NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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December 21, 2018

SENT VIA EMAIL
Mr. Keith Mahoney, P.E.
Acting Program Manager - LTCP
Bureau of Wastewater Treatment
New York City Department of Environmental Protection
96-05 Horace Holding Expressway
Corona, NY 11368

Re: Order on Consent ("CSO Order"), DEC Case #CO2-20110512-25 modification to DEC Case #CO2-20000107-8, Appendix A
XII. Jamaica Bay CSO, D. Submit Approvable Drainage Basin Specific LTCP for Jamaica Bay / Tributaries

Dear Mr. Mahoney:

The New York State Department of Environmental Conservation (Department) has reviewed the Jamaica Bay / Tributaries CSO Long-Term Control Plan (LTCP) submitted by the New York City Department of Environmental Protection (City) on June 30, 2018 in accordance with the CSO Order, Appendix A, milestone XII.D. The Department acknowledges the efforts of the City to consider a broad range of alternatives to enhance the ecological systems in Jamaica Bay and its tributaries under the Jamaica Bay / Tributaries LTCP.

The selected alternative offers numerous important non-water quality benefits for the Bay and its tributaries that normally would not be considered under the CSO program; however, the water quality benefits of the selected alternative appear to be minimal and uncertain. The Department must evaluate the LTCP based on its potential to improve water quality and attain applicable water quality standards in accordance with EPA's CSO Control Policy. As such, the City must explore or consider other options that may provide additional water quality benefits for Jamaica Bay and/or its tributaries in order for the Department to approve the Jamaica Bay / Tributaries LTCP. Further analysis of some elements of the selected alternative are also warranted to ensure that the anticipated benefits will in fact be realized and the elements are cost-effective. Attachment A elaborates on these general comments as well as provide specific comments on the LTCP.

Please provide written responses to the attached comments within 60 days of the date of this letter. If you have any questions regarding this letter, please contact Mr. Edward Hampston, P.E., Section Chief at 518-402-9660 or edward.hampston@dec.ny.gov.

Sincerely,

Edward Hampston, P.E.
Acting Director, Bureau of Water Compliance
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Attachment A

Major Comments:

1. **Ribbed Mussels.** Under the selected alternative, the City has proposed construction of ribbed mussel beds in both Bergen and Thurston Basins to reduce bacterial load from CSOs and storm water discharges to these waterbodies. Ribbed mussels have not been considered under any other LTCP and represent a novel yet unproven technology. The ribbed mussel beds are the primary component of the selected alternative that will be used to reduce bacterial loads to both Basins (the other components have no or negligible impact on water quality) and the analysis presented in Appendix D assumes that the ribbed mussels will remove 10 percent of the bacterial load in the waterbodies. Based on that assumption, attainment levels in the Basins for the fecal coliform water quality standard will improve by up to 5 percent on an annual and recreational season basis.

   At present, the Department is reluctant to accept the City's analysis of the ribbed mussel performance. The information provided in Appendix D of the LTCP does not support the 10 percent removal efficiency assumption and a review of existing research on ribbed mussels by the Department did not reveal a solid basis for assuming a 10 percent removal efficiency either. Overall, the existing research indicates that ribbed mussels are capable of filtering particles from water columns, including plankton, organic matter, and bacteria. However, specific research on the use of ribbed mussels to remove fecal coliform in-situ is very limited. Moreover, the research conditions differed notably from what will be experienced in Bergen and Thurston Basins, which will be year-round, submerged deployment of very dense mussel beds in ambient waters with intermittent high volume flows of CSOs and stormwater.

   Overall, the very limited available bench-top and small scale field-level research on the use of mussels for fecal coliform removal is insufficient to make a leap to full-scale engineering application with significant assumptions on bacterial removal and improvements in water quality. As such, implementation of the ribbed mussel project needs to include further assessment steps leading from planning and bench scale studies to a large-scale field study prior to proceeding to a full scale engineered application. The Department offers the following conceptual outline for an overall research and planning process to include ribbed mussels in the proposed alternative that provide a solid basis for full scale application and water quality benefits:

   <u>Research and Planning Process</u>

   - First, the City must develop a method or system for reliably culturing a large number of mussels for the mussel beds. The City has estimated it will need about 50

million mussels for the mussel beds but the LTCP does not provide any information on where the mussels will be obtained. According to the Department's Marine Resources experts, the mussels **cannot** be taken from adjacent marshes as they are integral to the marshes function and help to hold marsh peat in place. Although some research has been undertaken on culturing ribbed mussels, the state of that science is not sufficient to produce the quantity of mussels needed for the City's full-scale project. As the City is probably aware, one of the findings from the small-scale study by Galimany, et al. (2017)[1] that examined the use of mussels for bioextraction in the Bronx River estuary was that "[s]pat collection efforts from shore and within the water column were unsuccessful; this was identified as a key bottleneck to future large-scale implementation." Thus, a first key step is developing a reliable method for culturing the mussels.

