Capital Project No. WP-169
Long Term Control Plan II

Combined Sewer Overflow Long Term Control Plan for Bronx River

Appendix D: Supplemental Documentation September 2015

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Department of Environmental Protection
Bureau of Wastewater Treatment

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1. INTRODUCTION

1. Purpose

This Supplemental Documentation contains the New York City Department of Environmental Protection's (DEP's) responses to the New York State Department of Environmental Conservation's (DEC's) comment letter, dated August 24, 2015, on DEP's June 2015 Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) for the Bronx River. This Supplemental Documentation is now made part of the referenced LTCP as Appendix D.

As so supplemented, the LTCP sets forth DEP's plans for managing CSO discharges into the Bronx River and its findings and recommendations to further improve water quality in the River.

2. RESPONSE TO COMMENTS

DEC COMMENT No. 1:
Westchester County Water Quality Data. For all of the figures, such as Figures ES-3, ES-4, etc. that present the water quality monitoring data, include the data from sampling location BR-0 as well to provide a better indication of the upstream water quality conditions.

DEP Response:
The original receiving water quality sampling program for the Bronx River consisted of Stations BR-1 through BR-9, and included four 3-day, twice/day wet-weather events and four 1-day, twice/day dry-weather events. Sampling at these stations occurred from May 17, 2014 through July 17, 2014. The purpose of the sampling was to characterize the water quality during both wet- and dry-weather, and to provide data that could be used to calibrate the water quality model.

During the sampling program, it was determined that additional data would better characterize dry- and wet-weather water quality conditions entering NYC from Westchester County. Accordingly, bi-weekly sampling was added at Stations BR-1 and BR-0 beginning June 6, 2014, and on July 25, 2014, respectively. The bi-weekly sampling at each location ran through September 19, 2014. The bi-weekly samples were taken regardless of the weather, but the data were categorized as taken from either a dry- or wet-weather period. Thus, the bi-weekly data provided a more general characterization of water quality coming from Westchester County, while the original sampling program provided a more targeted assessment of the time-varying response to wet-weather conditions, with an emphasis on capturing peak flows and concentrations.

Because of the differences between the way the bi-weekly and original sampling was done, the data for the two programs is not directly comparable. For example, data from the original program include peak concentrations measured on the day after each storm at each sampling station. The bi-weekly wet-weather data could have been collected any time within the window qualifying as a "wet-weather" sample, and would not necessarily include the higher concentrations typically associated with sampling one day after a storm. Comparing the bi-weekly dry-weather data to the dry-weather data at the remaining stations is also difficult because the collection periods for the most part do not overlap. For these reasons, the bi-weekly data for Stations BR-0 and BR-1 will not be added to the box plots in Figures ES-3 and ES-4, or to the corresponding figures in the body of the report. However, to address DEC's comment, new figures will be provided that show the bi-weekly sampling data from Stations BR-0 and BR-1 in box-plot format (see figures below). The geometric means of the bi-weekly data are currently shown in tabular format in Table 2-19.

