Reduce toxicity of PAHs in canal sediments for humans exposed while swimming, and reduce toxicity of PCBs in fish for humans exposed by ingestion of fish by reducing PAHs in sediments and PCBs in fish.

   CSOs do not exceed

3. **NAPL Mitigation**

   Prevent migration of NAPL to the canal through sediments or groundwater

   Does not apply to City

Ecological PRG

Eco PRG is based on poor or unsupported analyses.

- Benthic toxicity tests: Data are poor.
- PRG; methodology is poor. Uncertainty exceeds 100%.
- DEP Consultant developed Eco PRG = 85 ppm PAHs: CSOs do not exceed
- Other Sediment sites (CSTAG reviewed)
  - Duwamish TPAH PRG = 79ppm: CSOs do not exceed
  - Ashland WI TPAH PRG =139pm: CSOs do not exceed
  - Portland Harbor B(a)P PRG =27.6ppm: CSOs do not exceed
  - TPAH PRG on other sites ranges from 35 ppm to 100ppm

CSO Sediment PAH Data Evaluation

- Based on Poor Data
- Solids Concentration not measured directly;
- Estimated TPAH concentration is TSS measurement dependant (wide range 19 mg/L to 989 mg/L)

Need a well supported Eco PRG to warrant extensive CSO remediation

Need Better CSO Data to characterize the TPAH concentration

Methodological Issues With EPA Tests

- The EPA Toxicity Tests Using *Leptochirus* Are Uncertain Because:
  - The toxicity tests on these sediments did not meet acceptability criteria in two prior attempts;
  - EPA notes that there may have been a problem with the health of the test organisms;
  - EPA does not describe the time that sediment was held between attempts (i.e. were holding times exceeded);
  - EPA unclear on whether these final tests were re-run on the same test sediments as used in the first two failed tests, on new samples, or on an archived subsample;
  - EPA does not describe the conditions under which sediment were held between attempts (e.g. freezing samples for *Leptochirus* testing confounds test results);
  - EPA does not address the potential changes in the sediment during the unspecified periods between trials;
  - The EPA laboratory report does not address or explain the revised testing – the reference to these re-trials occurs only in a footnote to the text.

Technical Issues in Calculation of PRG

- EPA Development of PRG:
  - Demonstrates No Significant Dose Response Relationship Between Toxicity and Total PAH
  - Derives PRG Under the assumption that there is a valid dose response relationship
  - Ignores four sample toxicities for growth that are not significantly different from the value used to derive the PRG (these toxicities indicate a PRG of 29.1)
  - Ignores a sample toxicity for reproduction that is not significantly different from the value used to derive the PRG (this toxicity indicate a PRG of 28.7)

- NYCDEP Development of PRG:
  - PRG based on the more certain *Nereis virens* toxicity tests conducted in Gowanus Canal, results in a PRG of 85 ppm which is within the range of PRGs for total PAHS proposed at other sites nation-wide.
  - Based on average concentration of total PAHs among non-toxic (relative to the reference area toxicity tests) site stations

Example Eco PRGs vs Gowanus

The Gowanus Canal PRG for Total PAHs is 2 to 18 Times Lower Than Those Developed at Other Sites Nation-Wide:

