



EPA Meeting

Gowanus Canal

10/6/11

Agenda

Results of RI Study

Inputs to Conceptual Site Model

Engineering Alternatives for CSO Reductions

Basis for Remedial Action at Gowanus Canal

Human Health Risk Assessment Results

Lifetime Recreational User (Cumulative Risks $>10^{-4}$)

Lifetime Recreational Angler (Cumulative Risks $>10^{-4}$; HI >1)

Ecological Risk Assessment Results

Excess risks for ecological receptors

Comparison of CSO Sediment Concentrations to Risk-Based Cleanup Values and Background Sediment Concentrations

Chemical of Concern	Maximum measured CSO sediment concentration (mg/kg) (1)			Human health risk-based cleanup value (mg/kg) (3)	Maximum background sediment concentration (mg/kg) (4)	Background statistical comparison (5)	Greater of background and risk-based cleanup value(mg/kg)	CSO Exceeds Background and risk-based cleanup value?
Receptor: Recreational User Lifetime Exposure								
Arsenic	7.9			138.5	19	Inadequate data	138.5	N
Benz(a)anthracene	1.3J			27.6	1.2	CSO=Bkgd	27.6	N
Benzo(a)pyrene	1.3J			2.7	0.9	Inconclusive	2.7	N
Benzo(b)fluoranthene	4.5J			27.6	1.4	Inconclusive	27.6	N
Benzo(k)fluoranthene	1.5			276	0.8	Inconclusive	276	N
Dibenz(a,h)anthracene	0.5			2.8	NR	Inadequate data	2.8	N
Indeno(1,2,3-c,d)pyrene)	1.8J			2.6	1.0	Inconclusive	2.6	N

1-Taken from Table I-47A of RI Report; 2- Taken from Table 4-3 Science Collaborative, 2011; 3-Taken from Table xx, NYCDEP, 2011; 4-Taken from Table 4-4b of RI Report; 5-Results from Table xx, Louis Berger, 2011.

Comparison of CSO Sediment Concentrations to Risk-Based Cleanup Values and Background Sediment Concentrations

Chemical of Concern	Maximum measured CSO sediment concentration (mg/kg) (1)	Average measured CSO sediment concentration (mg/kg) (1)	Ecological risk-based cleanup value average concentration (mg/kg) (2)	Maximum background sediment concentration (mg/kg) (4)	Background statistical comparison (5)	Greater of background and risk-based cleanup value(mg/kg)	CSO Exceeds Background and risk-based cleanup value?
Receptor: Ecological							
Barium	368 (RH-037)	149	141	133	Hyp:CSO ≤ Bkgd :Inad Data	141	N
Cadmium	6.8 (RH-031)	2.0	2.6	6.3	Hyp: CSO ≤ Bkgd	6.3	N
Copper	614 (RH-031)*	318	188.6	242	CSO>Bkgd	242	Y
Lead	619 (RH-037)	248	340	244	CSO>Bkgd	340	N
Mercury	1.0	0.4	1.24	3.7	CSO<Bkgd	3.7	N
Nickel	42.9	29	41.75	50	Hyp: CSO≤Bkgd	50	N
Silver	2.8	1.6	4.1	9.5	CSO≤Bkgd	9.5	N
Total PAHs	18.2	8.3	85.3	14.4	CSO≤Bkgd	85.3	N
Total PCBs	ND	ND	0.69	NR	Inadequate data	0.69	N
* Outlier at OH-007 (4540ppm)							

1-Taken from Table I-47A of RI Report; 2- Taken from Table 4-3 Science Collaborative, 2011; 3-Taken from Table xx, NYCDEP, 2011; 4-Taken from Table 4-4b of RI Report; 5-Results from Table xx, Louis Berger, 2011.

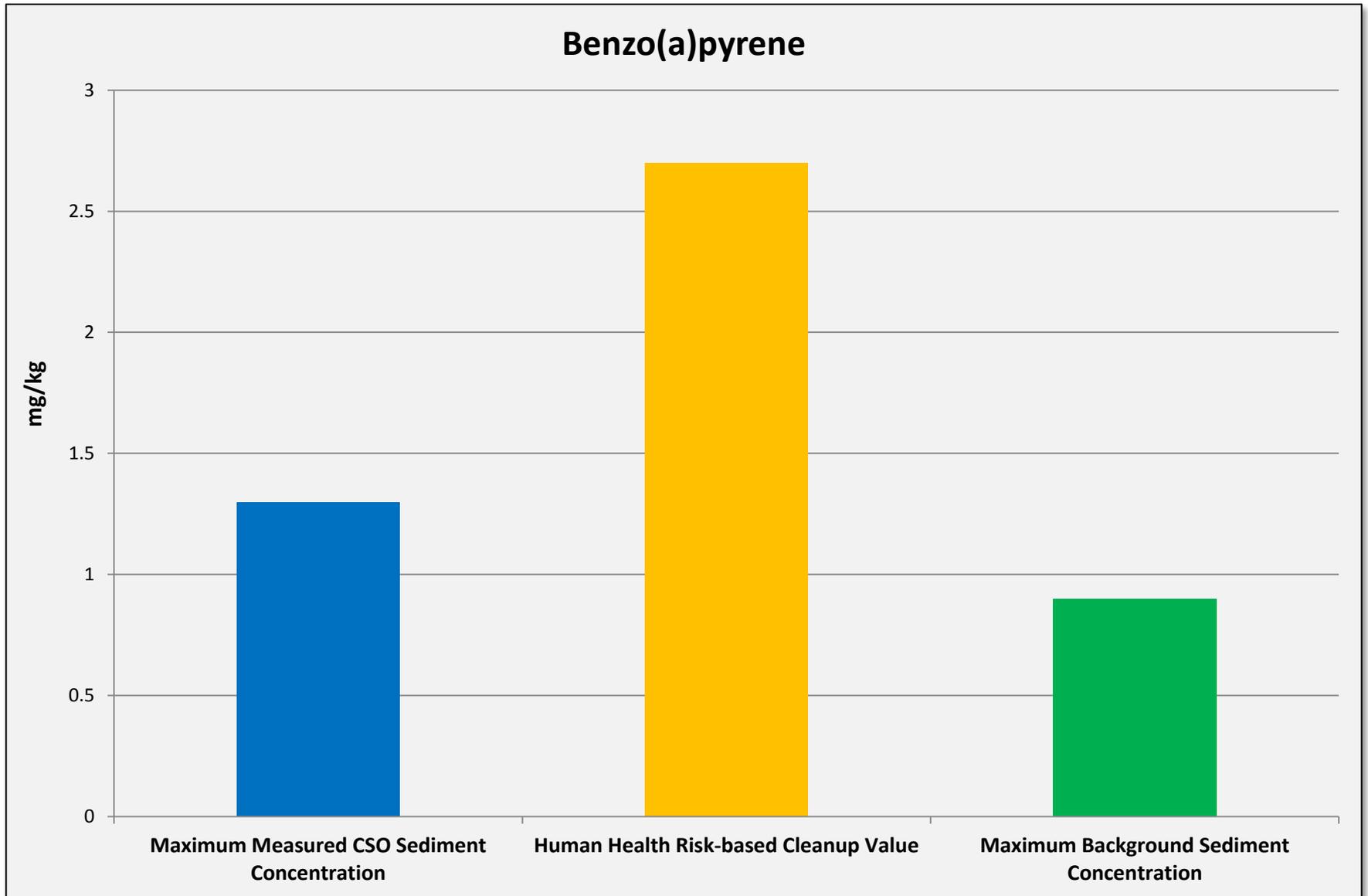
Table XX. Comparison of CSO Water Concentrations to Risk-Based Cleanup Values and Background Surface Water Concentrations

Chemical of Concern	Maximum measured CSO Outfalls Water concentration (ug/l) (1)	Ecological risk-based cleanup value concentration (ug/l) (2)	Human health risk-based cleanup value (ug/l) (3)	Maximum background Surface water concentration (ug/l) (4)	Background statistical comparison (5)	Greater of background and risk-based cleanup value (ug/l)	CSO Exceeds Background and risk-based cleanup value?
Receptor: Ecological							
Lead, dissolved	6.8 (wet)	8.1	NA	244	Data Inadequate	340	N
Receptor: Recreational User Lifetime Exposure							
Chromium +6, total	14.6 (wet)	NA	64	30.6 (dry)	CSO≤bkgd	64	N
Tetrachloroethylene	0.84 (wet)	NA	67.8	0.51	CSO>bkgd	67.8	N