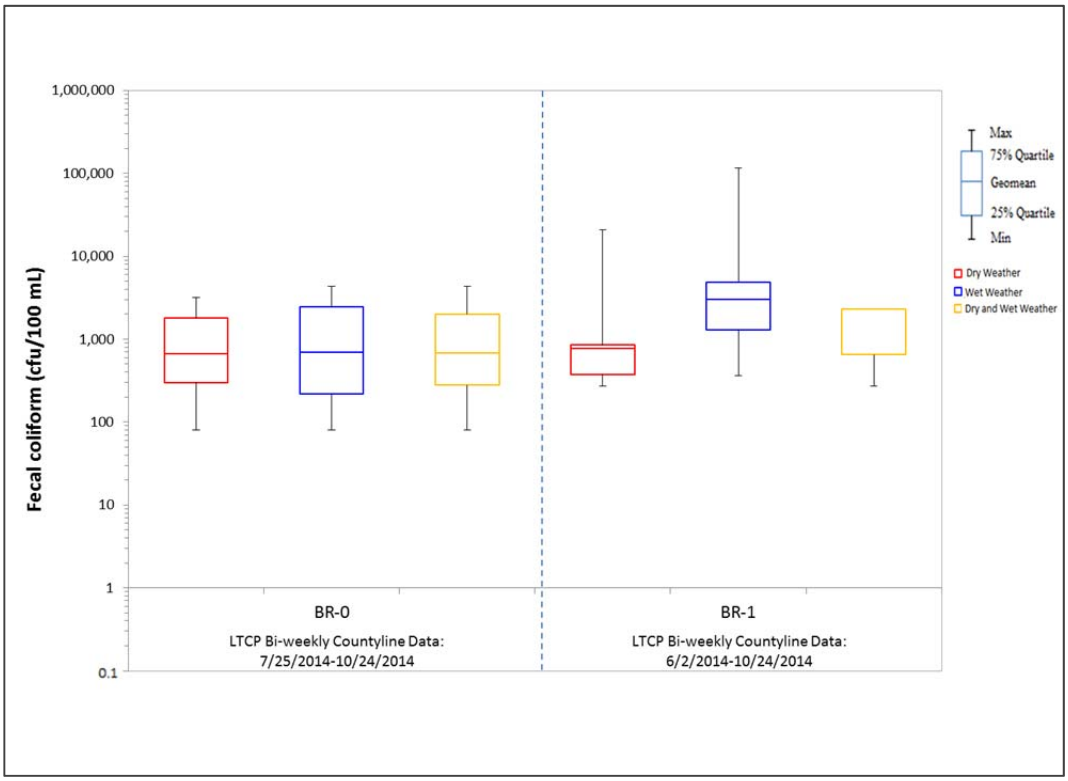

Figure 1. Fecal Coliform Bi-weekly County Line Data

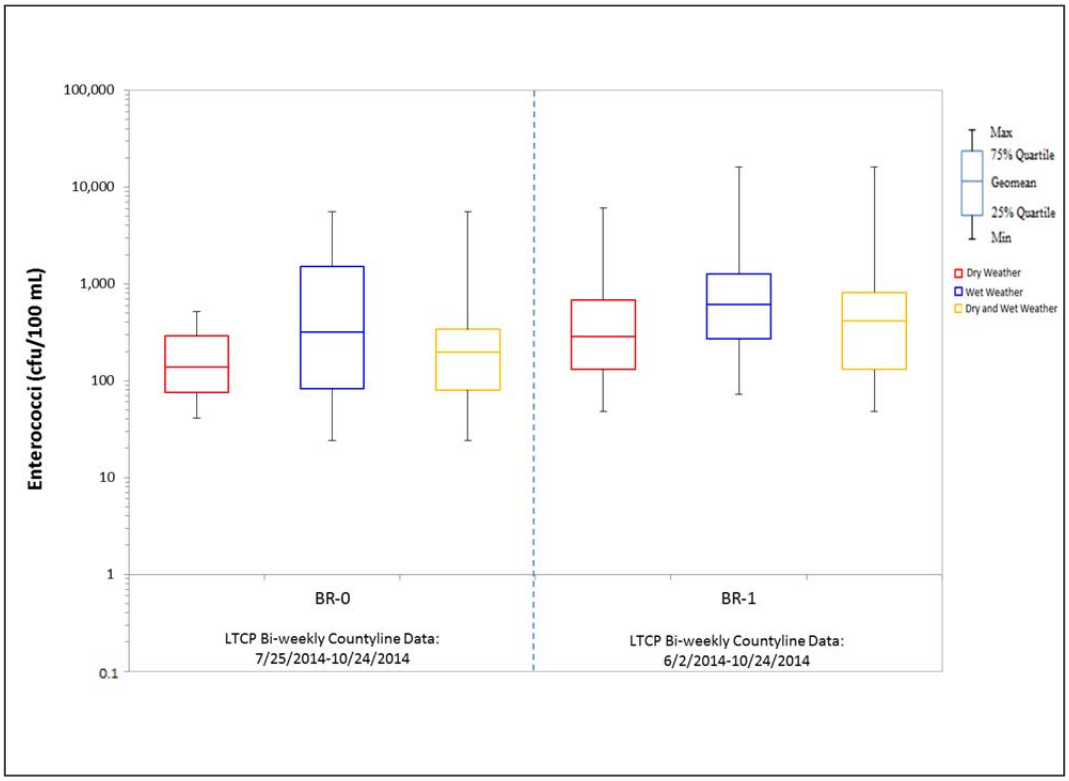

Figure 2. Enterococci Bi-weekly County Line Data

DEC COMMENT No. 2:
Sediment Removal. The LTCP indicated that the City has conducted some sediment removal in the Bronx River watershed. However, this removal appears to be minimal. During construction of the Bronx River floatables project, significant amount of sediments (>4ft) were found in the CSO-29A regulator and it is possible that similar conditions exist elsewhere in the sewershed. Thus, the Department encourages the City to expand their sewer investigation and cleaning efforts in the sewershed.

DEP Response:
Regulator CSO-29A is located in the Westchester Creek sewershed, and is not hydraulically related to the Bronx River sewershed, except through the connections to the interceptor system at the far downstream ends of each sewershed. DEP asks whether DEC intended to reference regulator CSO-27A, which is associated with outfall HP-007 in the Bronx River. DEP is investigating any history of sediment issues that may have been noted at regulator CSO-27A, and will consider the findings of this investigation in assessing whether further action on sewer investigation or cleaning may be warranted.

Regardless of those findings, DEP's practice has been to include a unit-price item for sewer cleaning in the CSO project specifications whenever work is being performed in the collection system. For the Bronx River, the recommended plan has several elements that will require working in the collection system, including the two proposed relief sewers, the raising of the weir at Regulator 13 and floatables control at Regulator 5. These construction contracts will include provisions for any sewer cleaning that may be necessary in these work areas.

DEC COMMENT No. 3:
Stormwater Pollutant Concentrations. The LTCP states that stormwater water quality monitoring data collected in 2014 was used in conjunction with data from previous sampling events, including data from the early 1990s, to develop the stormwater pollutant concentrations. The Department supports these efforts to use more recent data for updating their models for the LTCPs, however, it is not clear the extent to which the new data will be used. For example, the fecal coliform data for the Bronx River obtained in 2014 indicate a geomean ranging from about 19,000 cfu/100mL to 86,000 cfu/100mL, yet the stormwater pollutant concentration for stormwater used in the LTCP model is 120,000 cfu/100mL, which is notably higher than the recent data. In the interests of transparency, the City must update its 2005 Technical Memorandum, related to stormwater pollutant concentrations and submit for review, so that the Department can better understand how the recent data is being utilized.

DEP Response:
Stormwater data were collected at three locations: HP-627, HP-608-1 and HP-608-3. The calculated maximum likelihood estimator (MLE) fecal coliform concentrations for the three locations were 89,800 cfu/100mL, 27,800 cfu/100mL, and 85,600 cfu/100mL, respectively. Because HP-608-1 and HP-608-3 had different concentrations and insufficient information existed to determine the drainage area of each pipe, a conservatively high concentration of 90,000 cfu/100mL was assigned to HP-608 based on

HP-608-3, as shown in Table 6-1. Due to the relatively small contribution of MS4 area in the Bronx River, the model is fairly insensitive to the concentrations assigned to stormwater (MS4). The existing understanding of the Bronx River drainage area is that the majority of the area is more representative of direct drainage due to the large areas covered by the cemeteries and parks.

It should be clarified that the fecal coliform concentration of 120,000 cfu/100mL was used only for the stormwater fraction of the mass balance approach used for CSOs when data were not available to assign Monte Carlo concentrations. CSOs for which the mass balance approach was used represent less than 10 percent of the annual CSO volume. The concentration of 120,000 cfu/100mL was used for the stormwater fraction of the CSO because it is believed that representative data collected is insufficient to modify the previously used concentrations from the HydroQual (2005) Memorandum.

With respect to updating the 2005 memo, DEP offers the following:

To date, DEP has collected samples of stormwater under the LTCP program as follows:

- *4 locations in Coney Island Creek watershed*
- *2 locations in the Bronx River watershed*
- *2 locations in the Hutchinson River watershed*
- *3 locations in the Alley Creek watershed*

Of this total of 11 locations, three are fairly limited in their use for re-assessment of the stormwater concentrations (Oakland Lake outlet-Alley Creek, Cope Lake-Bronx River, HP-627 Bronx River). The remaining eight locations can be combined with the information in the 2005 memo to re-evaluate stormwater runoff pathogen concentrations within NYC in association with their site specific watershed characteristics. DEP has begun this re-evaluation and expects to complete it within six months.

In addition, as part of the LTCP work, stormwater sampling will be performed within the Newtown Creek area at two locations and Jamaica Bay at one location during 2015/2016. No additional stormwater sampling is planned for the Harlem River or City-Wide LTCPs. As a part of the MS4 Permit, a monitoring and assessment plan that will provide additional stormwater data will be developed.

Although DEP will initiate the re-evaluation of the stormwater concentrations based on the data presently available, it believes that MS4 permit monitoring assessment plan requirements will be more comprehensive to represent stormwater data and will be developed according to the MS4 permit deadlines. Future LTCPs (Flushing Bay, Coney Island Creek, Newtown Creek and Jamaica Bay) would rely on site-specific data collected as part of the LTCP and the 2005 memorandum, as needed. Should the results of the evaluation to be completed at the end of 2015 prove useful, those results could be incorporated into the corresponding LTCPs.