- Once the City has established a method for culturing the mussels, it must undertake studies to confirm that the mussels are capable of removing fecal coliform via lab bench-top studies, including cytometry filtration and aquaculture studies. This phase should also include experiments to determine actual removal efficiencies for the mussels under conditions likely to be experienced in the field. Building on these bench-top tests, the City will then need to undertake mesocosm-level experiments to simulate field conditions.

- Following bench-top and mesocosm-level experiments, the City must undertake an in-situ pilot study (in accordance with all applicable laws and regulations). The in-situ study should be used to identify the key design factors that influence the performance of the mussel beds in filtering the targeted bacteria, including location within the waterbody, design of the placement of the mussels, mussel size and filtering capacity, waterbody retention times, existing water quality and particulate size, types of bacteria encountered, and mussel survivability and die off over time. The results from the various experiments and studies should be used to further develop appropriate models to represent the mussels and these models should be peer reviewed.

- Finally, based on in-situ study results, the City will need to consider measures to be taken to minimize bird attraction. The City eliminated from consideration tidal wetland/marsh restoration near the airport due to potential hazards from birds with aircraft. A subtidal deployment of ribbed mussels would presumably avoid bird attraction but would need to remain submerged even at low tide. Any infrastructure (rafts, racks, etc.) used to maintain the mussels sub-tidally must also be

[1] Eve Galimany, Gary H. Wikfors, Mark S. Dixon,Carter R. Newell, Shannon L. Meseck, Dawn Henning, Yaqin Li, and Julie M. Rose (2017). Cultivation of the Ribbed Mussel (Geukensia demissa) for Nutrient Bioextraction in an Urban Estuary. *Environmental Science & Technology*, 51, 13311-13318.

subtidal. If the mussel bed will be intertidal, it would be exposed and needs to be outfitted with effective bird deterrents as birds are known to aggregate in large numbers to floating gear used for shellfish farming, or to any other structure that offers a perch in a marsh or estuary. Birds also result in additional fecal coliform loads, so their presence needs to be minimized for that reason as well.

In sum, for the ribbed mussel component of the selected alternative, the City needs to include a plan to undertake a series of experiments and studies that will gradually build upon each other and establish a solid basis for the design of a full-scale engineered application of ribbed mussels for improving water quality in Bergen and Thurston Basins. This plan should outline the major phases of research and study, including timeframes and milestones, and culminating in the submittal of an approvable engineering report. The approvable engineering report shall include any recommendations for full-scale application and updated projections on water quality impacts.

Until the City presents and commits to complete a more comprehensive process for confirming the performance of the mussels as outlined above, including submission of an engineering report for the full-scale application, the Department cannot approve a full-scale engineered application of the ribbed mussels as a primary component of the LTCP. The Department is not opposed to the use of ribbed mussels for reducing bacterial load in the Basins, but feels it would be premature to approve construction of the mussel beds without first validating their performance, including their ability to filter high volumes of CSO, with peak flows as high as 555 MGD in Bergen Basin, within short periods of time.

Based on the foregoing, the City must provide a more detailed description and schedule in the LTCP for conducting a planning and research process as outlined above to validate the performance of mussel beds, rather than proceeding to full-scale implementation. The process must include the submittal of an approvable engineering report documenting the basis for the design of the full-scale application along with projected water quality improvements. For assessment purposes under the LTCP analysis, a **zero percent** removal efficiency should be assumed for the ribbed mussels until the planning and research process is completed. Lastly, to better understand the assumptions made in the Appendix D analysis, the City must provide a copy of the engineering analysis completed to size the ribbed mussel beds presented in Figures 8-10 and 8-17.

2. **Southeast Queens (SEQ) Storm Sewer Buildout and High Level Sewer Separation (HLSS) in Springfield/Laurelton.** The SEQ storm sewer buildout and HLSS in Springfield and Laurelton have been long-standing projects planned by the City to alleviate flooding and sewer backups in this area of Queens as well as to reduce CSOs to Thurston Basin. The City has discussed the storm sewer buildout and HLSS in past planning documents but has never committed to complete the projects within the context of the CSO Order

due to uncertainty of project funding and the long timeframe for implementation. However, the City has recently allocated $1.9 billion to implement a portion of the storm sewer buildout over the next 10 years. While this funding may not result in the complete buildout of the storm sewers, it should allow for measurable progress on this project.