PRGs From Various Sites Nation-Wide Applied to Gowanus Canal			
Site	**PRG Total PAH** (mg/kg dw)	**Note:**	**Basis of PRG Development**
Buffalo River	16 ppm	This PRG is for the sum of 17 non-alkylated PAHs	(1) Ten Day Benthic Toxicity Tests (2) Benthic Invertebrate Equilibrium Partitioning Model (3) Target Lipid Model for Invertebrates (3) Chronic Invertebrate Toxicity Testing
Indiana Harbor, Lake Michigan	36.5 ppm (assuming 6.4% average TOC in Canal)	Extrapolated from Indiana Harbor Site PRG of 45.8 ppm based on 8% TOC	(1) 28 Day Benthic Toxicity Tests (2) Regression Analysis (3) Comparison to Threshold Values for protection of benthic organisms and Effect Levels From Literature (to demonstrate validity of site specific calculations)
Elizabeth River, VA	45 ppm		(1) Regional Benthic Toxicity Studies (2) Application Of An Exposure Model To Site Specific Sediment Data, (3)Comparison Between Onsite And Background Sediment [PAH]
Steven's Point, WI	22.8 ppm		(1) Adopted Probable Effects Levels for Invertebrates from MacDonald et al. 2000.
Grand Calumet River, Lake Michigan	24.3 ppm	Extrapolated From Grand Calumet Site PRG of 30.8 based on 8% TOC	(1) 28 Day Benthic Toxicity Tests (2) Regression Analysis (3) Comparison to Threshold Values for protection of benthic organisms and Effect Levels From Literature (to demonstrate validity of site specific calculations)
Ashland Northern States Power	146 ppm	Extrapolated from Ashland PRG of 9.5 based on 0.415% TOC	(1) Benthic Toxicity Testing (2) Comparison to Benthic effects benchmarks in literature
Duwamish	79 ppm	Extrapolated from Lower Duwamish River PRG for LMW and HMW PAHs	Based on Benthic Organisms

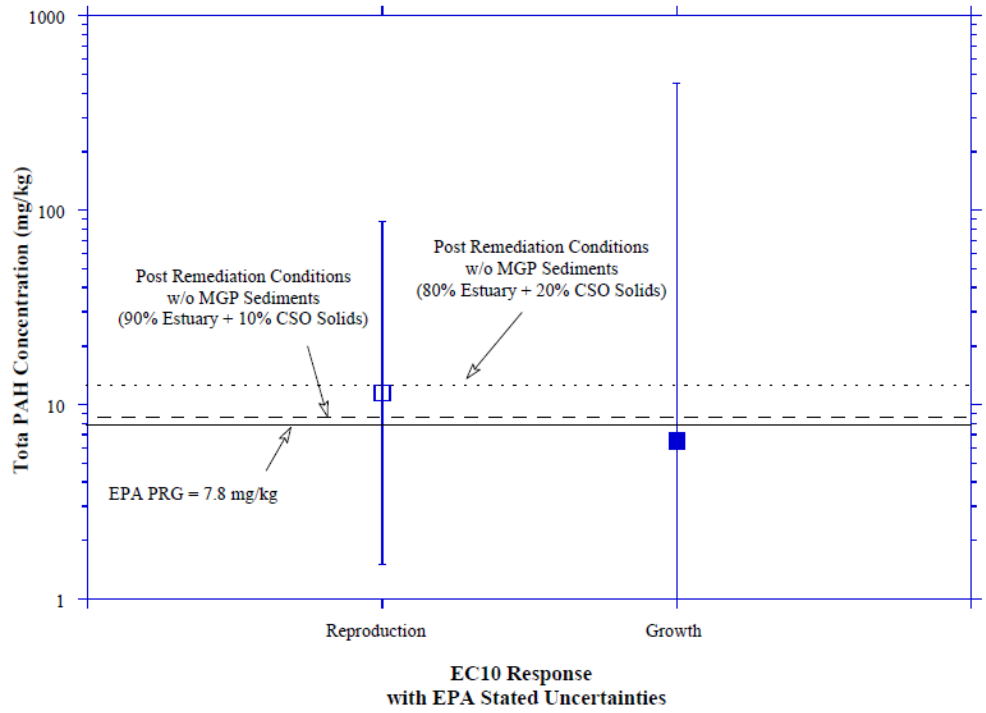
Considerations on Sediment PRG *vs.* CSO PAH Concentrations

- EPA's PRG for surface sediments for ecological impacts is 7.8 mg/kg derived from EC10 growth and reproduction considerations
- Uncertainty on this value is very large!
  - ± 660% for reproduction effects (1.5 to 87.3 mg/kg)
  - ± 7,000% for growth effects (0.09 to 452 mg/kg)
- CSOs constitute 10 to 20 percent of depositing solids in the Canal.
- Estimates of PAH concentrations for CSO plus estuary deposition are in the range of 9 to 12 mg/kg
  - Only 13 to 50% higher than the PRG
- With planned CSO reductions these concentrations drop to 7.7 to 10 mg/kg
  - Equal to or only 23% higher than the PRG, well within any uncertainty of the PRG value.
- These values warrant monitored natural attenuation and not active remediation after CSOs are reduced.
- NYC DEP estimates also assume **100%** control of upland MGP wastes and discharges, which if uncontrolled will continue to contaminate the canal.