DEC COMMENT No. 4:
Potential Illicit Discharges. The LTCP states that stormwater Outfall HP-608 had dry-weather discharges (originating from Cope Lake) with somewhat elevated bacterial contamination which has the potential to impact the water quality of the lower freshwater section of the Bronx River. The Department requests that the City conduct additional site investigations, per its MS4 SPDES permit, Part iV.D.4, to determine if illicit discharges are contributing to high pollutant concentrations.

DEP Response:
The dry-weather sampling data from the outlet to Cope Lake are presented in the table below. The geometric means shown provide the basis of the assumed concentrations of enterococcus and fecal coliform bacteria for the Cope Lake discharge of 100 and 500 cfu/100mL, respectively, which were presented in Table 6-1. While these concentrations are somewhat elevated, they are still significantly lower than dry-weather concentrations observed in other locations where illicit connections were determined to exist. Available mapping showed a single localized storm drain discharging into the western end of Cope Lake with no apparent potential sources of illicit connections in the vicinity (see Figure 3 below). However, a significant wildlife presence has been observed (see Figure 4 below). Flow monitoring indicated that the dry-weather outflow from Cope Lake was a relatively constant 1.1 MGD. The only known source of dry-weather flow into the lake is supplied with water from a pinched 2-inch DEP pipe, but that pipe would account for only a small percentage of the observed flow. DEP investigated the area for water main leaks, but found none.. Groundwater could also be a contributing source of dry-weather flow. Based on the available data, the somewhat elevated bacteria concentrations observed in dry-weather appear most likely to be caused by the observed wildlife, as opposed to any illicit sanitary connection(s).

Table 1. Cope Lake Sampling Data

Date	Enterococcus cfu/100mL	Fecal Coliform cfu/100mL
6/20/2014	56	390
	38	290
7/11/2014	36	700
	41	300
7/23/2014	210	1,300
	220	1,500
8/12/2014	270	19
	300	550
8/19/2014	47	1,180
	161	1,550
Geomean	99	495

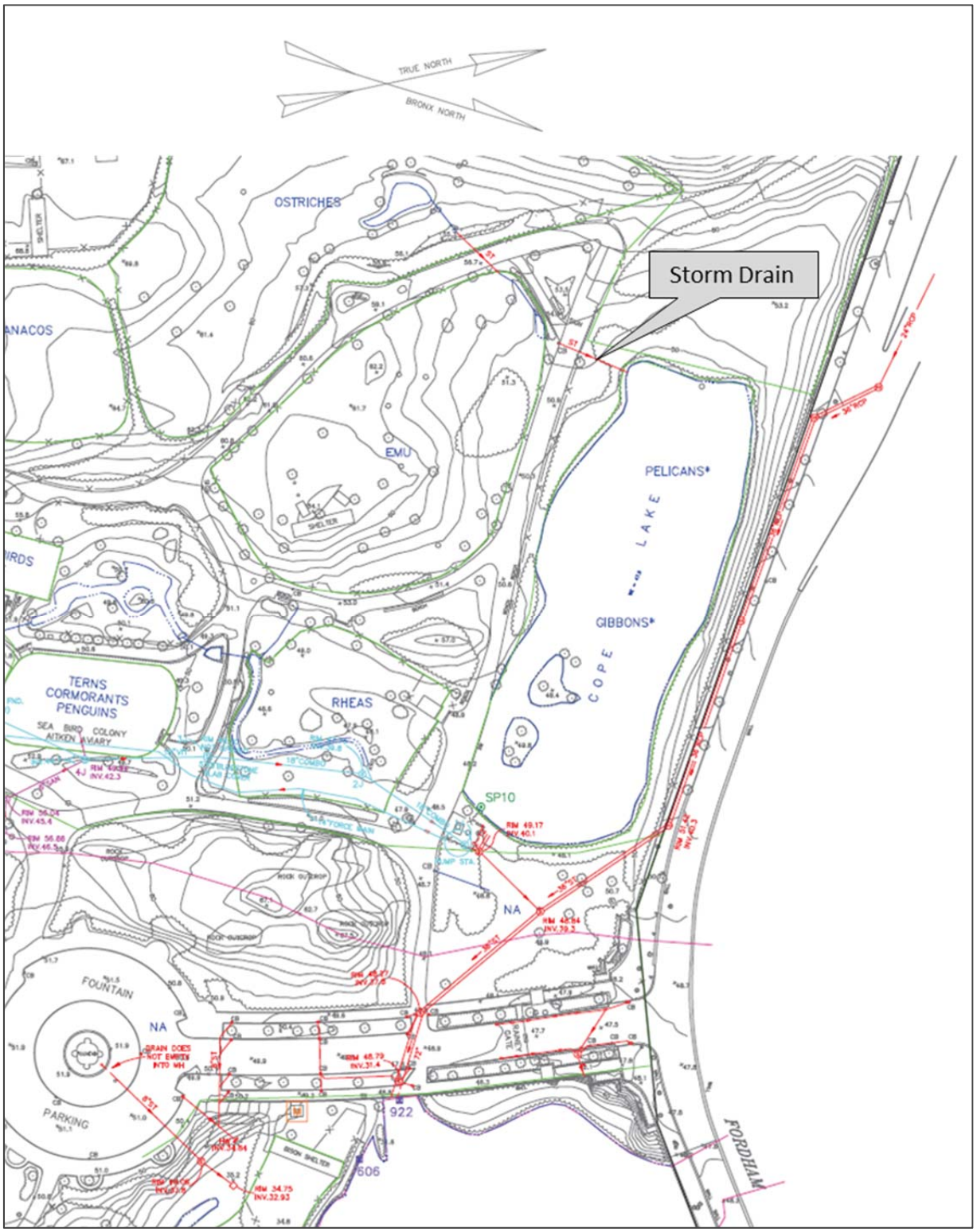

Figure 3. Excerpt from the "Topographic Map Prepared for the Wildlife Conservation Society Bronx Zoo". Dated December 11, 2000

Figure 4. Photos of Geese and Ducks on Cope Lake, August 2015

DEC COMMENT No. 5:
Floatables Control. The LTCP does not provide much discussion on the levels of floatables that exist in the Bronx River at present. Although the City has constructed floatable control at three of the CSO outfalls on the waterbody, additional information from the floatable annual survey, as well as the quantity of floatable removed from the boom and netting facilities, could be used to determine if there continues to be a floatable problem in the Bronx River. Thus, LTCP must expand on the floatable discussion.