Given that the City has received substantial funding to complete a significant portion of the storm sewer buildout project within an intermediate timeframe of 10 years and that buildout will reduce CSOs, it seems reasonable that the City could include the pending construction as part of the selected alternative. The City has publicly stated on several occasions that the "bulk of the funding will go towards the construction of large trunk sewer spines along 150th Street, Guy Brewer Boulevard, Farmers Boulevard, and Springfield Boulevard." These trunk lines are major components of the buildout that can readily be incorporated into the LTCP.

Moreover, future phases of the project, which may occur after 10 years, are well within the timeframe for this LTCP. Other LTCPs have included large tunnel projects that will take up to 25 years to complete, which is a comparable timeframe for the SEQ storm sewer buildout and HLSS in Springfield / Laurelton projects. As such, the City must consider including some or all of the SEQ storm sewer buildout and HLSS in Springfield / Laurelton projects within the selected alternative. The milestones can be structured to accommodate the uncertainty associated with future phases of the project, such as by incorporating more specific schedules for construction at future dates once they are known.

To facilitate further discussion on including the storm sewer building and HLSS projects as part of the selected alternative, the City must provide detailed information on the work to be undertaken with the $1.9 billion, including scopes of work for construction, maps where the work will be completed, and implementation schedules. Additionally, the City must provide water quality model projections for CSO overflows, storm water discharges, and water quality attainment assuming the full completion of the SEQ storm sewer buildout and HLSS in Springfield and Laurelton projects.

3. **Additional Options to Improve Water Quality.** The analysis of alternatives included in the LTCP examined a broad range of alternatives and the alternative that was selected appeared to be the most cost-effective and feasible of those considered. The selected alternative, however, is not solely focused on CSO reduction and while it provides important non-water quality benefits, the associated improvements to water quality are minimal and uncertain. Thus, the City must reconsider or evaluate other alternatives that might enhance the water quality of the Bay or tributaries by either further reducing or mitigating CSOs, consistent with the CSO Control Policy, or by reducing other sources of impairment to the waterbodies on a voluntary basis similar to the tidal wetland restoration projects proposed in the LTCP. The following provides examples of some alternatives that

should be further considered and the Department encourages the City to identify other options that may not have yet been considered.

a. **HLSS at Fresh Creek.** Fresh Creek continues to receive around 300 million gallons per year of CSO and the headend of the waterbody does not attain the fecal coliform water quality standard on an annual (86 percent) or recreational season (93 percent) basis. The City is currently completing HLSS in the CSO drainage basin that overflows to Fresh Creek, but the 440 or so acres that are currently being separated represent only a portion of the area that is planned for separation. Another approximately 2400 acres is planned for separation. As such, the City must consider undertaking additional HLSS for Fresh Creek, to further improve water quality.

b. **Floatables Control at Fresh Creek.** The City's annual floatables monitoring report indicates that floatables may be a problem for this tributary (station J9A). As such, the City must consider undertaking floatables control for Fresh Creek, to further improve water quality and aesthetics.

c. **Disinfection at Thurston Basin.** The City evaluated the construction of a disinfection facility (comprised of chlorination and dechlorination) for CSO Outfalls JAM-005 and JAM-007 that discharge into Thurston Basin, however, this alternative was determined to be infeasible due to siting issues and other technical challenges associated with construction and operation. For this alternative, both the chlorination and dechlorination facilities were sited close to the discharge end of the CSO outfalls. However, the CSO being discharged at these two outfalls overflows at regulators located much further upstream, and there is a large quantity of stormwater discharged downstream of the CSO regulators as well as some tidal influence in the outfalls, which is also subject to chlorination and dechlorination. In order to alleviate some of the challenges associated with siting the disinfection facility at the downstream reach of the CSO outfall and reduce the amount of flow that would be subject to disinfection to only CSO, the City must consider siting the disinfection facility further upstream and utilize the length of the outfall for contact time and consumption of the chlorine through mixing with the stormwater and tidal water. To facilitate further discussion on this alternative, the City must provide a to-scale schematic illustrating the location of the storm water discharges into the Thurston Basin CSO outfalls vis a vis location of the CSO regulators and outfall discharges and a preliminary analysis of the feasibility of this disinfection configuration.

d. **In-Line Storage.** The City evaluated in-line storage to reduce CSOs to Bergen and Thurston Basins, but eliminated this alternative for various technical reasons. However, for Thurston Basin, the City must consider installation of tide gates to reduce the tidal influence for these outfalls for the in-line storage option.