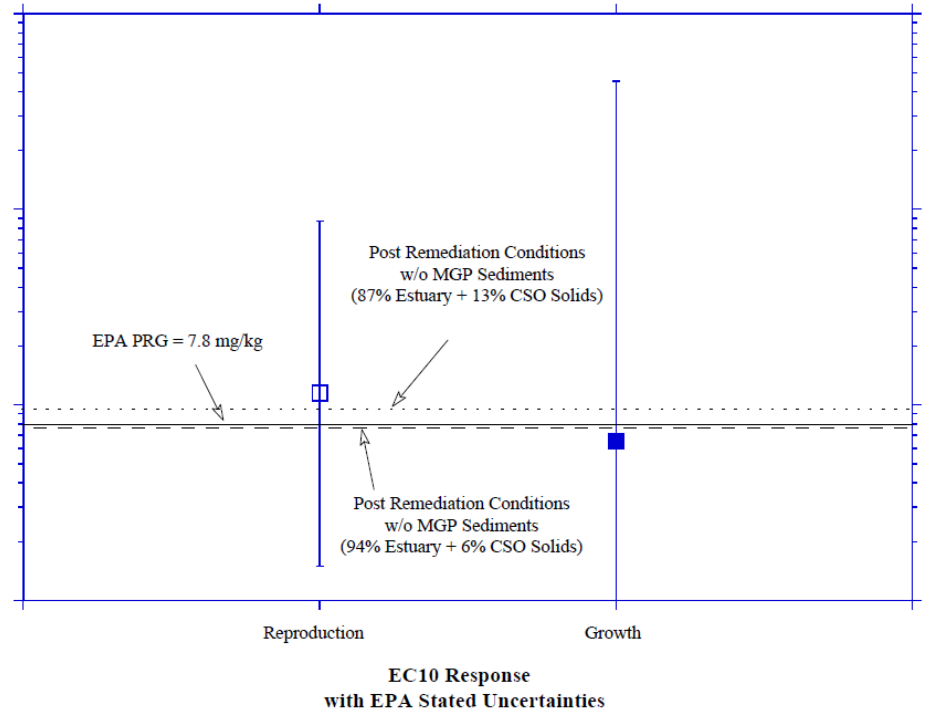
NYC DEP Estimates of Surface Sediment Concentrations Post Remediation: Well within EPA PRG Uncertainties

- Estimated Mixtures in the Canal Surface of CSO and Harbor Solids are within the Ecological PRG.