DEP Response:
Existing floatables control facilities are briefly described in Section 4.2 of the LTCP. Floatables control for the Bronx River is also mentioned in the context of screening of alternatives, in the first paragraph following the bullet list on page 8-7. The first sentence of that paragraph reads: "Floatables control, while currently implemented at the major Bronx River outfalls, remained for consideration at Outfall HP-011, which discharges to the East River." The following expanded discussion of floatables control will replace that sentence:

As noted in Section 4.2, existing floatables control facilities at the regulators associated with Outfalls HP-004, HP-007 and HP-009 have been in operation since October 2012. Because these three outfalls account for over 99 percent of the average annual CSO volume discharged to the Bronx River, most of the CSO volume to the River is receiving floatables control. At Diversion Structures 27 and 27A, associated with Outfall HP-007, floatables control is provided by horizontal mechanical screens. Floatables that are retained by the screens remain in the combined sewer, so quantification of floatables captured at those locations is not possible. At the netting facilities (HP-004 and HP-009), DEP staff have reported that, on average, the nets are changed once per month, with an average of about 60 nets replaced per year. Over a three-year period, 230 tons of floatables have been removed by the netting facilities. In the fall, leaves are reported to constitute a significant percentage of the floatables volume captured. Figure 5 shows one of the nets being removed.

Figure 5. Net with Captured Floatables from Bronx River Floatables Control Facility

The data from the netting facilities indicate that the facilities have been effective in capturing floatables that would otherwise have been discharged to the Bronx River.

A floatables containment boom spanning the River is located adjacent to Concrete Plant

Park, downstream of Outfalls HP-004 and HP-007, and upstream of Outfall HP-009. Floatables captured by the containment boom are removed using a skimmer vessel. Based on data from the Annual SPDES BMP Reports, the annual floatables yield from the Bronx River containment boom in cubic yards from 2005 to 2014 is presented in Figure 6.

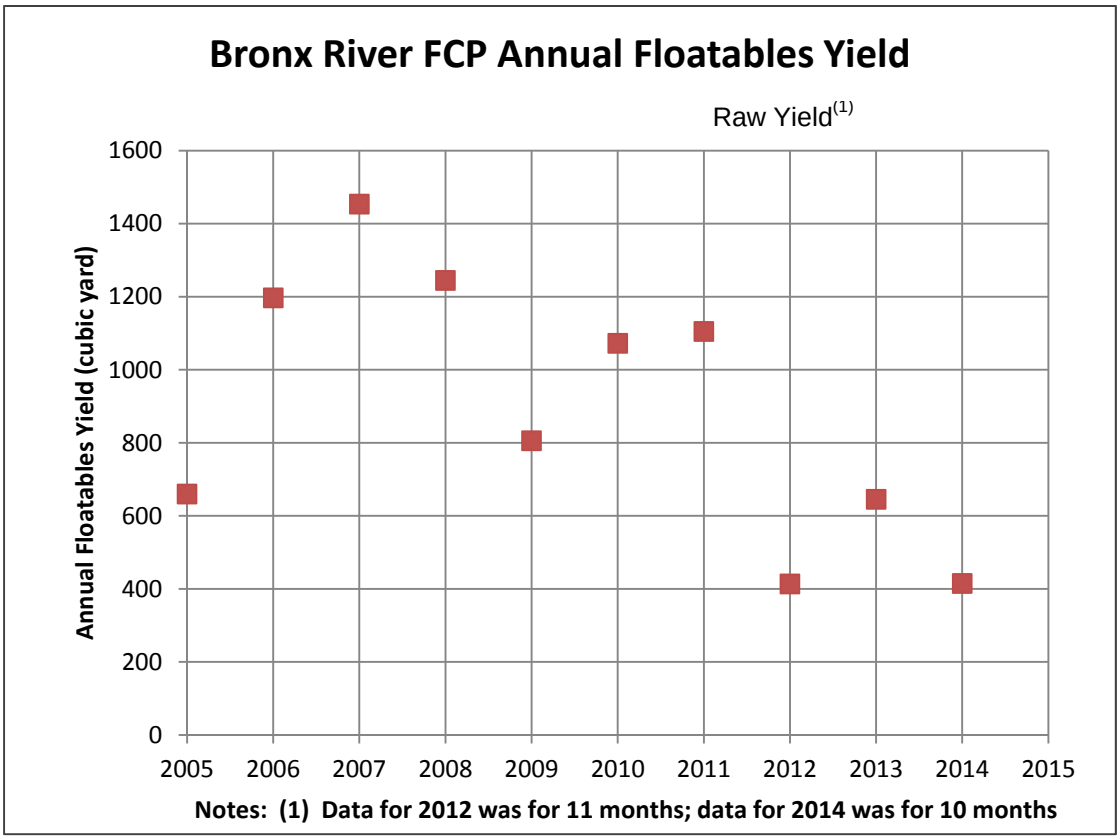

Figure 6. Annual Floatables Yield at Bronx River Containment Boom

Figure 7 presents images of the material captured at the Bronx River containment boom. As indicated in the figure, the bulk of the material is branches and other natural materials.

The data from the Bronx River containment boom show a decreasing trend in floatable material captured by the boom. However, visual observation of the material captured by the containment boom indicates that much of the captured material appears to be branches, sticks, leaves, and other natural materials. The containment boom would also capture floatables from separate storm drain outfalls and overland direct drainage, as well as materials originating further upstream in Westchester County.

Another measure of the aesthetic conditions in the waterways related to floatables is provided in DEP's Annual Floatables Monitoring Program Progress Reports. For the Bronx River, data were obtained from the reports for monitoring Station BR-5, from 2011 to 2014. Conditions were recorded at that site for "Open Water", "Near Shore", and "Shoreline". As indicated in Table 2, for the Open Water and Near Shore categories at Station BR-5, between 81 and 100 percent of the observations fell into the Very Good or Good classifications. For the Shoreline category, half of the observations over the four years fell into the Very Good or Good classifications. As noted above, floatables from separate storm drain outfalls and overland direct drainage, as well as materials originating further upstream in Westchester County could be contributing to the floatables observed on the shoreline. The remaining CSO volume to the Bronx River that is not receiving floatables control via nets or mechanical screens is a very small percentage of the total river flow and stormwater flow tributary to the Bronx River. Accordingly, further CSO floatables control measures were not developed for the Bronx River.