e. **Floatables Control.** The City evaluated floatables control at the largest outfalls that only have floatables booms, in particular JAM-003A, JAM-005, JAM-007, and 26W-003, and indicated that the alternatives were abandoned due to adverse impacts to hydraulic grade line in upstream sewers. However, the only floatables control technology considered was underflow baffles. Netting facilities downstream of the regulator should not have any impact on the HGL, so the City may want to consider that technology as well. Additionally, for floatables control at Fresh Creek and Hendrix Creek, the LTCP states the alternative was abandoned due to no CSO benefits. While floatables control does not reduce CSO volumes, it does mitigate floatables from CSO and improve attainment with the water quality standard for floatables, so it should not be eliminated because it does not reduce CSO volume. As such, the City must reconsider underflow baffles for floatables control at the largest outfalls where it does not impact the HGL.

f. **Nitrogen Reduction.** In the 2006 Jamaica Bay Comprehensive Plan, the City evaluated the nitrogen contributions from CSO to the Bay and their impacts on water quality, in particular dissolved oxygen. At that time, the CSOs did not have a significant impact in comparison to the wastewater treatment plants. However, the nitrogen loads from the treatment plants has been reduced under the Biological Nutrient Removal program, and it seems reasonable for the City to reevaluate the CSO nitrogen contributions under the LTCP to determine if they have a more measurable impact on dissolved oxygen in the Bay. In conjunction with this evaluation, the City might also consider other projects that further reduce nutrient load to the Bay, not directly related to CSOs. The City has completed numerous upgrades to the wastewater treatment plants to reduce nitrogen loading to Jamaica Bay, however, the level of chlorophyll-a has remained relatively unchanged over time in the waterbody (based on post-construction monitoring data). Thus, the City must examine alternatives that might further reduce nutrient loading to the Bay, either from CSOs or from the treatment plants, such as reducing the transshipment of sludge to 26th Ward wastewater treatment plant.

4. **Green Infrastructure.** According to the LTCP, the City's baseline commitment for green infrastructure for Jamaica Bay and its tributaries was to manage 1-inch of storm water runoff from 877 acres, which will reduce CSOs to these waterbodies by about 202 MGY for an average rainfall year (note: see additional comment below on the baseline green infrastructure commitment). The selected alternative includes additional green infrastructure beyond the baseline commitment in both CSO and separately sewer areas that drain to Bergen and Thurston Basins. Specifically, the City will manage 1-inch of storm water runoff from 147 acres in the Thurston Basin drainage area, which will reduce CSO by 6 MGY and storm water by 22 MGY to this waterbody, as well as manage 1-inch of storm water runoff from 232 acres in the Bergen Basin drainage area, which will reduce CSO by 9 MGY and storm water by 211 MGY to this waterbody.

The LTCP does not provide detailed information on how these CSO and storm water reductions were calculated or their estimated cost. At first glance, based on capture ratios alone, it does not appear that the additional green infrastructure is cost-effective, because there is very little CSO reduction achieved despite the sizable amount of green infrastructure proposed for both Basins. For the baseline green infrastructure commitment, the ratio of CSO reduction per impervious acre managed (MG/Ac) is about 0.23 MG/Ac, and this ratio is consistent with citywide ratio of 0.22 MG/Ac presented in the ***June 2016 GI Metrics Report***. However, the additional green infrastructure has a ratio of only 0.04 MG/Ac, about a fifth of the citywide ratio and a tenth of the ratio for green infrastructure with high percentage of retention assets, which is 0.4 MG/Ac.

While the additional green infrastructure will also reduce storm water discharges to Bergen and Thurston Basins, the overall level of reduction is minimal compared to the volume of storm water being discharged. As such, it appears that there is very little benefit from constructing additional green infrastructure in the drainage areas for these two Basins. To better understand the technical basis for the GI, the City must provide a more detailed explanation of how the projected reductions for CSO and storm water for the additional green infrastructure in Thurston and Bergen Basins were calculated, their estimated costs, and their projected water quality benefits.

Miscellaneous Comments:

5. Chapter 8. Provide figures (similar to Figure ES-8) that show attainment levels for the ***entire*** Jamaica Bay as well as tributaries for fecal coliform, enterococcus, and dissolved oxygen standards for the **selected alternative**. The figures provided, such as Figure ES-2, only show the tributaries and the northern half of the Bay. Additionally, provide a similar figure in the Executive Summary for the baseline, 100 percent CSO reduction, and selected alternative showing the attainment levels for the proposed enterococci 130 cfu/100 ml STV standard.