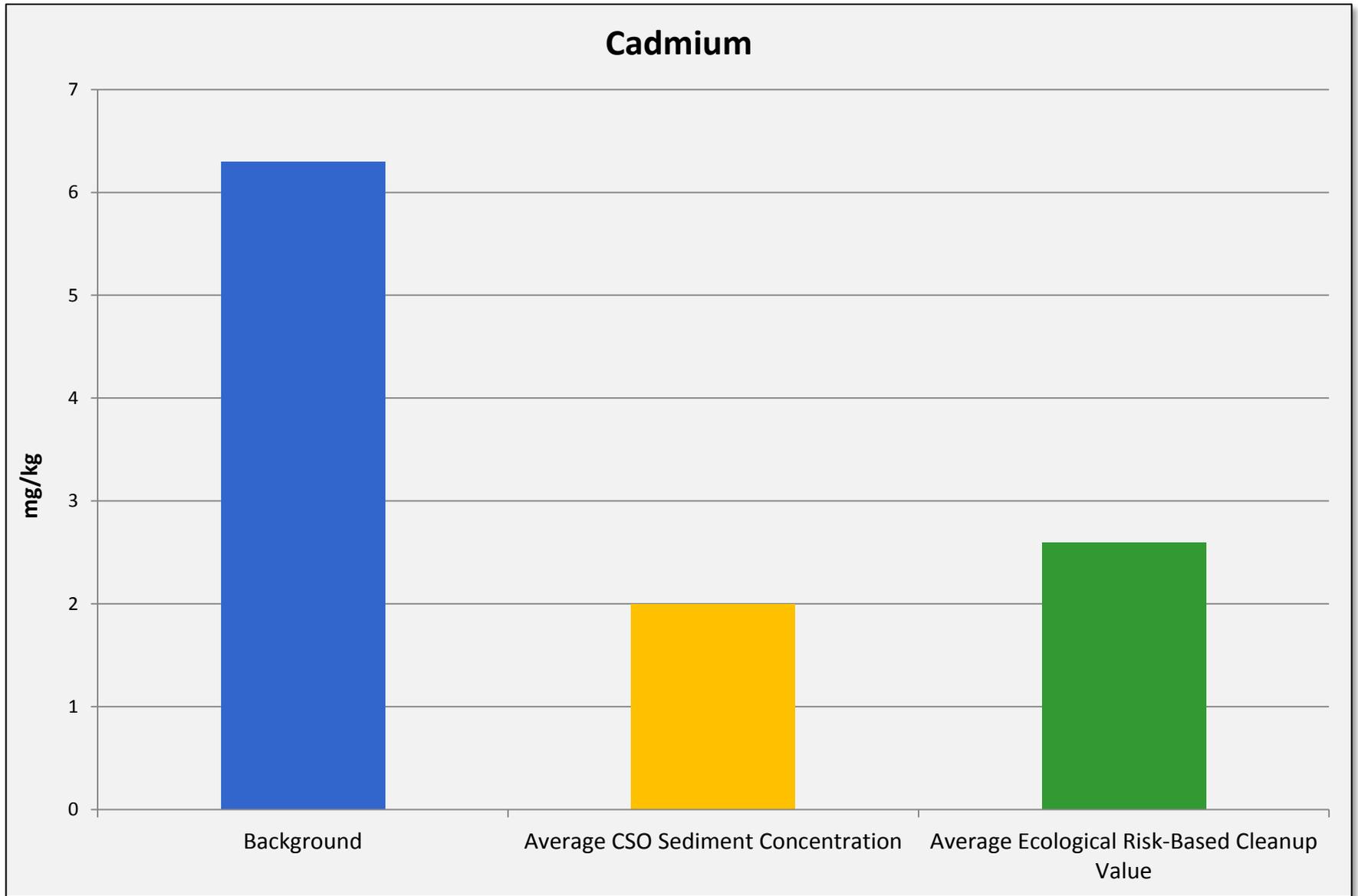
1-Taken from Table I-53a or I-49a of RI Report; 2- Taken from Table 4-3 Science Collaborative, 2011; 3-Taken from Table xx, NYCDEP, 2011; 4-Taken from Table 4-4b or 4-9b of RI Report; 5-Results from Table xx, Louis Berger, 2011.

ND-All results were non-detect.