Figure 7. Material Captured from Bronx River Containment Boom

Table 2. Summary of Annual Floatables Monitoring Program Data for Bronx River Site BR-5

		Number of Observations By Classification by Year			
Location	**Classification**	**2014**	**2013**	**2012**	**2011**
BR-5 Open Water	Very Good	15	17	19	14
	Good	5	5	6	6
	Fair	0	3	1	1
	Poor	1	2	1	0
	Very Poor	0	0	0	0
	Total Observations	21	27	27	21
	Percent Very Good/Good	95%	81%	93%	95%
BR-5 Near Shore	Very Good	15	19	18	15
	Good	3	3	8	6
	Fair	3	2	0	0
	Poor	0	3	1	0
	Very Poor	0	0	0	0
	Total Observations	21	27	27	21
	Percent Very Good/Good	86%	81%	96%	100%
BR-5 Shoreline	Very Good	5	1	4	5
	Good	9	8	11	4
	Fair	4	6	6	6
	Poor	3	6	3	5
	Very Poor	0	5	3	0
	Total Observations	21	26	27	20
	Percent Very Good/Good	67%	35%	56%	45%

DEC COMMENT No. 6:
Green Infrastructure. The discussion on GI appears to under-report the progress that OGI has made overall and specifically in this watershed. The LTCP must include an up-to-date look at contracts in place and future plans towards their goal of GI application.

DEP Response:
The table below outlines the proposed revisions to Section 5.

Page No.	Language
5-1	The 2012 CSO Order on Consent requires DEP to control the equivalent of stormwater generated by one inch of precipitation on 1.5 percent of impervious surfaces in combined areas citywide by December 31, 2015. If DEP fails to attain the initial citywide GI application rate of 1.5 percent and associated CSO volume reduction by December 31, 2015, DEP must certify that $187M has been encumbered for the purpose of GI and submit an approvable contingency plan to the DEC by June 30, 2016. As stated in the 2nd Quarter 2015 report, DEP expects to meet the 1.5 percent milestone by the end of 2016 (rather than 2015), and therefore is developing a contingency plan in accordance with the Order. Additionally, DEP has encumbered more than $187M for green infrastructure implementation on a citywide basis.
5-1, 5-2	The OGI has developed design standards for Right-of-Way GI Practices, such as Bioswales (ROWBs), Stormwater Greenstreets (SGSs), and Rain Gardens (ROWRGs), and ~~has designed other projects on~~ is developing additional GI standards in response to unusual field conditions and restrictions. New standards include the Right-of-Way Infiltration Basin, Green Strip, and Porous Pavement. The OGI is also developing on-site GI standards to retrofit NYC-owned properties. These standards ~~that~~ include ~~pervious pavement, rain gardens, retention/detention~~ Porous Pavement, Rain Gardens, Retention systems, and Synthetic Turf. ~~and green and blue roofs. The Area-wide implementation strategy and other implementation details initiated by OGI to achieve the milestones in the 2012 CSO Order on Consent are described in more detail below, and in the 2012 and 2013 *Green Infrastructure Annual Report*, available on DEP's website.~~
5-2	As is expressly provided in the Order, DEP employs adaptive management principles in the implementation of the Green Infrastructure Program, which allows for factoring-in field conditions, costs, and other challenges as it proceeds toward each milestone. DEP is in the process of identifying additional Area-wide GI contracts for implementation.

Page No.	Language
5-2	DEP manages several of its own design and construction contracts for right-of-way and on-site GI practices. Additionally, the New York City Economic Development Corporation (EDC), DPR, and Department of Design and Construction (DDC) manage the design and construction of several of these Area-wide contracts ~~on behalf of~~ in conjunction with DEP. Presently, DEP has 42 active Area-wide GI contracts, 17 of which are in construction. DEP has constructed 308 GI Practices to date, and has another 2,412 GI Practices in construction.
5-5, 5-6	**5.3.b Public Projects** ~~***Green Infrastructure Schoolyards***~~ In coordination with City agency and non-profit partners, DEP continues to identify, design and construct public-property GI retrofit projects. To date, DEP has identified 80 parks, 44 schools, and 20 public housing developments for GI retrofit feasibility analysis and preliminary design. See the Green Infrastructure Annual Reports, "Citywide Coordination and Implementation," for detailed information on the site selection and design process for public property retrofit projects. The "Schoolyards to Playgrounds" program, one of PlaNYC 2030's initiatives aimed at ensuring that all New Yorkers live within a ten-minute walk from a park, is a collaboration between the non-profit Trust for Public Land (TPL), DPR, New York City Department of Education (DOE), and New York City School Construction Authority (SCA) to renovate public school playgrounds and extend playground access to surrounding neighborhoods. In 2011, DEP joined TPL, SCA, and DOE funding up to $5M for construction of up to ten GI schoolyards each year for the next four years. The partnership is a successful component of DEP's strategy to leverage public-private partnerships to improve public property using GI retrofits. Six projects have been completed to date. The partnership continues to identify new sites for analysis and design. ~~See the Green Infrastructure Annual Reports, "Citywide Coordination and Implementation," for up-to-date information on completed public property retrofit projects.~~

DEC COMMENT No. 7:
Dissolved Oxygen Standards. In various sections of the LTCP, the City incorrectly refers to the Class I/SC dissolved oxygen standards as "primary contact recreation" standards. The D.O. standards are not related to contact recreation, they are associated with supporting aquatic species, either for survival or propagation, and may include single "never less than" standards or acute and chronic standards. As such, any reference to dissolved oxygen standards must be revised to clarify they are not related to contact recreation.

DEP Response:
The table below outlines the proposed revisions associated with references to the Dissolved Oxygen standards.

Type	Language
Executive Summary Page ES-3	The bacteria criteria assessed in this LTCP include the Existing WQ Criteria (Class I – secondary contact recreation) for the Bronx River, and Class SC - limited primary contact recreation.
Section 6 Page 6-1	Continuous water quality simulations were performed to evaluate the gap between the calculated baseline bacteria and DO levels and both the Existing WQ Criteria and the Potential Future Primary Contact WQ Criteria for bacteria/Class SC/SB DO Criteria. As detailed below, a one-year simulation using 2008 JFK Airport rainfall was performed for bacteria and DO. This simulation served as a basis for evaluating of the control alternatives presented in Section 8.0.