No Reduction in CSO Solids

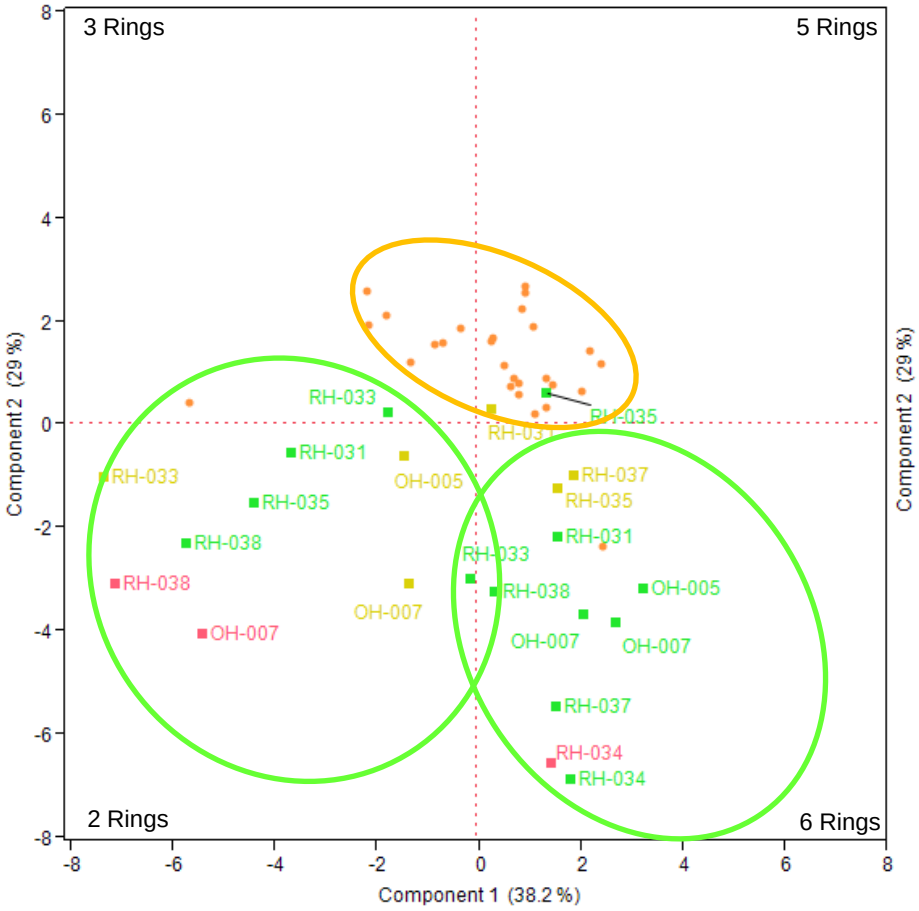


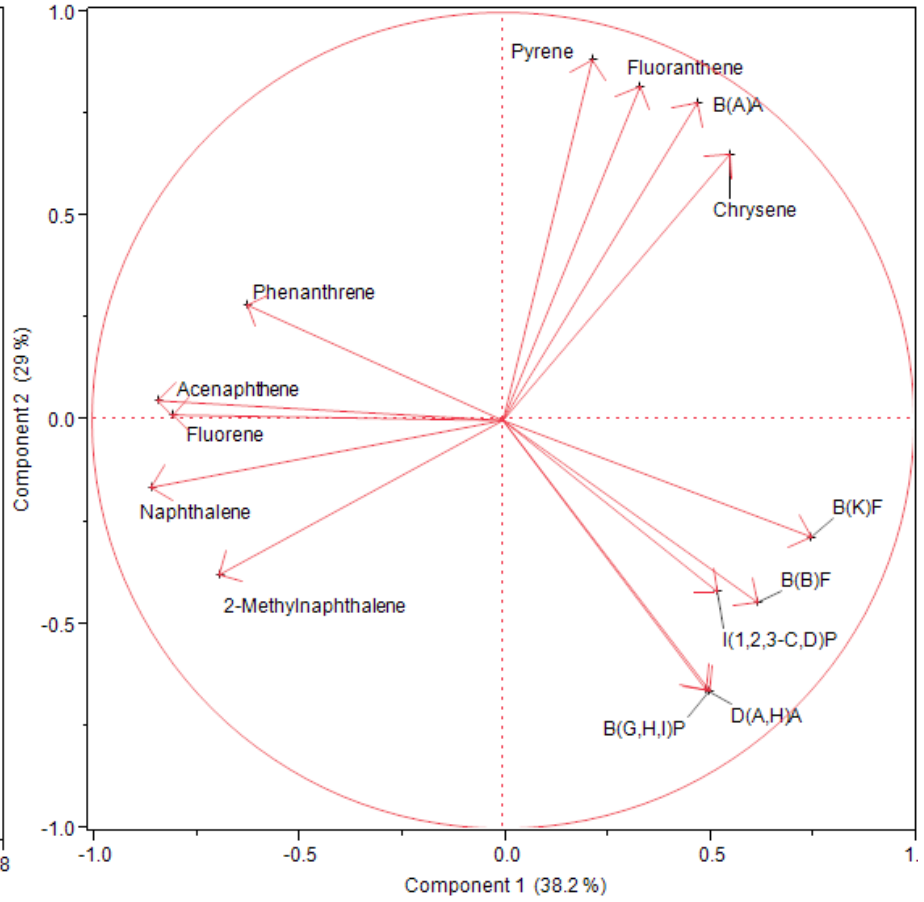
37 % Reduction in CSO Solids



Principal Component Analyses of the PAH concentration in CSO Solids and Surface Sediments in the Canal