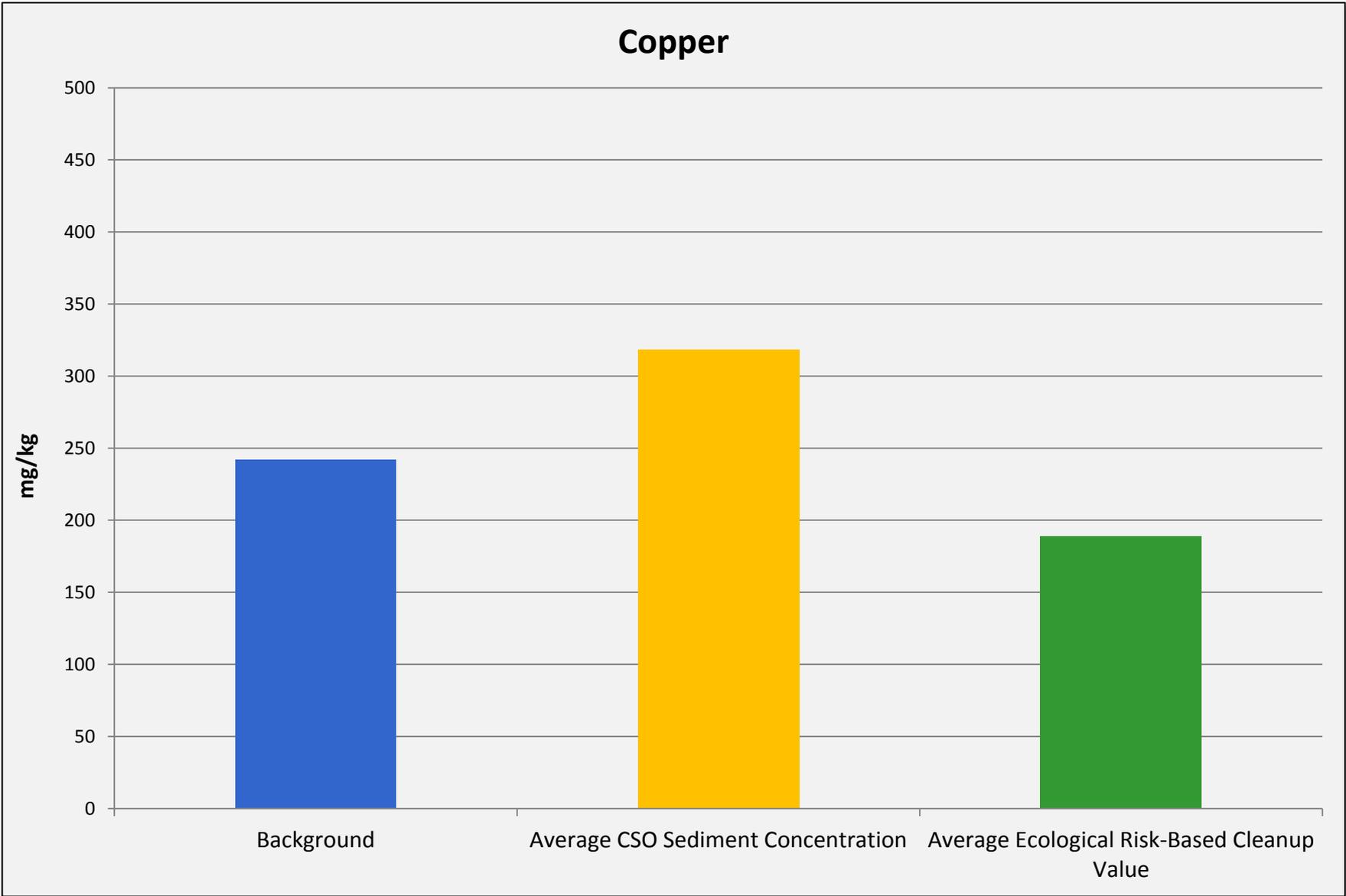
Benzo(a)pyrene



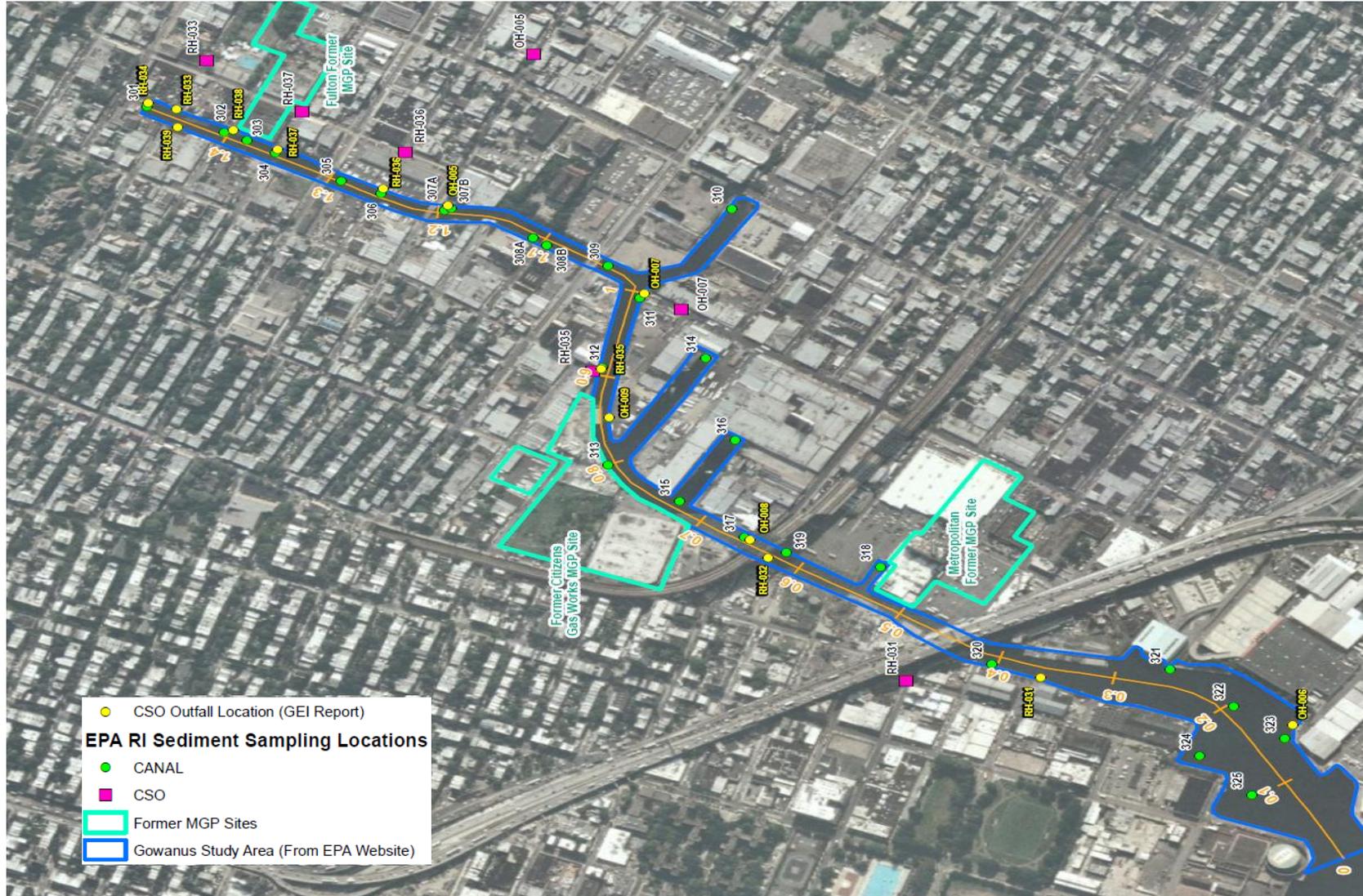
Cadmium

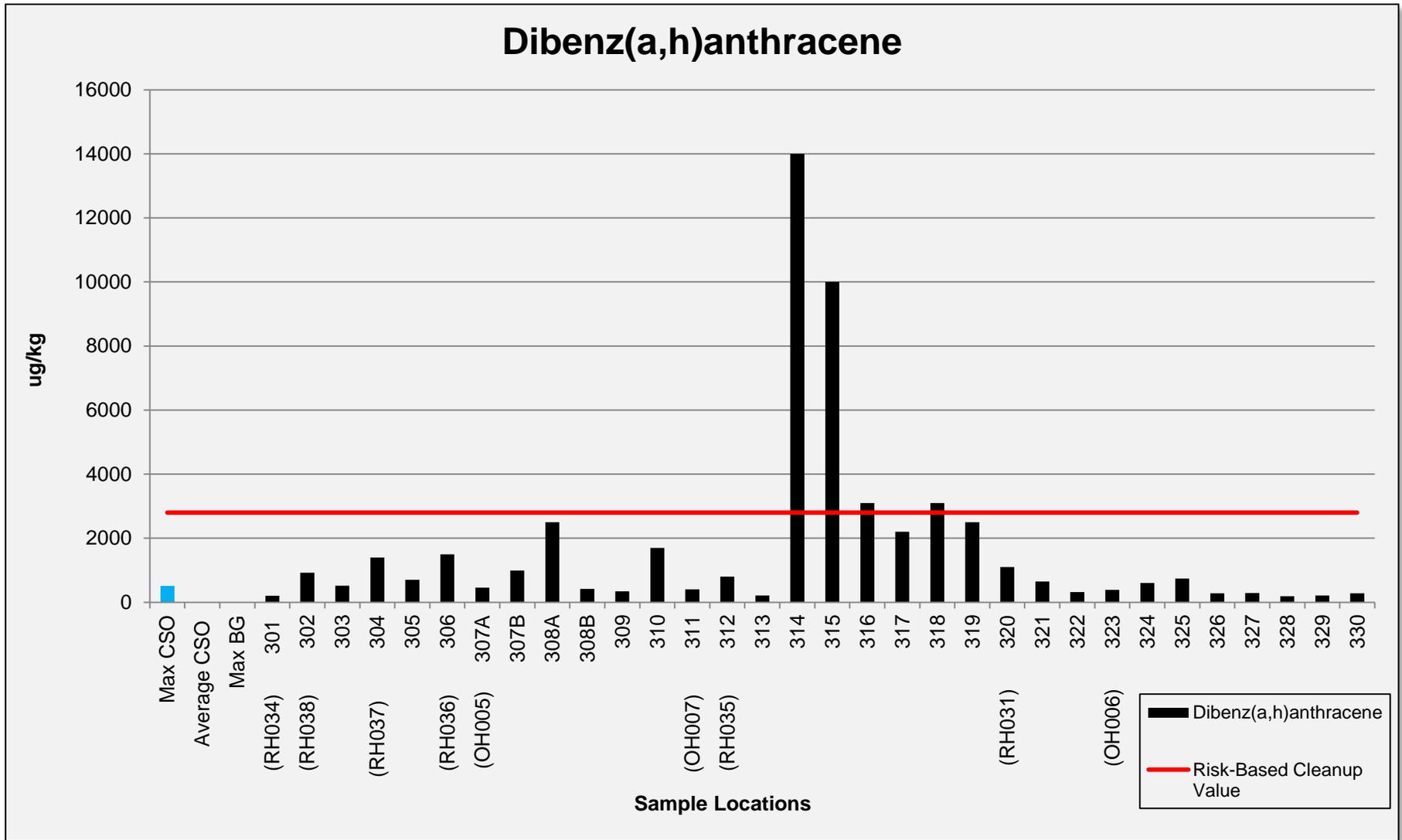


Copper

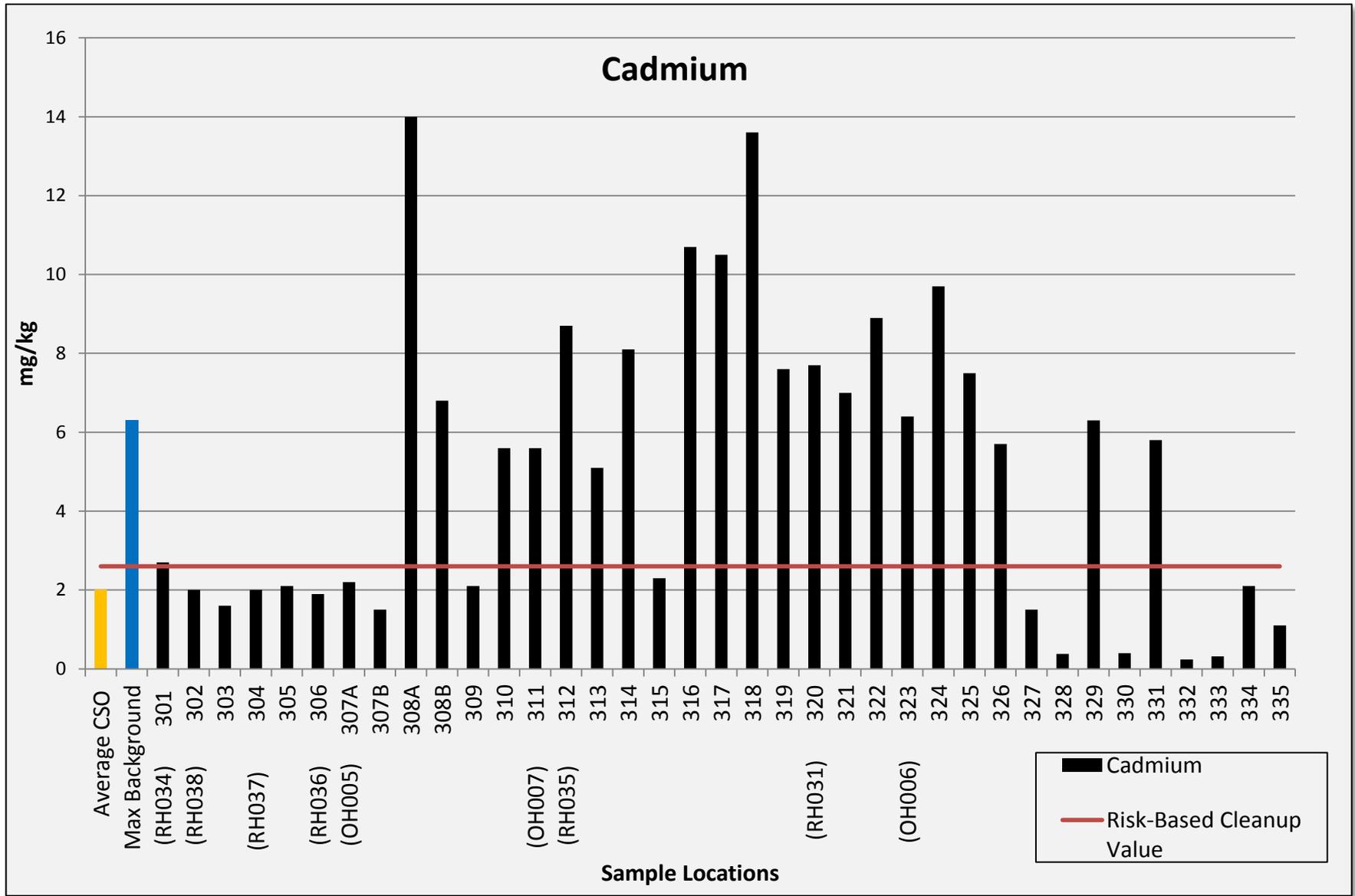


Sediment Sampling Locations (Canal and CSO)