Type	Language
Section 6 Page 6-10	The Bronx River portion of the ERTM model was used to simulate bacteria and DO concentrations for the baseline conditions using 2008 rainfall and tidal data. Hourly model calculations were saved for post-processing and comparison with the Existing WQ Criteria, Primary Contact Criteria and the Potential Future Primary Contact WQ Criteria for bacteria, as well as designated and next higher use classifications for DO, as discussed in Section 6.3.c. The performance gap was then developed as the difference between the model-calculated baseline waterbody DO and bacteria concentrations and the applicable numerical WQS. The analysis is developed to address the following three sets of criteria: • Existing WQ Criteria (Freshwater - Class B, Saline water – Class I); • Bacteria Primary Contact WQ Criteria (Freshwater - Class B, Saline water – Class SC) and DO next higher use classification; and • Bacteria Potential Future Primary Contact Recreational WQ Criteria (2012 EPA RWQC).
Section 6 Page 6-15	The attainment of the DO Class SC criteria for the entire water column is presented in Table 6-10, respectively, for the baseline and 100% Bronx River CSO control conditions. The attainment of ~~the Primary Contact WQ Criteria~~ Class SC is quite high when considering the entire water column. Stations BR-6 through BR-9 remain below the desired 95 percent attainment target, but are close as they range from 92 to 94 percent attainment with the chronic criterion. All of the stations have higher than 95 percent of the acute criterion based on the entire water column. 100% CSO control does not result in significant improvements in attainment of the Class SC criterion, and as such does not close the gap between attainment and non-attainment.
Section 8 Page 8-57	The dissolved oxygen attainment of the chronic Class SC/SB DO standard (daily average ≥ 4.8 mg/L) is calculated to range between 92 and 94 percent at Stations BR-6 through BR-9.

Table ES-1. Classifications and Standards Applied

Analysis	Numerical Criteria Applied	
Existing WQ Criteria	Freshwater (Class B)	Fecal Monthly GM ≤ 200; Daily Average DO ≥ 5.0 mg/L; DO never < 4.0 mg/L
	Saline Water (Class I)	Fecal Monthly GM ≤ 2,000 DO never <4.0 mg/L
Bacteria Primary Contact WQ Criteria(1) / DO Class SC/SB	Freshwater (Class B)	Fecal Monthly GM ≤ 200 Daily Average DO ≥ 5.0 mg/L; DO never < 4.0 mg/L
	Saline Water (Class SC)	Fecal Monthly GM ≤ 200 Daily Average DO ≥ 4.8 mg/L; DO never < 3.0 mg/L
Potential Future Primary Contact WQ Criteria(2)	Entero: rolling 30-d GM – 30 cfu/100mL Entero: STV – 110 cfu/100mL	

Notes:

GM = Geometric Mean; STV = 90 Percent Statistical Threshold Value

(1) This water quality standard is not currently assigned to the saline Bronx River.

(2) The Potential Future Primary Contact WQ Criteria have not yet been adopted by DEC.

Table ES-15. Model Calculated 2008 Preferred Alternative DO Attainment of ~~Primary Contact~~ Class SC/SB WQ Criteria

Station		DO Annual Attainment % Attainment (Water Column)	
		Preferred Alternative	
		≥ 4.8 mg/L	≥ 3.0 mg/L
BR-5	Saline	100	100
BR-6		92	97
BR-7		94	99
BR-8		94	100
BR-9		93	100

Table 6-4. Classifications and Standards Applied

Analysis	Numerical Criteria Applied	
Existing WQ Criteria	Freshwater (Class B)	Fecal Monthly GM ≤ 200; Daily Average DO ≥ 5.0 mg/L; DO never < 4.0 mg/L
	Saline Water (Class I)	Fecal Monthly GM ≤ 2,000 DO never <4.0 mg/L
Bacteria Primary Contact WQ Criteria(1) / DO Class SC/SB	Freshwater (Class B)	Fecal Monthly GM ≤ 200 Daily Average DO ≥ 5.0 mg/L; DO never < 4.0 mg/L
	Saline Water (Class SC)	Fecal Monthly GM ≤ 200 Daily Average DO ≥ 4.8 mg/L; DO never < 3.0 mg/L
Potential Future Primary Contact WQ Criteria(2)	Entero: rolling 30-d GM – 30 cfu/100mL Entero: STV – 110 cfu/100mL	

Notes:
GM = Geometric Mean; STV = 90 Percent Statistical Threshold Value
(1) This water quality standard is not currently assigned to the saline Bronx River.
(2) DEC has not yet adopted the Potential Future Primary Contact WQ Criteria.

Table 6-10. Model Calculated 2008 Baseline and 100% CSO Control DO Attainment of ~~Primary Contact~~ Class SC/SB WQ Criteria

Station		Annual Attainment Percent Attainment (Water Column)			
		Baseline		100% Bronx River CSO Control	
		≥ 4.8 mg/L	≥ 3.0 mg/L	≥ 4.8 mg/L	≥ 3.0 mg/L
BR-5	Saline (Class SC)	100	100	100	100
BR-6		92	97	93	97
BR-7		94	99	94	99
BR-8		94	100	94	100
BR-9		93	100	93	100

Table 8-22. Model Calculated 2008 Preferred Alternative DO Attainment of ~~Primary Contact WQ~~ Class SC/SB DO Criteria

Station		DO Annual % Attainment (Water Column)	
		Preferred Alternative	
		≥ 4.8 mg/L	≥ 3.0 mg/L
BR-5	Saline	100	100
BR-6		92	97
BR-7		94	99
BR-8		94	100
BR-9		93	100

DEC COMMENT No. 8:
Typo. The geomean values for fecal coliform for sampling locations BR-7 and BR-8 in Tables 6-5 and 6-13 appear to have been transposed.

DEP Response:
The values shown in Table 6-5 are accurate. The values in Tables 6-13 should be revised according to the table below.

Table 6-13. Fecal and Enterococci GM Source Components

Source	Station	Fecal Coliform Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)
		Annual Worst Month February Monthly GM	Max(1) 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)
Bronx River at County Line	BR-1	85	30
NYC Freshwater Non-CSO	BR-1	0	0
NYC Saline Non-CSO	BR-1	0	0
CSO	BR-1	0	0
East River	BR-1	0	0
Total	BR-1	**85**	**30**
Bronx River at County Line	BR-2	85	30
NYC Freshwater Non-CSO	BR-2	0	0
NYC Saline Non-CSO	BR-2	0	0
CSO	BR-2	0	0
East River	BR-2	0	0
Total	BR-2	**85**	**30**
Bronx River at County Line	BR-3	84	29
NYC Freshwater Non-CSO	BR-3	12	4
NYC Saline Non-CSO	BR-3	0	0
CSO	BR-3	0	0
East River	BR-3	0	0
Total	BR-3	**96**	**33**