6. Page 1-4. The Interstate Environmental Commission is not part of NEIWPCC as of September 2018, it is an independent organization.

7. Figures 2-3 and 6-2. Explain the difference between areas designated as "storm drainage" and "MS4 drainage". In previous LTCPs, the City has not similarly differentiated the separately sewered areas in the drainage basins.

8. Section 2.2.a.5. Provide a figure showing the specific sensitive areas in Jamaica Bay and its tributaries, such as locations associated with endangered species and any public bathing beaches.

9. Provide a copy of ***CSO-LTCP: Basis for Modeling – Jamaica Bay and Tributaries*** and ***Jamaica Bay LTCP Sewer System and Water Quality Modeling Report.***

10. Section 6.3. The gap analysis does not need to examine attainment with DO for the next higher use classification. For Class I waterbodies, examine attainment with only the existing DO water quality standard, which is never less than 4.0 mg/l.

11. Section 8.1.c. The use of a NPV factor of 24.505, based on a 100-year useful life, does not seem reasonable given the nature of the projects included in the selected alternative. A useful life of 20 years, as has been used for other LTCPs, seems more reasonable.

12. Section 8.1.i. The justification for elimination of the mechanical aeration does not make any sense. Aeration can be used even though elimination of the CSOs does not notably improve attainment levels, in fact, that very rationale would support use of instream mechanical aeration. Additionally, Figure 8-4 does not show that the technology has been eliminated from consideration. Please confirm that the narrative and figure are correct.

13. Section 8.4.k. Provide a detailed breakdown of the cost estimate for each component of the selected alternative (e.g. wetlands, dredging, mussels, and green infrastructure).

14. Section 8.2.a.2. Describe in more detail the alternatives B-1f and 26W-1, "Real time control of existing private building retention facilities" considered for Bergen Basin, Spring Creek, Hendrix Creek, and Fresh Creek and why they were eliminated from consideration.

15. Page 8-54. The discussion under Spring Creek alternatives indicates that the CSO chlorination study is still ongoing, although the City has stated before that it is complete. Confirm that the statements regarding the pilot study are correct or revise as needed.

16. Confirm if the City has bathymetry for the head-end of Bergen Basin or provide photos of the exposed sediments during low tide if readily available.

17. Inflow and Infiltration. The LTCP indicates that inflow and infiltration are a problem within some of the sewersheds covered under this LTCP (e.g. Coney Island Creek WWTP, 26th Ward WWTP, and Jamaica WWTP). Specifically, the LTCP states that the Paerdegat CSO retention facility and Spring Creek AWWTP both receive I&I, and the southeast Queens area contributes inflow to the Jamaica WWTP due to a lack of storm sewers. The Department requests more specific information on the magnitude of the I&I in these sewersheds and the extent to which the City has monitored its collection system to identify the specific areas where the great contributions of I&I are occurring. Section 7.2.2 of the 2011 Jamaica Bay/Tribs Watebody/Watershed Facility Plan states that I&I control would be reevaluated during the development of Jamaica Bay/Tribs LTCP, but the LTCP

does not indicate if any further I&I assessments were completed. Lastly, confirm that the original baseline conditions for the InfoWorks model included I&I for Paerdegat and Spring Creek CSO storage tanks.

18. Table 9-16. It would be more appropriate if the cost estimates for the CSO program were all presented in the same year dollars or include a footnote that indicates otherwise.

19. Confirm if the City examined the collection system for Jamaica WWTP, 26th Ward WWTP, and Coney Island Creek WWTP using the Optimizer software.

20. During past discussions related to the Rockaway sewershed, the City has stated that the collection system in this sewershed is completely separated. However, in the LTCP the City states that sewershed has CSOs, implying that a portion of sewershed had a combined sewer system. The City and Department are currently confirming the configuration of the sewer system as part of negotiations to resolve the Rockaway 2xDDWF notice of violation. Any references to CSOs from the Rockaway sewershed should be revised to be consistent with these discussions between the Department and City.

21. According to a "June 14, 2016 Green Infrastructure Performance Metrics Report Briefing for DEC", presented by the City, the baseline GI commitment for Jamaica Bay and its tributaries was to manage 1-inch of storm water runoff from 1153 acres, or about 14.6 percent of the impervious surface, which would result in a reduction in CSO of about 248 MG. The LTCP presents different values for both the acres of impervious surface managed and CSO reduction and the City needs to explain in more detail the reasons for the differences in baseline values.