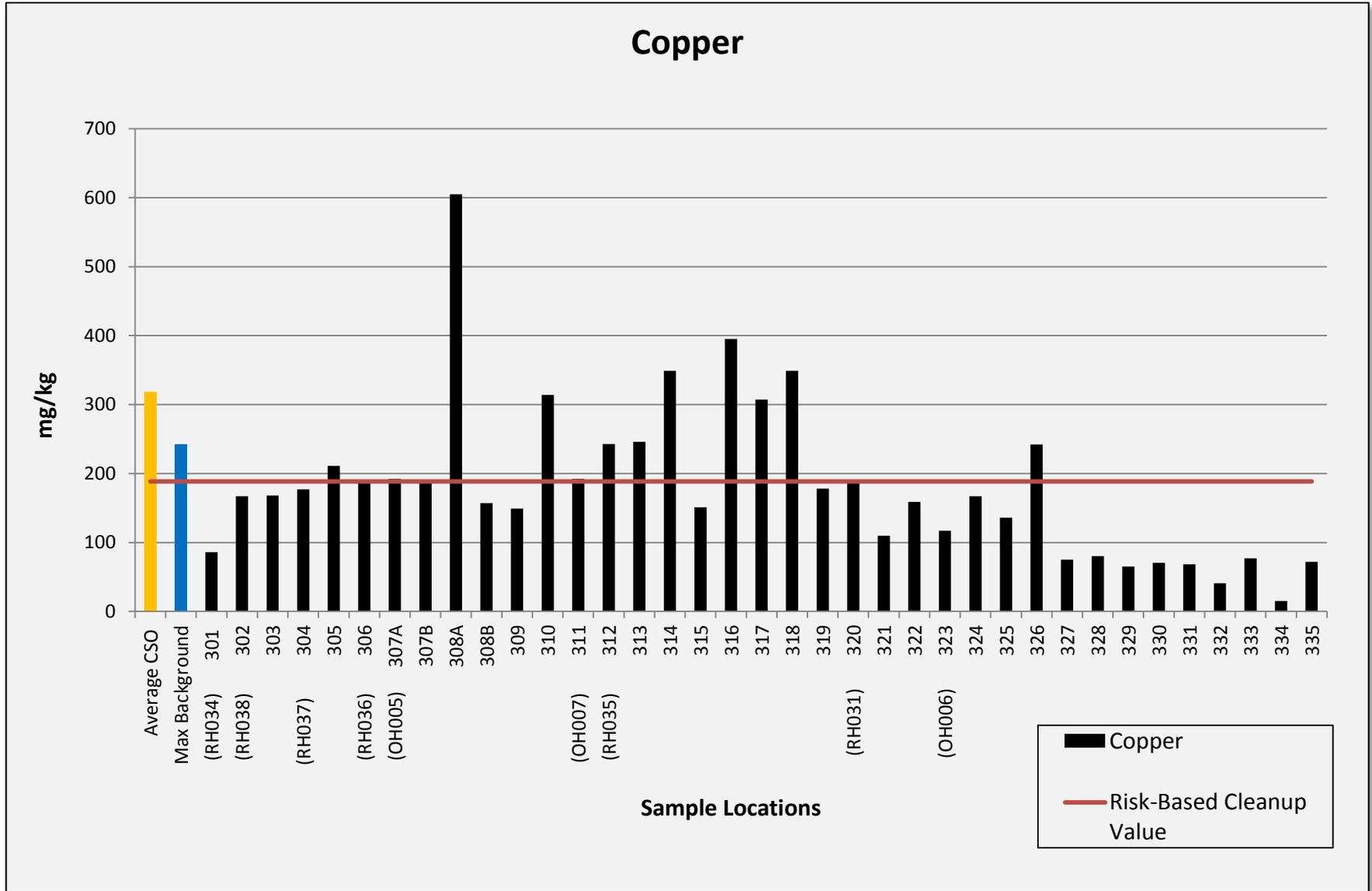


Metal Concentrations in Surface Sediment versus Ecological Risk Based Cleanup Value



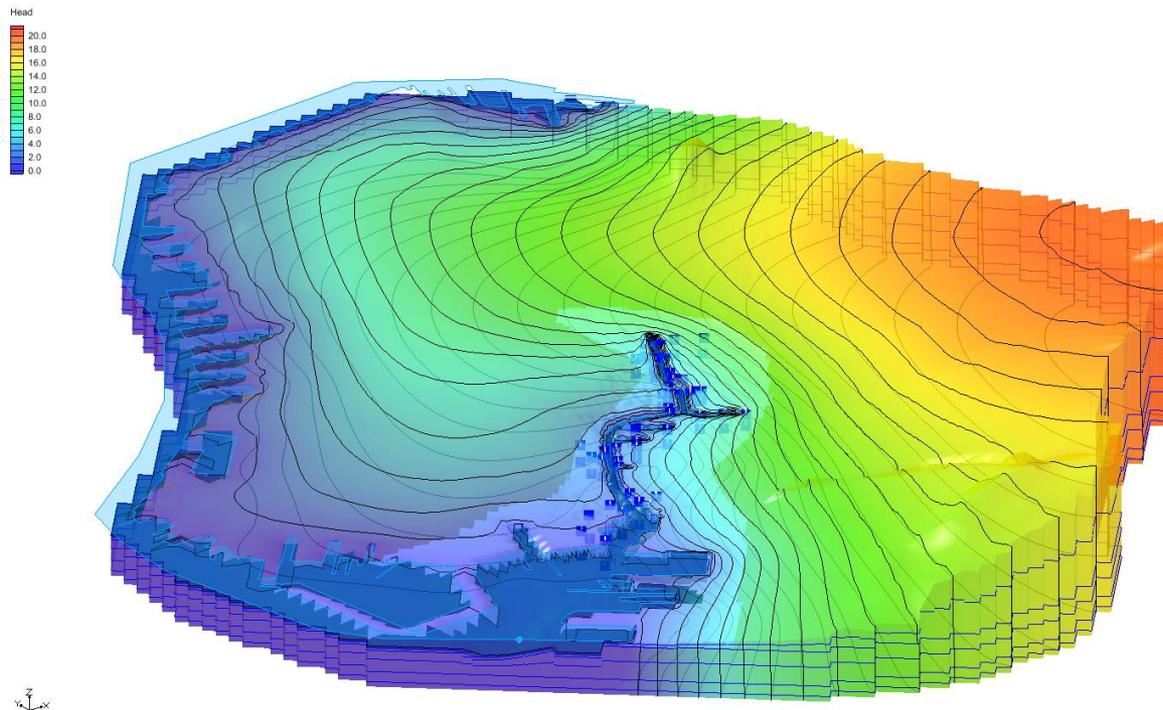
Metal Concentrations in Surface Sediment versus Ecological Risk Based Cleanup Value

Copper



Considerations for Conceptual Site Model

- ❖ Based on site information and USGS publications
- ❖ Agrees well with USGS head and flow data
- ❖ The calibrated discharge to Gowanus Canal is about 2.1 ft³/sec (USGS pre-development estimate is 2.5 ft³/sec)
- ❖ Model indicates about 75% of the flow to Gowanus Canal is through the sediment and 25% of flow is through the banks