Source	Station	Fecal Coliform Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)
		Annual Worst Month February Monthly GM	Max[(1)] 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)
Bronx River at County Line	BR-4	74	25
NYC Freshwater Non-CSO	BR-4	86	44
NYC Saline Non-CSO	BR-4	0	0
CSO	BR-4	0	0
East River	BR-4	0	0
Total	BR-4	**160**	**69**
Bronx River at County Line	BR-5	80	24
NYC Freshwater Non-CSO	BR-5	83	34
NYC Saline Non-CSO	BR-5	0	0
CSO	BR-5	8	2
East River	BR-5	44	1
Total	BR-5	**215**	**61**
Bronx River at County Line	BR-6	64	9
NYC Freshwater Non-CSO	BR-6	21	2
NYC Saline Non-CSO	BR-6	6	1
CSO	BR-6	82	5
East River	BR-6	266	4
Total	BR-6	**439**	**21**
Bronx River at County Line	BR-7	40	7
NYC Freshwater Non-CSO	BR-7	10	1
NYC Saline Non-CSO	BR-7	19 ~~24~~	2
CSO	BR-7	87 ~~96~~	5
East River	BR-7	250 ~~212~~	5
Total	BR-7	**406 ~~382~~**	**20**
Bronx River at County Line	BR-8	19	4
NYC Freshwater Non-CSO	BR-8	3	0
NYC Saline Non-CSO	BR-8	24 ~~18~~	3
CSO	BR-8	96 ~~87~~	7
East River	BR-8	240 ~~279~~	7
Total	BR-8	**382 ~~406~~**	**21**

Source	Station	Fecal Coliform Contribution (cfu/100mL)	Enterococcus Contribution (cfu/100mL)
		Annual Worst Month February Monthly GM	Max(1) 30-Day Rolling GM during the Recreational Season (May 1st through October 31st)
Bronx River at County Line	BR-9	3	1
NYC Freshwater Non-CSO	BR-9	0	0
NYC Saline Non-CSO	BR-9	1	0
CSO	BR-9	12	1
East River	BR-9	226	10
Total	BR-9	**242**	**12**

Notes:
(1) Based on the 30-day period with the maximum CSO contribution to the GM.

DEC COMMENT No. 9:
Evaluation of Alternatives

a) Page 8-14 refers to "rock" as a possible challenge for the construction of the hydraulic relief alternatives for CSO Outfalls HP-007 and HP-009, but especially for HP-007 given that the relief sewer would run under the I-95/Bronx River Parkway and be located up to 50 feet below the surface. Confirm if the rock is bedrock and if so, that the cost estimates account for removal of large amount of bedrock. Provide any depth to bedrock information that were used during design feasibility study.

DEP Response:

According to the USGS Bedrock and Engineering Geologic Maps of Bronx County and Parts of New York and Queens Counties, New York (1992), bedrock elevation in the project area is relatively uniform at about +7.4 feet Bronx Sewer Datum (BSD). Depth to bedrock from the existing grade is likely to be less than 10 feet for the relief sewer alignment at HP-009 and ranging from 10 to 40 feet below grade at HP-007, according to available geological data. This information was known during the design feasibility study and accounted for in the Class 5 cost estimate.

b) Confirm if there are any impacts to CSO outfalls in the Westchester Creek or Hutchinson River sewershed due to the selected alternative for the Bronx River.

DEP Response:
Table 8-10 presented the predicted change in CSO volume in the Bronx River and in outfalls outside of the Bronx River associated with the short-listed CSO control alternatives. The Preferred Alternative for the Bronx River, shown in the second row of Table 8-10 ("Outfall HP-007 Relief + Outfall HP-009 Relief") was predicted to result in a 0.2-percent increase in CSO volume at "All Other HP CSO Outfalls" (note that this alternative, as with all alternatives in Table 8-10, included the underflow baffle and bending weir at Outfall HP-011). The "All Other HP CSO Outfalls" column included the outfalls to the Hutchinson River and Westchester Creek, as well as other outfalls to the East River not specifically included in other columns in the table. Breaking the "All Other HP CSO Outfalls" column down further for the Hutchinson River and Westchester Creek CSOs specifically, the following changes in CSO volume were predicted:

Hutchinson River: No changes to any of the outfalls

Westchester Creek:
HP-012: Increase by 1.0 MG
HP-013: Increase by 1.5 MG
HP-014: No change
HP-015: No change
HP-016: No change
HP-033: Increase by 0.1 MG

The total predicted increase to Westchester Creek of 2.6 MG represents less than one percent of the baseline annual volume of 285 MG. This nominal change in predicted annual CSO volume would not have a measurable impact on attainment of water quality standards in Westchester Creek.

c) The GI commitments were included in the "summary of recommendations" but not in the "Recommended LTCP Elements to meet water quality standards" Section 8.8. Please reconcile this inconsistency.

DEP Response:
The first paragraph in Section 8.8 will be revised as follows:

Water quality in Bronx River will be improved with the preferred alternative and other actions identified herein.

The actions identified in this LTCP include:

- *A 2,700-ft. relief pipe at Relief Structure 27 to reduce CSO discharges at Outfall HP-007.*
- *Raising a weir at Regulator 13; adding a relief pipe between Regulator 13 and the Bronx River siphon to reduce CSO discharges at Outfall HP-009.*
- *Implementation of floatables control for Outfall HP-011 at Regulator 5 to reduce the quantities of floatables discharged to the East River.*
- *Costs for the recommended Alternative 2 are: NPV $111M, Construction $110M and O&M of $53,000.*
- *The LTCP includes a UAA that assesses compliance with Primary Contact WQ Criteria based on projected performance of the selected CSO controls.*
- *DEP will establish with the NYC Department of Health and Mental Hygiene (DOHMH) through public notification a wet-weather advisory during the recreational season (May 1st through October 31st) during which swimming and bathing would not be recommended in the Bronx River. The LTCP includes a recovery time analysis that can be used to establish the duration of the wet-weather advisory for public notification.*
- *DEP will continue to implement the Green Infrastructure Program.*

d) Provide a table summarizing the uncertainties associated with each cost estimate (e.g. -50 percent/ +100 percent for Class 5 estimates) for all retained alternatives.

DEP Response:

Section 8.1.b of the LTCP describes the cost estimates as Association for the Advancement of Cost Engineering (AACE) Class 5 estimates, and presents the AACE Class 5 accuracy range criteria of minus 20 to 50 percent to plus 30 to 100 percent. Table 8-18 summarizes the estimated probable bid cost, annual O&M cost, and total present worth of the retained alternatives. This table will be revised to include a column indicating the uncertainty range associated with the Class 5 estimates, as shown below.

Table 8-18. Cost of Retained Alternatives(1)

Alternative	PBC ($ Million)	Annual O&M Cost ($ Million)	Total Present Worth ($ Million)	Accuracy Range (AACE Class 5 Estimates)
1. Combination of former Alts. 7-4 and 9-1	59.1	0.38	65	-50% to +100%
2. Combination of former Alts. 7-1 and 9-1	110.1	0.05	111	-50% to +100%
3. Former Alt. 9-1	39.9	0.05	41	-50% to +100%
4. Combination of former Alts. 7-4 and 9-3	143.0	0.70	153	-50% to +100%
5. Combination of former Alts. 7-4 and 9-4	75.2	0.65	85	-50% to +100%
6. 75% CSO Control Tunnel	418.1	1.5	440	-50% to +100%
7. 100% CSO Control Tunnel	660.0	2.7	701	-50% to +100%

Notes:
(1) Includes $9M associated with the implementation of floatables control at CSO Outfall HP-011, on the East River.

e) Include an estimate of site acquisition costs for each alternative if available.