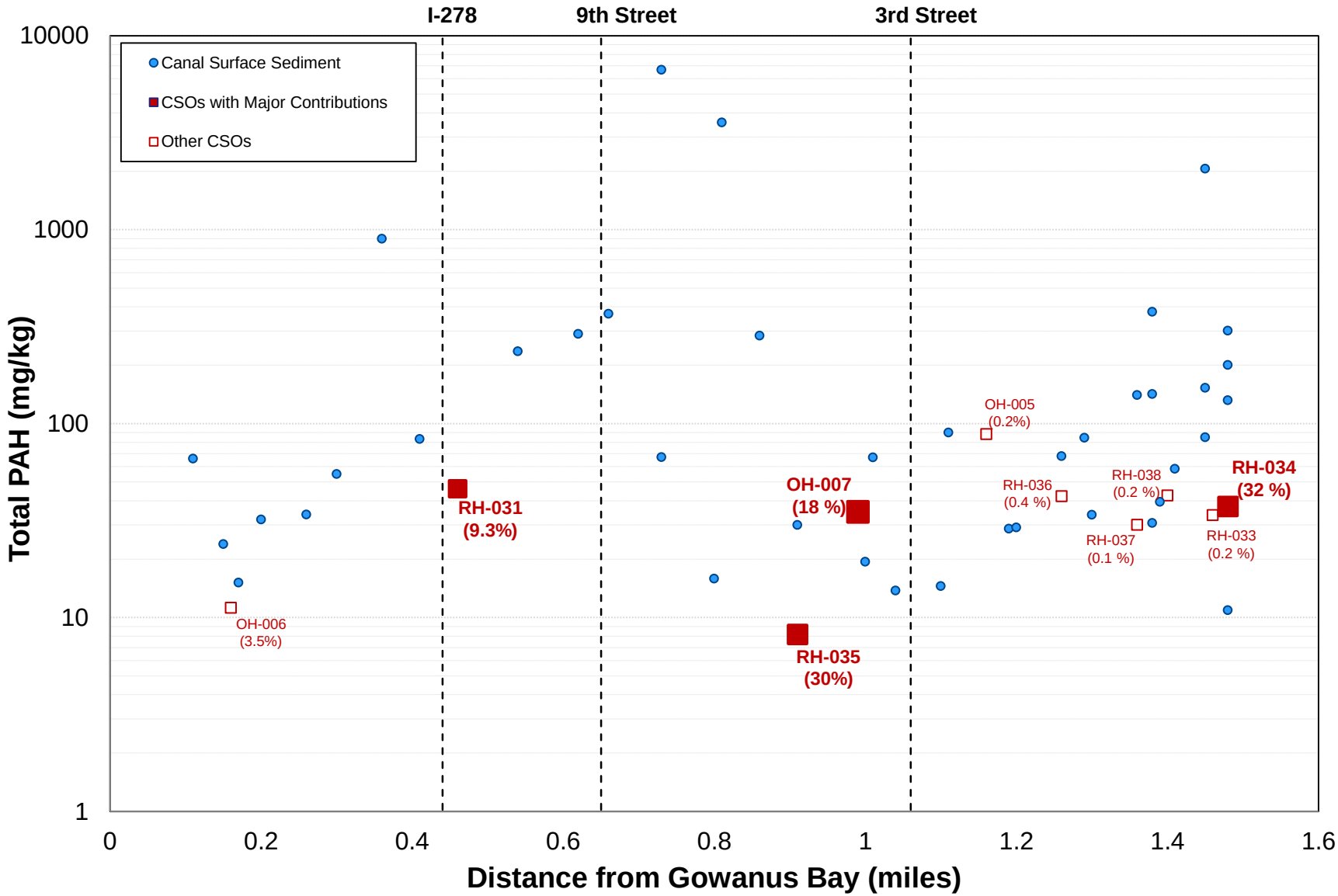
- PAH Pattern analyses clearly identifies the surface sediments with a signature unrelated to the CSOs.