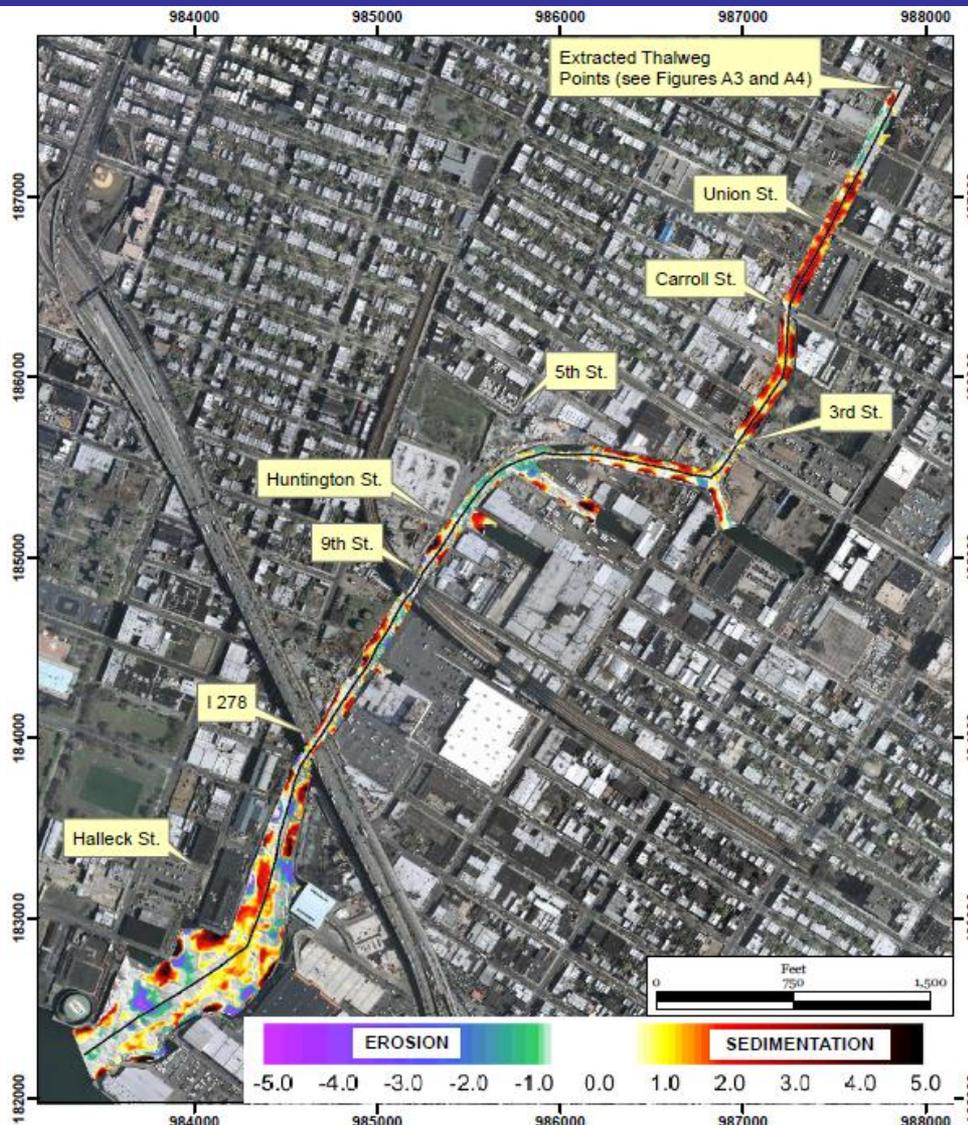


Analyte	Mean GW Concentration (ug/L)	Potential Annual Loads from GW (Kg/yr)	Mean CSO Aqueous Concentration (ug/L)	CSO Loads (kg/yr)
Acenaphthene	946	1,750	0.67	1.0
Acenaphthylene	1,020	1,900	0.20	0.3
Anthracene	156	300	0.20	0.3
Benzo(a)anthracene	5.1	10	0.25	0.4
Benzo(a)pyrene	1.2	2	0.25	0.4
Benzo(b)fluoranthene	0.7	1	0.35	0.5
Benzo(g,h,i)perylene	0.4	1	0.39	0.5
Benzo(k)fluoranthene	0.2	0.4	0.23	0.3
Chrysene	3	6	0.26	0.4
Dibenz(a,h)anthracene	9	17	0.24	0.3
Fluoranthene	34	65	0.34	0.5
Fluorene	429	800	0.29	0.4
Indeno(1,2,3-cd)pyrene	0.44	1	0.35	0.5
Naphthalene	26,925	50,500	4.0	5.7
Phenanthrene	412	770	0.48	0.7
Pyrene	53	100	0.38	0.5

Preliminary Upper Bound Estimates of Metals Load from Groundwater to Sediment Bottom

Analyte	Mean GW Concentration, ug/l	Potential Annual Loads from GW (Kg/yr)	Mean CSO Aqueous Concentration (ug/L)	CSO Loads (kg/yr)
Arsenic	9	17.6	3	4
Barium	308	598	59	84
Cadmium	0.7	1.4	1	1
Chromium, Total	5	9.5	4	6
Copper	22	42	58	83
Lead	10	19	67	95
Mercury	0.10	0.2	0.1	0.2
Nickel	10	20	6	8
Silver	0.7	1.4	0.7	1

Change in Elevation from 2003 to 2010 – EPA RI Report



 www.crenvironmental.com	<p>Bathymetric Surface Model Comparison - June 2003 and January 2010 Survey Data Gowanus Canal Brooklyn, New York</p> <p>NOTES: 1) Survey data collected by CR Environmental, Inc. of East Falmouth, Massachusetts on June 25, 2003 and January 5, 2010. 2) Grid: NY State Plane (LI), NAD83, US Foot. 3) Elevation differences less than +/- 0.6 feet are transparent. These values are within the combined RMS error range for the two surveys.</p>	 Figure A2
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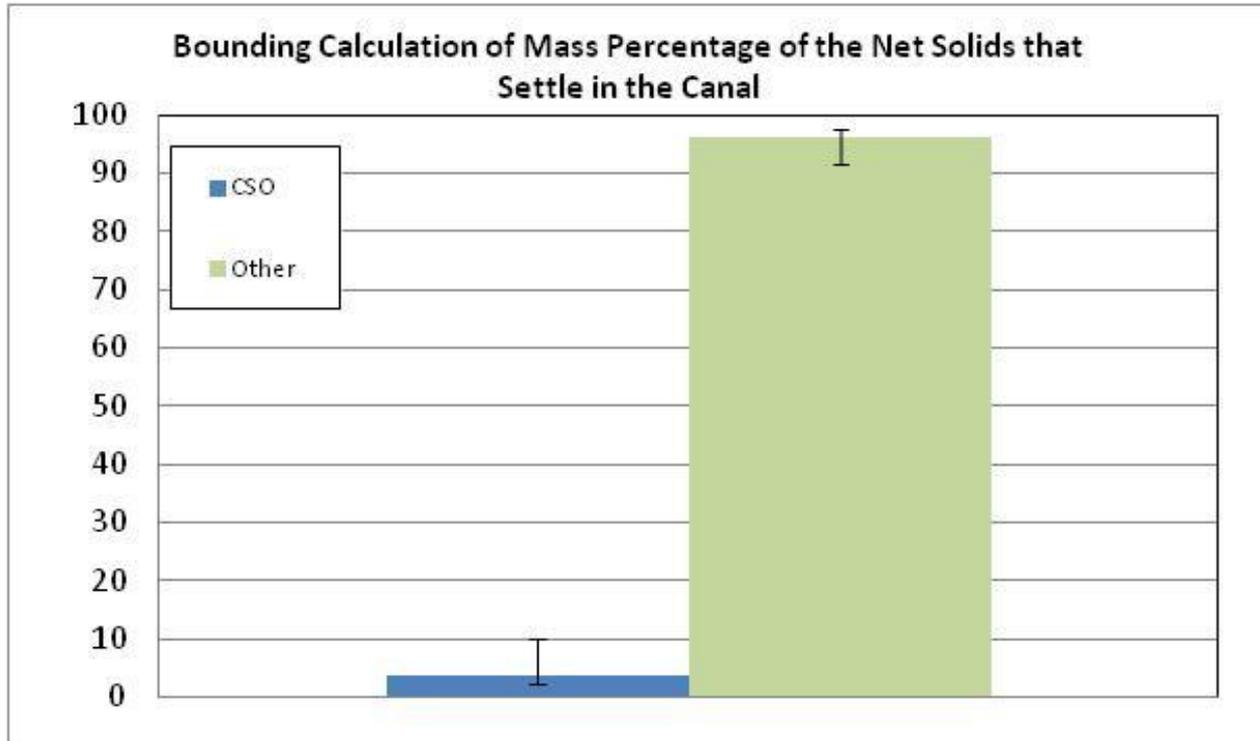
Calculation of Net Solids Deposition

Change in Elevation from June 2003 to January 2010 (6.6 years)

	Deposition	Erosion	Net (Deposition - Erosion)	Uncertainty**
Volume (cy)	41,000	14,000	27,000	15,200
Rate (cy/yr)	6,200	2,100	4,100	2,300
Mass (kg/yr)*	3.8×10^6	1.3×10^6	2.5×10^6	1.4×10^6

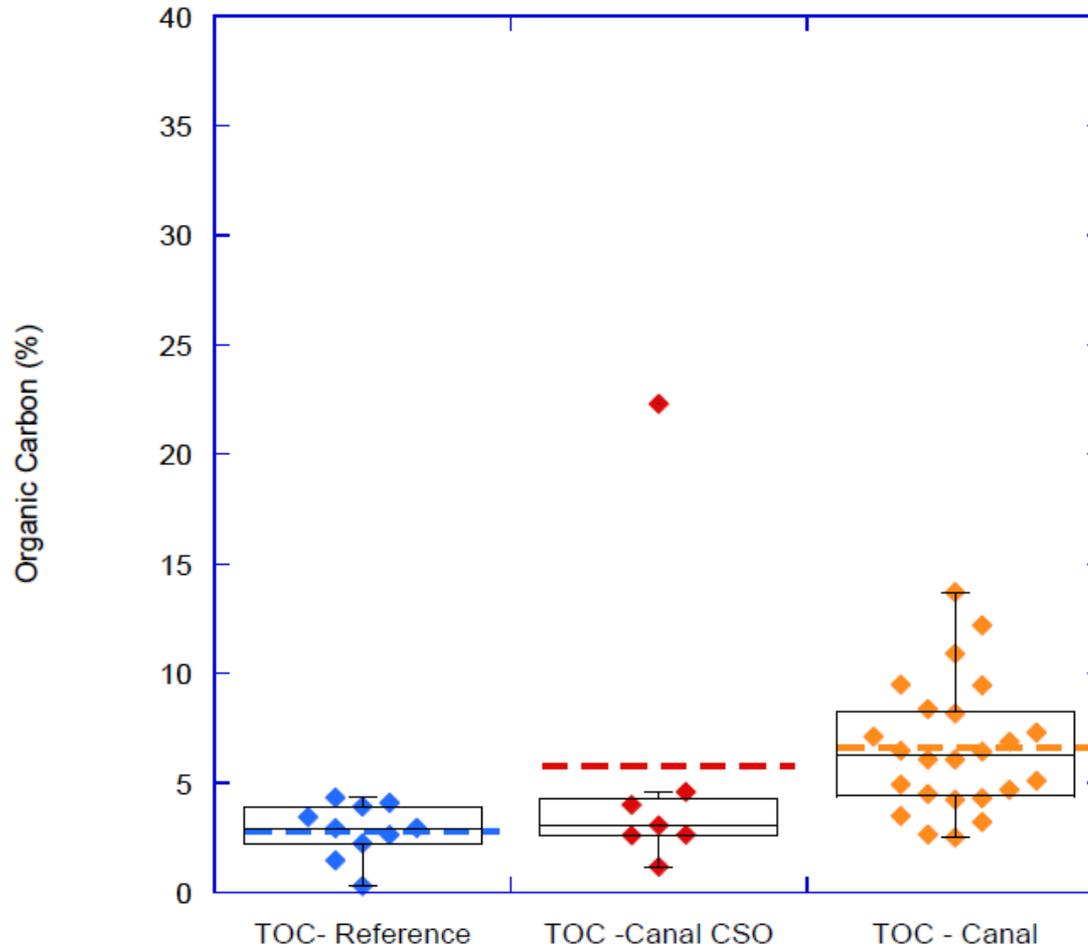
* Mass was calculated using a solid specific density of 0.8 g/cc

** Uncertainty was calculated using areas where the change in elevation from June 2003 to January 2010 was within 0.6 feet.