DEP Response:
Site acquisition costs were not developed for the Bronx River alternatives as part of the LTCP; therefore, those costs are not currently available.

f) For Alternative 5, provide additional discussion on the concerns voiced by the public, as well as the risk of storing chemicals and increase in heavy commercial traffic may be associated with the project. Also, describe any analysis or study the City has completed to evaluate potential impacts of disinfection on the oyster spat or bed.

DEP Response:
The third paragraph in Section 8.5.c will be revised as follows:

The LTCP alternatives were presented to the general public and stakeholders by DEP during the public participation process described in Section 7.0. During these public meetings, some commenters asserted that disinfection was a less desirable CSO control measure than those involving volumetric reduction. One of the stated reasons for this included the desire not to have chemicals stored in neighborhoods, requiring new facilities and result in additional heavy commercial traffic. For the disinfection

alternatives, the chemical to be stored would be sodium hypochlorite solution. This chemical would be delivered to the disinfection facility via a tanker truck. A hose from the truck would be connected to a fill pipe at the disinfection facility, and the sodium hypochlorite solution would be pumped into a storage tank inside the facility. The frequency of chemical delivery would depend on how often the disinfection facility activated, the size and length of the storms that caused the activations, and the size of the storage tank. No chemical deliveries would be anticipated during the non-recreational season (November 1st through April 30th), because the disinfection system would not be operated then. The only potential exception would be a delivery required immediately prior to the start of the recreational season (May 1st through October 31st). If dechlorination is required, separate deliveries of liquid sodium bisulfite solution would also be required.

The liquid chemical storage areas would include containment walls, so that if the storage tank failed, the contents of the tank would be contained within the containment area inside the chemical storage building.

Another commenter opposed the seasonal addition of a disinfectant to the Bronx River when nearly the same levels of annual equivalent loading reduction could be achieved through year-round volumetric control. In addition, the public noted that the Bronx River has an experimental in-stream bio-treatment pilot project consisting of oyster reefs at the mouth of the Bronx River. The oyster reefs, first noted in Section 2.0, constitute an area within the waterbody that may benefit from the year-round bacteria and CSO volume reduction alternative, whereas the seasonal disinfection alternative may have a negative impact on the oysters and/or on oyster spat.

The following text will be inserted into Section 8, in the discussion of Alternative 5 in Section 8.5.c:

Regarding the potential impact of chlorine residual on the oyster beds, the decomposition rate of NaOCl is pH dependent with a peak rate at pH 7, slightly below that of most estuarine receiving waters. In natural waters (fresh and saline), free chlorine is represented as hypochlorous acid and hypochlorite ion. If ammonia is present, monochloramine and dichloromine will be present. All four of these forms are toxic to aquatic/marine organisms. Additionally, in saline waters, the presence of bromine leads to the formation of oxidants such as hypobromous acid, hypobromous ion and bromamines, which are also toxic. Saline or marine invertebrates are more sensitive to chlorine oxidants derived from chloromine than sodium hypochlorite; the opposite is true for fishes (USEPA, 1985).

A number of bioassay studies have documented the potential for population level impacts of chlorine toxicity in estuarine and saline/marine fish and invertebrates, many of which are of recreational and commercial importance. Bellanca and Bailey (1977) performed extensive chlorine toxicity studies using several estuarine fish and shellfish species in

response to growing concerns over the effects of WWTP effluent on fisheries resources, including commercially harvested oyster reefs, in the James River sub-estuary of Chesapeake Bay. Bioassays using copepods, oyster larvae, and clam larvae indicated that these common estuarine plankters were highly sensitive to chlorine, with 48 hr Median Tolerance Limits (TLm) values of 0.005 mg/L (5 ug/L) or less. The results of these studies validated the presumption put forth by marine resource managers that even very low chlorine levels were potentially impacting oyster populations in the Chesapeake Bay region, as oyster larvae were shown to be sensitive to chlorine residual concentrations too low to be accurately measured (Bellanca and Bailey, 1977).

The information in the literature about the known relationships between low levels of chorine byproducts and their impacts on oyster larvae supported the decision not to recommend alternatives that involved discharge of disinfected CSO to the Bronx River.

References:

Bellanca, M.A. and D. S. Bailey. 1977. Effects of chlorinated effluents on aquatic ecosystem in the Lower James River. Journal of the Water Pollution Control Federation 49: 639-645.

USEPA. 1985. Ambient Water Quality Criteria for Chlorine – 1984. U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC. 20460EPA 440/5-84-030.

DEC COMMENT No. 10:
Schedule for Implementation. The Department believes that the schedule for completing the design, including procurement, can be reduced to less than 5.5 years. The current schedule indicates 4 years for design and permitting, which seems too much. Similar projects, such as the Bergen Basin parallel interceptor, only required 2.5 years for design completion.

DEP Response:
DEP is willing to discuss the projected implementation schedule with DEC. However, the proposed Bronx River relief sewers are not comparable in scope and complexity to the Bergen Basin parallel sewer project. The Bergen Basin Sewer Project consists of constructing 600 linear feet of a 54 inch diameter sewer via microtunneling. The staging area for this $20M construction project and associated jacking pits are located within a grassy median along the Belt Parkway. The project was designed to minimize working within City streets, with a large portion of the pipe being tunneled in the grassy area and beneath the Belt Parkway, thereby reducing traffic and community impacts. In comparison to the Bergen Basin project, the proposed Bronx River relief sewers are larger in their extent and are more complex in their construction as described below.

DEP has proposed two relief sewers in the Bronx River LTCP, one of which is a 2,700-linear-foot, 60-inch diameter pipe that begins at relief structure 27 and generally runs parallel to an existing combined sewer through City streets and requires crossing beneath Interstate 95, the Bronx River Parkway and an active Amtrak line (see Figure 8-26 in the LTCP). During design, comprehensive maintenance and protection of traffic plans (MPTs) and close coordination/approvals from the various stakeholder agencies (NYCDOT, NYSDOT, Amtrak) will be required. Construction of this sewer will likely be a combination of cut and cover and microtunneling along the 2,800 foot route. The second relief sewer is a 1,100-linear-foot, 72-inch diameter pipe that runs from Regulator 13 to the Bronx River Siphon as shown on Figure 8-30 in the LTCP. This proposed sewer would run beneath Soundview Park, generally parallel to an existing combined sewer. This construction will require approvals and coordination with the NYC Parks Department, as construction will occur entirely within parkland.