- Canal Surface Sediments
- CSO Solids – Wet Weather Data
- CSO Solids – Dry Weather Data
- CSO Solids Sediment in Pipes

Total PAHs in Surface Sediments vs. CSO Wet Weather Solids



CSO Reductions

- EPA's position has been that CSO volume reductions are needed to achieve Eco PRG
- DEP analysis: Reduction in volume does not reduce PAH concentration in pipes.
- If PAHs need to be reduced in the CSOs, is it solids control or volume control?
  - If target is PAH concentration in CSO sediments in pipes, volume reduction will not get us there
  - If target is PAH concentration in canal sediments then CSO reduction will reduce mixing
- Green Infrastructure (GI) would address solids from surface runoff.

GI Alternative

alternative	% captured	CSO Reductions (MG/Y)		CSO Reductions %		Canal-wide reductions	
		RH-034	OH-007	RH-034	OH-007	MG/Y	%
HLSS		9	3	7	4	12	4
GI	10	17	9	13	13	26	13
	20	28	17	22	25	45	25
	30	43	26	34	38	69	38
	50	65	40	51	58	105	58
HLSS+ 10%GI		26	12	20	17	38	16
HLSS+ 20%GI		37	20	29	29	57	29
HLSS+ 10%GI+ WBWS						190	49
HLSS+ 20% GI+ WBWS						209	55%

Gowanus FS Summary

❖ DEP Proposal to EPA

1. Additional Studies for CSO Controls

- ➢Evaluate CSO volume and sediment controls on the accelerated LTCP schedule, 2013.
- ➢Additional studies on Eco PRG to provide better science
- ➢Additional sampling of CSO solids for PAHs (CSTAG)
- ➢Additional study of sediment mixing (CSTAG)

2. During remedial design phase, evaluate engineering alternatives, on schedule with LTCP, that meet performance criteria, as defined by EPA.

3.CSTAG comments received 1/30/12 favor City's proposal to collect more data and proceed on LTCP schedule

Concerns About FS Alternatives

- Cap Stability – Areas of Canal are likely to be geotechnically stable
- Removal of soft sediment acts as buffer to prevent NAPL recontamination of cap
- Remedy effectiveness / risk reduction effectiveness: PAHs are significantly higher in deep sediments than in surface sediments, increased risk
- Bulkhead stability / cost
- Navigation requirements –not consistent with reasonably anticipated future use
- ISS – Long term effectiveness, exothermic reaction effects not evaluated
- Deep Dredging Cost, Logistics, and Community Impacts
- Deep Dredging Resuspension impacts / quantification

Pilot Study Options / Screening

Pilot Study Option	Relative Cost	Study Description	Project References
Green infrastructure	$$	Effectiveness monitoring of planned green infrastructure project.	NYCDEP-sponsored grant programs
Sewer cleaning / monitoring	$-$$	Clean lines in portion of sewershed and monitor effectiveness.	Lower Duwamish waterway
Enhanced street sweeping	$-$$	Increase frequency of street sweeping in portion of sewershed and evaluate effectiveness.	Lower Duwamish watershed
Catch basin inserts	$$	Install fabric inserts in portion of sewershed and monitor effectiveness.	http://environment.fhwa.dot.gov/ecosystems/ultraurb/3fs13.asp
In-canal silt trap (bench-scale)	$	Column setting tests and perform model calculations of effectiveness.	

Proposal to EPA

Engineering analysis of CSO volume and sediment control alternatives to coincide with LTCP schedule to enable better engineering solutions and additional data collection.

Better engineering solutions

- 1. Conduct Pilot Study on sediment reduction alternative in advance of schedule*. (12/2013)
- 2. Evaluate EPA preferred remedy for CSO volume reduction (6/2013)
  - Flushing tunnel as retention tank
  - sewer separation
  - Green Infrastructure
  - other grey
- Better Engineering Solutions for Canal Sediment Remediation
  - Flexibility in Proposed plan and ROD to address critical gaps in data & design
  - Consideration of an Alternative with Restoration/Public Benefits and Sustainability

Proposal to EPA

Additional data collection (on the Schedule with LTCP)

1. Eco toxicity testing to get better Eco PRG (12/2012)*
2. CSO solids sampling to improve CSO PAH data (3/2013)*
   - If 1 and 2 show no exceedance then No Further Action
3. Sediment deposition study using CSO tracer--with risks (12/2013)*

*Cost $1.4 Million - $2 Million (+/- 50%)