Bounding calculation assumes that all CSO solids settle in the Canal

“Organic Sink” Concern - TOC Comparison



Means Comparisons using Tukey-Kramer Test

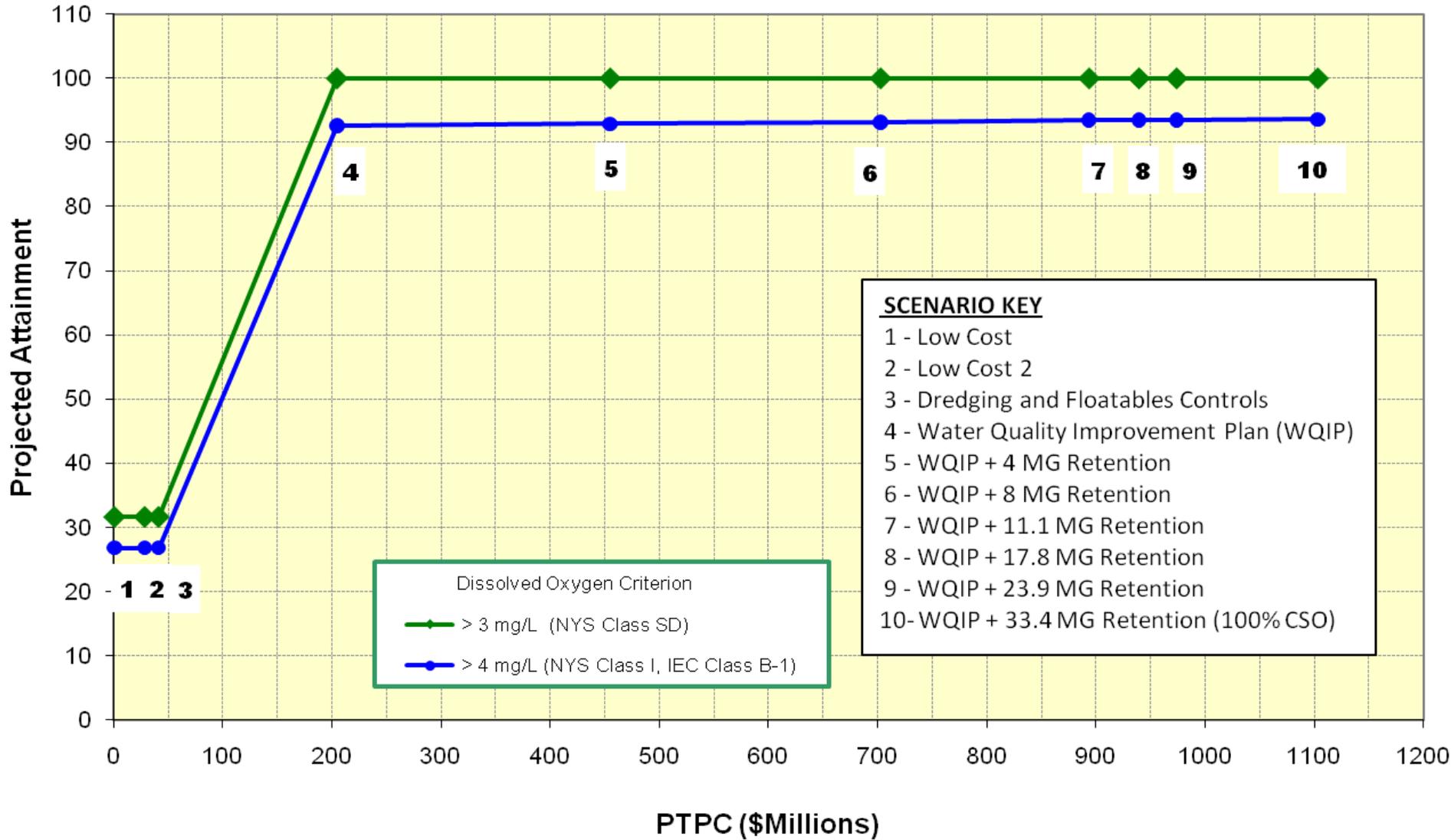
Level		Mean
CANAL	A	65979.167
CSO	A B	57714.286
REFERENCE	B	28358.000

Levels not connected by same letter are significantly different.

Engineering Alternatives Requested by EPA

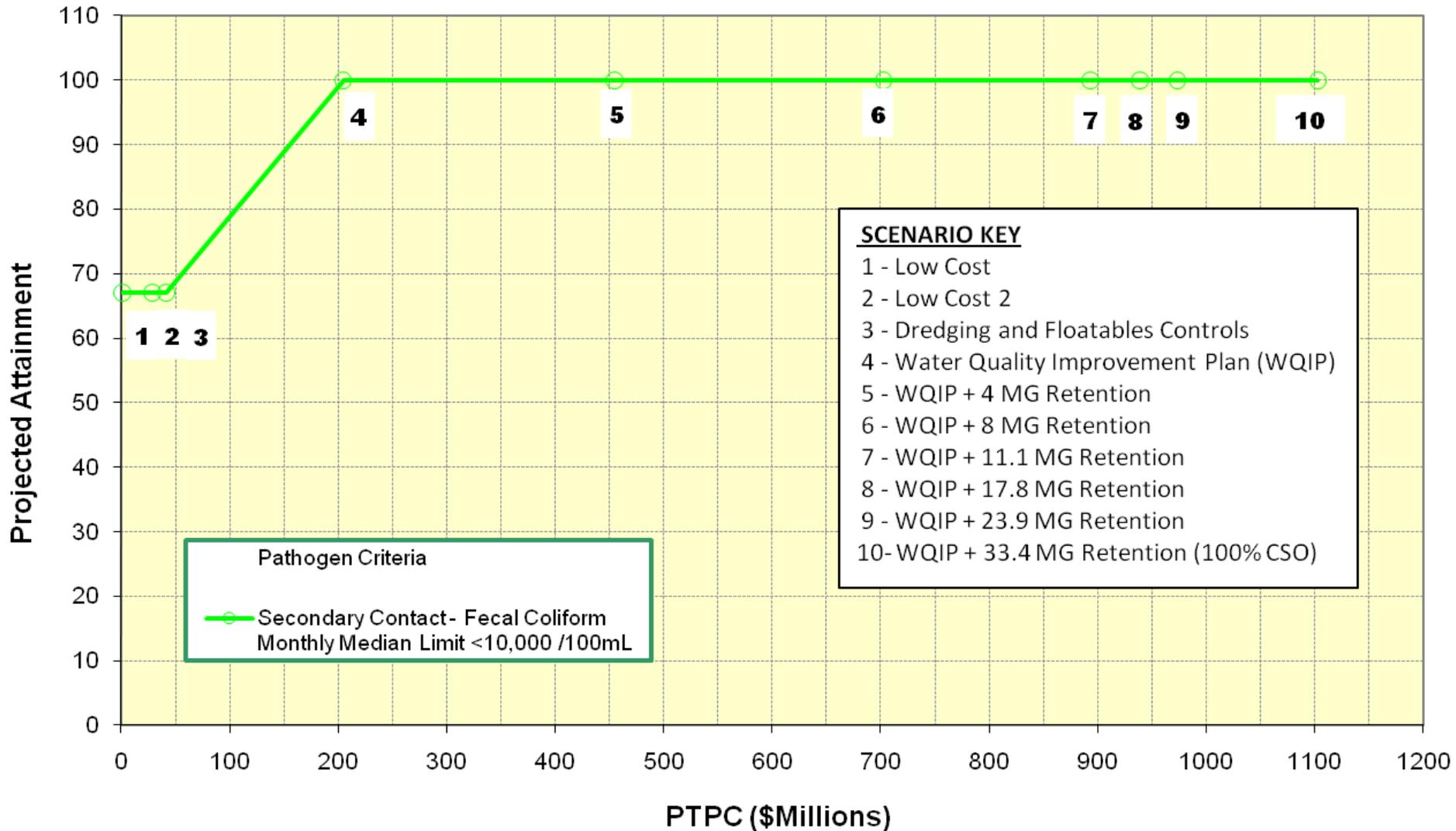
Alternative	Flow Reduction (MG/Yr)	Present Worth Cost (Million Dollars)	Cost Estimate Basis	Notes
		Capital		
Storage Tank - OH-007	69	420	8.2 MG Tank WWFP Table 7-4	Rejected during CSO Planning Project because : 1) Negligible impact on improving compliance with WQ standards 2) Construction requires condemnation and acquisition of private property 3) Difficult construction conditions related to groundwater and proximity to the waterbody 4) Long construction period with potential community impacts 5) High capital and maintenance cost
Storage Tank - RH-034	127	655	17 MG Tank WWFP Table 7-4	

Attainment of Dissolved Oxygen vs. Cost



Additional CSO controls do not increase attainment

Attainment of Fecal Coliform vs. Cost



CSO projects result in pathogens attainment that would allow boating

CSO Controls

- Gowanus Facilities Upgrade (\$140,000,000)
- CSO Reduction 34%
- Sediment Reduction 37%

Odor/Aesthetic Improvements

- Environmental Dredging = (\$20,000,000)



*Proposed Post-Upgrade
Rendering of the
Gowanus Facilities*

Additional Ongoing CSO Controls

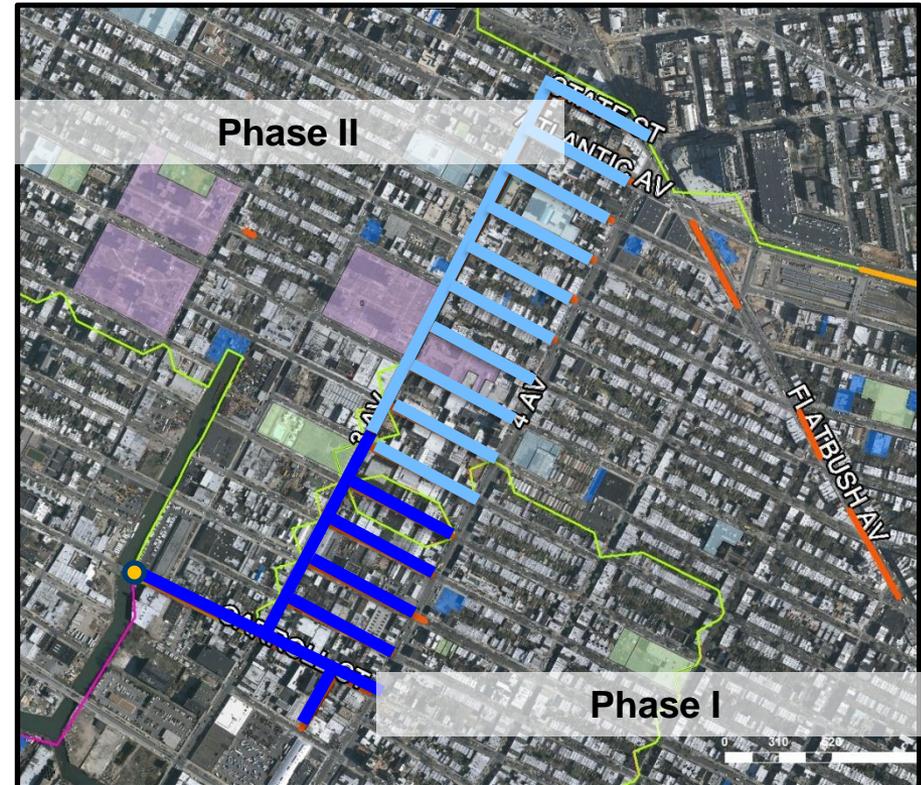
Alternative	Date	Notes	Costs	% CSO Reduction
High level Sewer Separation	Phase I FY13 Phase 2 FY20	Captures 50% of drainage area (96 acre) of street runoff. New storm outfall at Carroll St	\$20,000,000	5 %
Sewer Maintenance	2011, year to date 2004	37,355 linear ft of 4 th Ave sewer cleaned; 724 yd ³ of silt, debris, grease removed 110,000 yd ³ of silt, debris, grease removed in Bond-Lorraine sewer	\$ 685,000	
Interceptor Maintenance	2010-2012	Owl's Head and Red Hook Interceptor inspections. Completed 90% of total linear ft (16,530) for Red Hook. Inspected 2,200ft of 14,000ft in Owl's Head. On-going	\$ 148,000	
IPP Program	1987	Reduction of metals influx		
Green Infrastructure	2011-forward	Downtown Brooklyn Traffic Calming/ community grants/EBP grant/future budget allocations	\$ 1,000,000 +	11%
Total			\$ 21,853,000 +	16%
Total Reduction in CSOs		Plant Upgrades+HLSS+GI	\$181,853,000+	45%

High Level Storm Sewers (HLSS)

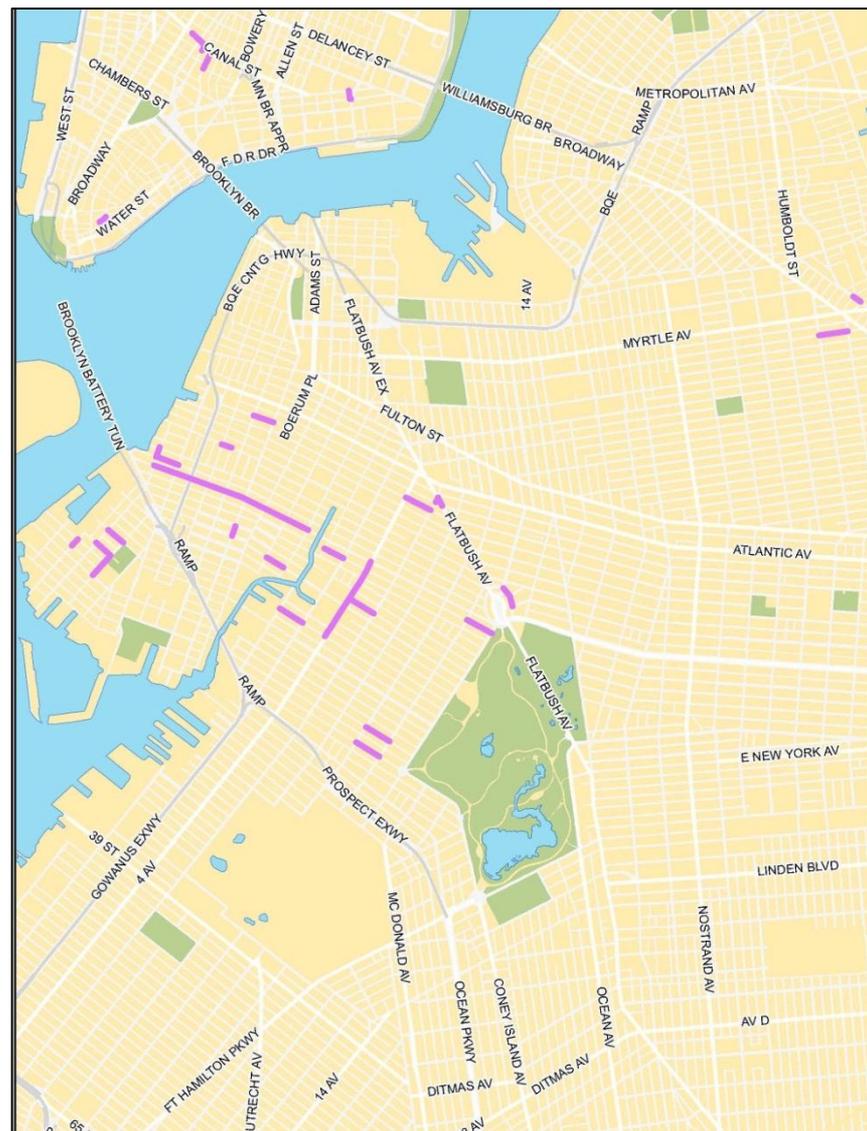
- Redirect existing catch basin flow from combined sewer to new HLSS
- Primary benefit includes reductions in street flooding
- Provides more capacity in the existing system including downstream interceptors
- Completed hydraulic analysis to determine feasibility for “Carroll Street Outfall” and CSO volume reduction of approximately 5% projected with modeling

Carroll Street Outfall Amended Drainage Plan includes:

- HLSS to capture 50% of drainage area runoff
- 96-acre area bounded by 1st Pl, 4th Ave, State St, 3rd Ave
- A new storm outfall would be located at Carroll St
- Phase I design expected in FY12, and construction in FY13
- Phase II design expected in FY19 and construction in FY20

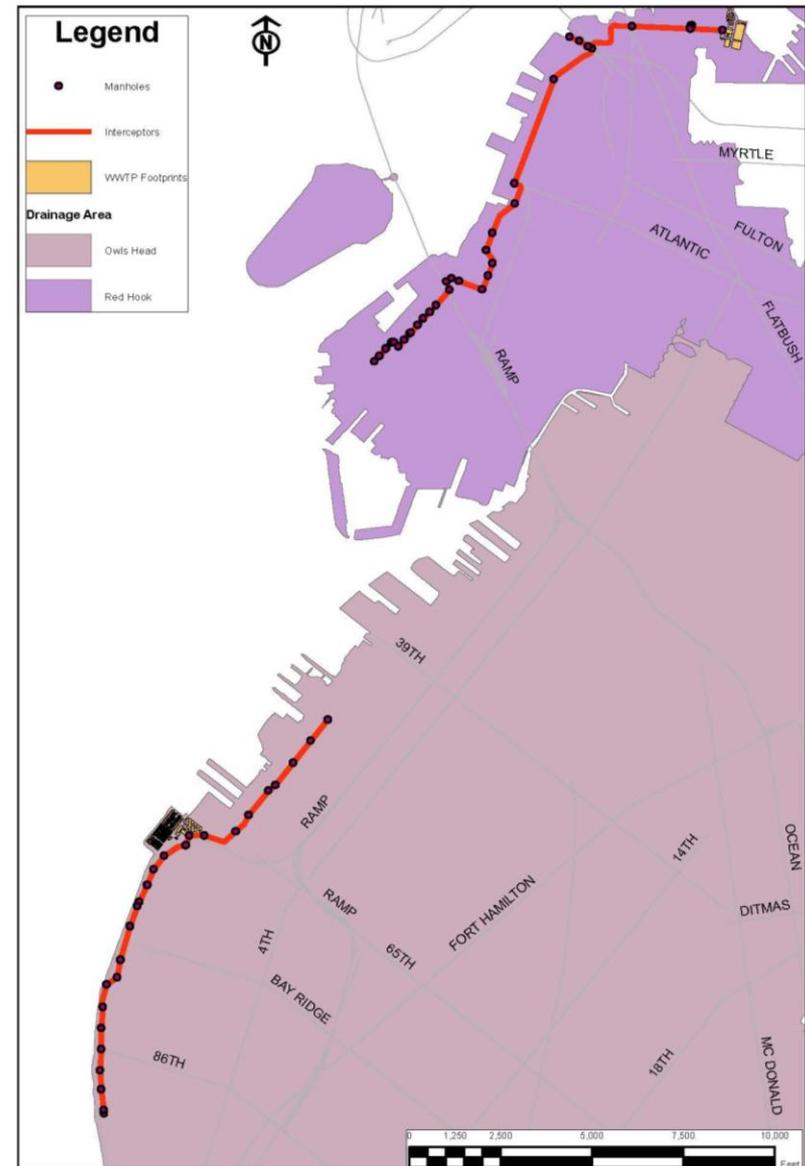


- 4th Ave activities for 2011 calendar year, to date:
 - Over 37,355 linear feet of sewers cleaned in response to complaints
 - 724 cubic yards of silt, grease, and debris removed
- Bond-Lorraine sewer cleaned in 2004:
 - 110,000 cubic yards removed from Bond Lorraine Street Sewer from Bond and 4th Streets to Lorraine and Court Streets



System Optimization: Interceptors

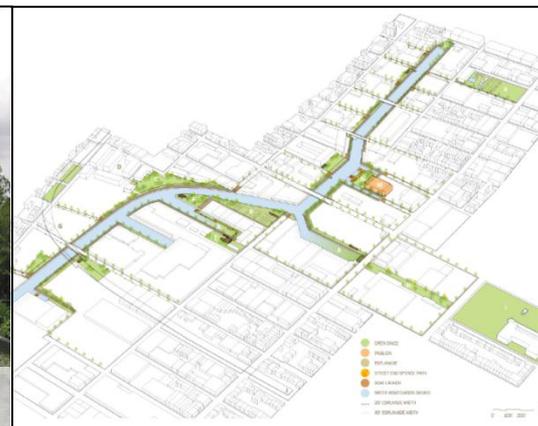
- In 2010, launched two-year program to systematically clean the City's interceptors
- Two new vactor trucks were purchased (cost \$450K each)
- Current program statistics for Gowanus Canal:
 - 90% of a total of 16,530 linear ft in Red Hook drainage area inspected
 - Inspection in Owls Head drainage area started and 2,200 ft of 14,000 ft surveyed to date



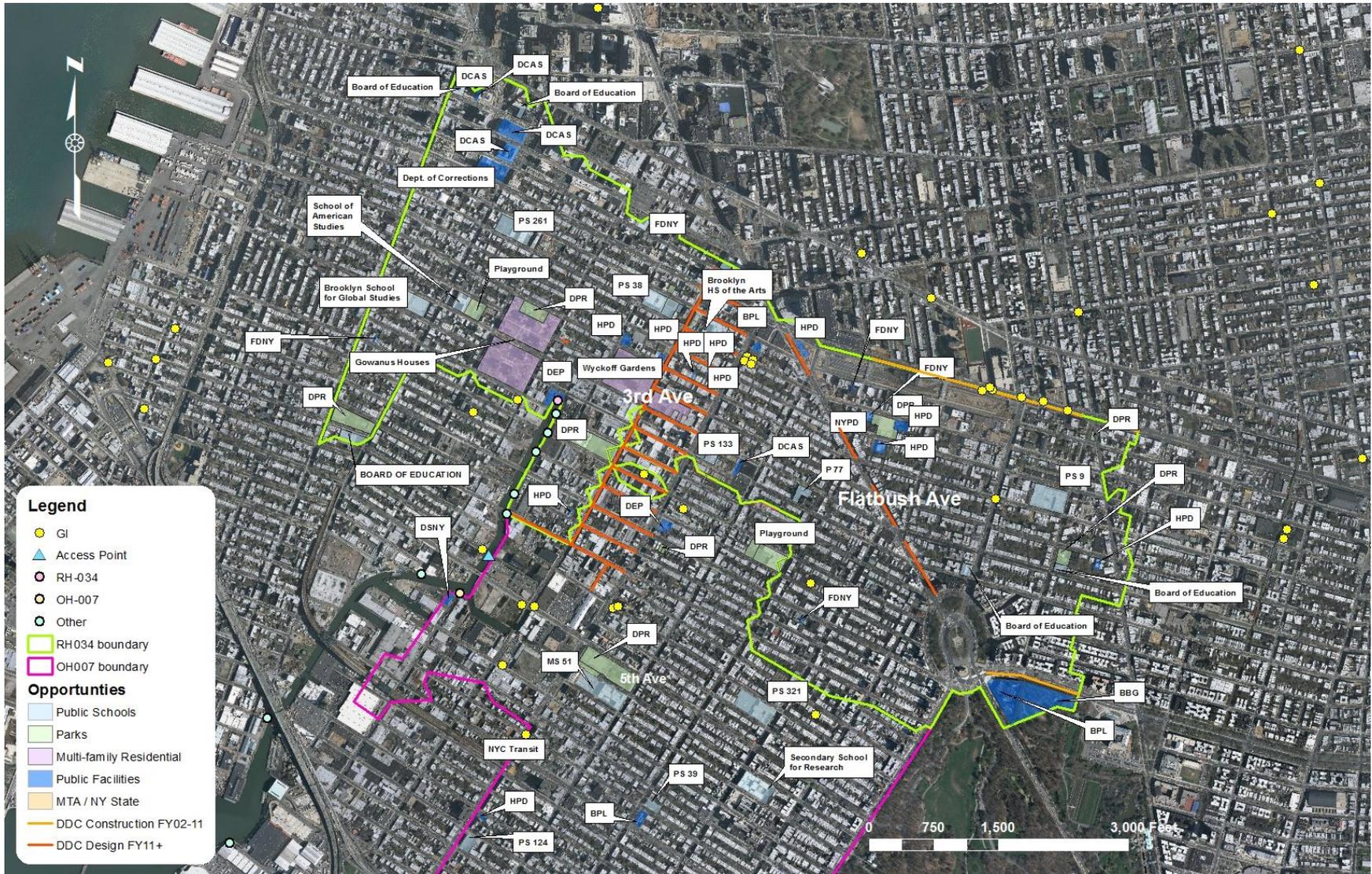
- Established in 1987 to control the introduction of toxic substances into public sewers that are tributary to WWTPs
- In 1992, DEP added a corrosion inhibitor (orthophosphate) to reduce leaching of lead
- Significant reduction of other metals due to:
 - Industries/businesses moving out of NYC or going out of business (currently, industries contribute less than 3% of the metals to the plant influent citywide)
 - Majority of metals in plant influent are from plumbing pipes/ fixtures
- Regulates discharge from 9 Significant Industrial Users in Red Hook and Owls Head drainage areas

Gowanus Canal Conservancy and dlandstudios' Designs

- Combination of federal, state, and city funding
- Located at end of 2nd Street along eastern edge of the Canal
- Rectangular planting beds approximately 28 ft by 40 ft to manage street runoff:
 - Runoff will be filtered by vegetation within swale or infiltrate through the open bottom of swale
 - Excess runoff is collected after passing through the swale and directed into the storm drain system
- Installations will be evaluated the potential for bio-filtration benefits



Ongoing Opportunities Analyses



Existing green infrastructure and publicly-owned properties within RH-034 and OH-007 drainage areas.

Additional Long Term Control Plan

Alternative	Flow Reduction (MG/Yr)	Present Worth Cost (Million Dollars)	Cost Estimate Basis	Notes
		Capital		
Second Avenue Pump Station	14	30	WWFP cost curves	Will be further evaluated during LTCP
Gowanus Wet Weather Pump Station	58	50	WWFP cost curves	Will be further evaluated during LTCP
OH-007 sediment trap cleaning and structural evaluation	NA	0.75	Planning level cost estimate	<ul style="list-style-type: none"> • Clean requires confined space entry, construction of bulkheads and is beyond the scope of DEP's sewer cleaning contracts. • Work must be handled through a capital contract requiring development of bid documents and contractor procurement.